Bulletin of the

UNIVERSITY OF NEW HAMPSHIRE

Undergraduate Catalog
1989 – 1990

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Contents

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For information about undergraduate admission to the University, students should contact Stanwood Fish, Dean of Admissions, (603) 862-1360.

For information about courses and academic records, students and former students should contact Stephanie M. Thomas, Registrar.

1989–1990 University Calendar

Summer Session 1989

May 22–August 11

Semester I

August 31, Thursday
Residence halls open for freshmen

September 1, Friday
Registration for freshmen

September 3, Sunday
Residence halls open for upperclass students
Registration for upperclass students

September 4, Monday
Registration

September 5, Tuesday
Classes begin

September 11, Monday
Last day to withdraw and qualify for ¾ tuition refund

September 22, Friday
Last day to add courses without dean's approval and without $25 late add fee
Last day to drop courses or change to audit without $25 late drop fee
Last day to choose pass/fail option
Last day to file an Intent to Graduate form for Dec. 1989 graduation without late fee

September 30–October 1, Saturday–Sunday*
Rosh Hashanah

October 5, Thursday
Last day to withdraw and qualify for ½ tuition refund

October 6, Friday
Last day to drop or change to audit ($25 per course late fee continues to apply)
Last day to carry more than 20 credits without a surcharge

October 9, Monday*
Yom Kippur

October 20, Friday
Midsemester
Last day to withdraw from the University without grades of WP or WF

November 7, Tuesday
Election Day—no exams can be scheduled

November 10, Friday
Veterans Day holiday—no classes

November 22, Wednesday
Classes follow Friday schedule

November 23–24, Thursday–Friday
Thanksgiving Holiday

November 27, Monday
Classes resume

December 7, Thursday
Last day an announced oral or written exam may be given before final exam period

December 14, Thursday
Last day of classes

December 15, Friday
Reading Day—no classes

December 16, Saturday
Commencement (10:30 A.M.)

December 18, Monday
Final exams begin

December 22, Friday
Final exams end

Semester II

January 21, Sunday
Residence halls open

January 22–23, Monday–Tuesday
Registration days

January 24, Wednesday
Classes begin

January 30, Tuesday
Last day to withdraw and qualify for ¾ tuition refund

February 9, Friday
Last day to add courses without dean's approval and without $25 late add fee
Last day to drop courses or change to audit without $25 late drop fee
Last day to choose pass/fail option
Last day to file an Intent to Graduate form for May 1990 graduation without late fee

February 22, Thursday
Last day to withdraw and qualify for ½ tuition refund

February 23, Friday
Last day to drop or change to audit ($25 per course late fee continues to apply)
Last day to carry more than 20 credits without a surcharge

March 16, Friday
Midsemester
Last day to withdraw from the University without grades of WP or WF

March 19–23, Monday–Friday
Spring Break

March 24, Friday*
Good Friday

March 26, Monday
Classes resume

April 10, Tuesday*
Passover

May 8, Tuesday
Last day an announced oral or written exam may be given before final exam period

May 15, Tuesday
Last day of classes

May 16–17, Wednesday–Thursday
Reading Days

May 18, Friday
Final exams begin

May 24, Thursday
Final exams end

May 25, Friday
Senior Day

May 26, Saturday
Commencement (10:30 A.M.)

Summer Session 1990

May 28–August 17

The University reserves the right to modify this calendar subsequent to printing.

*These holidays, important to many members of the University community, are not University holidays, but they are listed here to facilitate planning of University events. Faculty and staff should be sensitive to the needs of those who celebrate these and other holidays.

The University

The University of New Hampshire, founded in 1866 as the New Hampshire College of Agriculture and the Mechanic Arts, was among the early state institutions of higher education whose formation was made possible by federal government land grants to establish colleges to serve the sons and daughters of farming and laboring families.

First situated in Hanover as part of Dartmouth College, New Hampshire College moved to its Durham campus in 1893 after Benjamin Thompson, a prosperous farmer, bequeathed land and money to further the development of the college.

The college thrived in Durham, and in 1923 the state legislature granted it a new charter as the University of New Hampshire, composed of the College of Agriculture, the College of Liberal Arts, and the College of Technology. The Graduate School was formally added in 1928. The two-year program in agriculture, which had been offered since 1895, was formally recognized in 1939 and is now the Thompson School of Applied Science. The Whittemore School of Business and Economics was established in 1962.

In 1963, the University System of New Hampshire was created when the teachers' colleges at Plymouth and Keene were brought under the same board of trustees as the University. In 1969, the state legislature recognized the extended functions of the College of Agriculture, renaming it the College of Life Sciences and Agriculture, and the School of Health Studies was established as part of the University's programs. Beginning in 1971, the Division of Continuing Education was authorized to offer associate in arts degree programs as an additional approach to higher education for New Hampshire residents. In 1975 the College of Technology was renamed the College of Engineering and Physical Sciences.

In 1985, the University began offering its programs and resources to residents of the most densely populated region of the state through the University of New Hampshire at Manchester (formerly Merrimack Valley College).

Academic and cultural resources of each campus are amplified through System-shared programs and facilities. Cooperative ventures among the twelve member institutions of the New Hampshire College and University Council combine public and private higher education resources.

The Campus

The home of the University is Durham—one of the oldest towns in northern New England—near the seacoast of New Hampshire. The semirural town still retains traces of its colonial past.

The 200-acre campus is surrounded by more than 3,000 acres of fields, farms, and woodlands owned by the University. A stream flowing through a large wooded area in the middle of the campus enhances the natural open space among the buildings—74 for teaching, research, and service; and 36 residence halls for men and women.

The *University Library* houses 927,454 volumes, 8,141 serials and periodicals, 7,632 tapes and records, 4,121 cassettes, and a substantial microfilm collection. Specialized subject collections in chemistry, engineering and mathematics, biological sciences, and physics are housed in four branches administered by a physical sciences librarian and a biological sciences librarian.

Athletics-physical education facilities include indoor and outdoor swimming pools; tracks and courts; gymnasiums; weight training, wrestling, and gymnastics rooms; a dance studio; a number of playing fields; and an indoor ice rink.

The *Memorial Union Building* contains student activities offices, auditoriums and meeting rooms, food services, games and craft areas, and lounges.

The *Paul Creative Arts Center*, home of the departments of the arts, music, theater and dance, and communication, contains two theaters and two art galleries.

Thompson Hall is the main administration building.

College Woods includes 5 miles of well-kept paths through 260 acres of woods.

The *New England Center*, a cooperative effort by the six state universities of New England to offer outstanding continuing education programs, provides modern facilities for adult education conferences and seminars in its residence-dining-learning center.

The *John S. Elliott Alumni Center* houses the alumni and development offices and serves as a focal point for alumni activities and campus meetings.

The University's *computing facilities* operate virtually 365 days a year, 24 hours a day. They include large DEC 8600s, VAXs, and PRIMEs, plus numerous microcomputers.

Teaching, Service, and Research

In the 1988–89 academic year, the University of New Hampshire had 11,131 degree candidates enrolled, including 415 in the associate in applied science program of the Thompson School and 149 in the associate in arts program in the Division of Continuing Education. In the Division of Continuing Education, 1,909 special students also were enrolled.

The University is committed to offering excellent educational programs and opportunities for its students. The University's approximately 590 full-time teaching faculty provide a ratio of 1 full-time faculty member to about 17 full-time students. Eighty-five percent of the full-time faculty hold doctoral or terminal degrees, and many have earned national and international reputations in their professional fields.

A faculty member's first responsibility is teaching students. The University considers teaching so important that it engages in regular evaluation of each faculty member's teaching by students and colleagues. Such evaluation is intended to promote excellence in teaching and is used in tenure, promotion, and salary decisions concerning teaching faculty.

The University also requires its faculty to contribute to the growth of human knowledge through scholarly research and to disseminate that knowledge to the community beyond the campus. Research normally results in the publication of books, articles, or talks given to scholarly associations, while wider dissemination is accomplished, for example, through the Cooperative Extension Service, the public TV station, and various programs for educating professionals.

Accreditation

The University of New Hampshire is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators. Specialized programs of study are also accredited by various professional organizations.

All degree programs at the University of New Hampshire are approved for veterans' educational benefits. Individuals are encouraged to contact the veterans coordinator in Stoke Hall about specific questions.

The University of New Hampshire supports the efforts of secondary school officials and governing bodies to have their schools achieve regional accredited status to provide reliable assurance of the quality of the educational preparation of its applicants for admission.

Admissions

The University welcomes visitors to campus. Candidates are encouraged to contact the Office of Admissions to arrange for an interview or tour of campus with a student admissions representative. These representatives are qualified to give information about the academic organization of the University and the criteria used by the Admissions Committee in reviewing candidates, and they are best able to discuss student activities, living arrangements, and other aspects of UNH life. A professional staff member oversees each day's interview activity and is available to assist candidates with special concerns or questions. Also, frequent Saturday morning and weekday Group Information Sessions led by an Office of Admissions staff member and student representatives are followed by guided tours of the campus. Please call the Office of Admissions (603-862-1360) for information.

Admission Criteria

Admission to a bachelor's degree program is based upon successful completion of a four-year secondary school program of college preparatory coursework. Primary consideration is given to academic achievement and aptitude, as demonstrated by the quality of candidates' secondary school course selections, rank in class, recommendations, and the results of a College Entrance Examination Board Scholastic Aptitude Test. Consideration is also given to character, leadership, initiative, and special aptitudes and talents.

The choice of secondary school program and courses may limit or enhance opportunities and achievements in college. Candidates are strongly encouraged to extend their knowledge and learning skills through work in the basic academic disciplines. Most successful candidates present at least four years of English and mathematics, three years of laboratory science, and two years of social science. Successful candidates have generally completed three years of study in a single foreign language or have completed more than one year of study in each of two different languages.

Candidates are expected to pursue in greater depth those fields in which they have special interests. For example, students who plan to specialize in engineering, science, mathematics, or forestry should present four years of mathematics including trigonometry, as well as laboratory coursework in chemistry and/or physics. For students planning to major in health-related disciplines, secondary school laboratory courses in biology and chemistry are strongly recommended.

Applicants who have identified academic fields of interest are asked to indicate their "prospective" majors in order that the University may evaluate their credentials in terms of their academic objectives and avoid excessive enrollments in professional programs with fixed capacities. Candidates may also apply for general admission as "undeclared" applicants for the College of Liberal Arts, the College of Life Sciences and Agriculture, and the School of Health Studies.

Many University students request a change in major during their undergraduate years, and most are approved. These changes are possible after a student has been at the University for at least a semester and has secured permission from the appropriate college dean and department chairperson. In recent years, however, the University has not always been able to honor all requests for a change of major; at present this is true for programs in administration, communication, computer science, economics, hotel administration, occupational therapy, and the engineering fields.

Admission Tests Requirements

All candidates for admission to bachelor's degree programs are required to submit the results of a College Entrance Examination Board Scholastic Aptitude Test. While achievement tests are not required, a score of 500 or higher received on foreign language achievement tests satisfies the foreign language requirement of the bachelor of arts degree programs. Students who have identified a specific major are encouraged to submit achievement test results relating to that major. For example, an engineering applicant could submit math and physics or chemistry test results.

Art and Music Candidates

Candidates applying to any program within the Department of the Arts (except art history) are required to submit a portfolio to the department chairperson (telephone 603-862-2190). Candidates applying for programs in the Department of Music must make arrangements with the chairperson of that department for an audition (telephone 603-862-2404). Details regarding these requirements may be obtained from the departments or the Office of Admissions.

Freshman Admission Application Deadlines

Except for early notification candidates, applications should be submitted after the first marking period grades are available and before February 1. Applications received after that date may be considered only as vacancies occur. A nonrefundable application fee, $15 for New Hampshire residents and $30 for nonresidents, must accompany the application.

Candidates who apply for regular admission by the February 1 application deadline will receive notification by mid-April. Accepted candidates are required to confirm their intention to enroll with the payment of an enrollment fee ($150 in-state, $300 out-of-state) by May 1.

Early Notification

Between September 15 and December 1, the University considers well-qualified freshman applicants who desire fall enrollment under the early notification program. While it is not necessary that UNH be the first choice college, applicants should have carefully matched their objectives with the University's offerings and feel confident that their goals could be met at UNH. The University's early notification program places no obligation on the applicant to enroll if accepted for admission. The benefits for the successful early notification applicant are an early resolution of the question of admission to the University and priority with reference to the selection of a University residence hall if the student ultimately chooses to enroll. Unsuccessful early notification applicants will be reconsidered in the regular admissions process after receipt of senior year first–marking-term grades. Early notification applicants must submit a regular application, secondary school record, the results of a Scholastic Aptitude Test, and a counselor's letter of recommendation. Decisions will be returned by January 15 on all early notification candidates who have observed the application deadline.

Deferred Admission

The University considers applicants for deferred admission, which enables students to reserve a space in college while taking time off from school for work or travel. The University may not be able to offer deferred admission in certain program areas, however.

Advanced Standing

The University recognizes outstanding secondary school work by means of advanced placement and credit for those who have taken enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-

approved placement examinations, including the College Board Advanced Placement Tests, or through the College Level Examination Program (CLEP).

The University accepts College Board Advanced Placement Tests in nearly every subject area. The minimum score accepted is 3 with credit and course equivalency based on the score achieved. A score of 4 or better is required in some foreign languages and for some mathematics courses.

The University recognizes credit for the College Level Examination Program. Up to 32 semester credits of General Examination tests may be applied as elective credit only. Scores must be 50 or better in each sub-area of humanities, natural science, social science, or history. The minimum score for mathematics is 500 and for English, 610. Subject exams where applicable may be used to satisfy both departmental and general education requirements. Maximum credit accepted for all credit by exam or advanced placement testing is 64. Further information may be obtained from the Office of Admissions.

Associate Degree Candidacy

The University accepts candidates for associate in applied science and associate in arts degree programs who have demonstrated ability and motivation for learning through secondary school achievement, work experience, and/or military service.

Both New Hampshire residents and out-of-state students may be considered for admission to associate in applied science degree programs offered by the University's Thompson School of Applied Science. Candidates applying from the senior year in high school must submit the results of a College Entrance Examination Board Scholastic Aptitude Test. Students granted freshman admission to the Thompson School are eligible for University residence hall accommodations. Two of the programs offered by the Thompson School, forest technology and civil technology, require that candidates present a minimum of two years of college preparatory mathematics (see also the Thompson School section).

The University offers an associate in arts degree program through the Division of Continuing Education. While this program is available to both New Hampshire residents and out-of-state students, associate in arts degree candidates are not eligible for University residence hall housing because of space limitations (see also the Division of Continuing Education section).

For information concerning associate in arts and associate in science degrees offered through UNHM, see the section on the University of New Hampshire at Manchester.

Eligibility for Degree Candidacy

Applicants who meet the appropriate requirements for admission may become candidates for any undergraduate degree offered by the University. However, applicants having a degree will not be admitted into a program of study that awards the same degree (e.g., B.A., history, and B.A., zoology). Applicants may, however, be admitted into a program awarding a different degree (e.g., B.A., history, and B.S., biology; or B.A., history, and A.A.S., business management).

Readmission

An undergraduate who withdraws, does not register for UNH coursework in a given semester, or is suspended or dismissed from the University thereby terminates degree candidacy and must apply for readmission by the following deadlines: fall semester, June 1; spring semester, November 1. A nonrefundable application fee of $15 must accompany this application. Readmission applications are processed in the Office of Admissions. However, decisions regarding readmission are made in consultation with the Dean of Students Office and the dean's office of the University college division to which the student is applying.

Before seeking readmission, suspended students must remain away from school for at least one semester. The applications of suspended students should include a statement about the applicant's readiness to resume University work.

Only under extraordinary circumstances will students be readmitted after dismissal for academic reasons. Applications submitted by dismissed students are reviewed by the University's Academic Standards and Advising Committee.

Students applying for readmission should realize that it may not be possible to enroll in certain programs that have established enrollment limitations, and no assurance can be offered that University housing will be available.

Transfer Students

Transfer admission to UNH is competitive. The University will consider qualified candidates desiring to transfer from approved institutions. The consideration of a student's candidacy includes review of his/her course selection and the extent to which that selection addresses the University's general education requirements. Transfer credit is awarded for courses that have been completed with a grade above the lowest passing grade, provided those courses are comparable to courses offered at the University of New Hampshire. Formal transfer credit evaluations are provided only to applicants who have had their admission approved.

The University encourages competent applicants who have valid and legitimate reasons for desiring a transfer to UNH; however, it cannot encourage applicants with a history of academic or personal difficulty. Students who have encountered such difficulty are usually better advised to return after an appropriate period to their former college and improve their records before attempting to transfer.

Students enrolled in one of the University's associate degree programs who desire admission to a bachelor's degree program at UNH must apply as transfer students through the Office of Admissions. A recommendation from the associate degree adviser is also required.

It may not be possible for transfer applicants to enroll in certain programs with established enrollment limitations, and no assurance can be offered that University housing will be available.

Students desiring to transfer for the fall semester must complete application procedures before March 1; for spring semester, by November 1.

No portion of students' grade-point averages may be transferred; that is, external averages will not be calculated in the ones earned by students after entering UNH.

New England Regional Student Program

The University participates in the New England Regional Student Program of the New England Board of Higher Education, in which each state university in New England offers a number of regional curricula at the undergraduate level to students from other New England states. Under this program, students receive some preferential admission consideration and, if admitted, pay the UNH in-state tuition plus 25 percent. Students must indicate on the application the specific approved curriculum for which they are applying. Information about the curricula may be obtained from the New England Board of Higher Education, 45 Temple Place, Boston, Mass. 02111; or phone (617) 357-9620.

Special Student Status

UNH offers the special student classification for persons who wish to participate in University coursework without entering degree programs. Special (nonmatriculated) students register for coursework through the University's Division of Continuing Education and are usually restricted to part-time study (maximum of 11 semester hours) unless permission is granted by the Office of Admissions to exceed this limit. In evaluating requests for full-time status, the Office of Admissions applies the same criteria used in the review of applicants for admission to degree candidacy. Special students have full access to the academic counseling services of the division and should realize that their continuing participation in University coursework is predicated upon satisfactory achievement. Special students who subsequently become degree candidates may find that those courses taken under the special student classification cannot be applied toward the residence requirement for the degree.

Resident Status

All students attending any division of the University of New Hampshire in any capacity shall be charged tuition at a rate to be determined by their domicile. Those domiciled within the state of New Hampshire shall pay the in-state rate. Those domiciled elsewhere shall pay the out-of-state rate.

Students are classified as residents or nonresidents for tuition purposes at the time of admission to the University. The decisions, made by the dean of admissions, are based upon information furnished in students' applications and any other relevant information.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents have been legally domiciled in New Hampshire continuously for a period of at least twelve months immediately prior to registering for the term for which the students are claiming in-state status. Students admitted from states other than New Hampshire or from foreign countries are considered nonresident throughout their attendance at the University unless they have acquired bona fide domicile in New Hampshire.

If students maintain residency apart from that of their parents, they must clearly establish that they are financially independent and that their residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University. To qualify for in-state status, students must have been legally domiciled in New Hampshire continuously for a period of at least twelve months prior to registering for the term for which in-state status is claimed.

The burden of proof in all cases is upon the applicants. The University reserves the right to make the final decision concerning resident status for tuition purposes.

A copy of the rules governing tuition rates may be obtained from the Office of Admissions.

Division of Student Affairs

The Division of Student Affairs has major responsibility for student life on campus and provides a broad range of student services and programs to supplement the University's academic curriculum.

Within the Division of Student Affairs are the following offices: Dean for Student Affairs; Student Affairs Allied Programs; Dean of Students; Student Conduct Office; Department of Housing and Conferences (residence halls and family student housing); UNH Dining; Student Activities (Memorial Union); Financial Aid; Health Services; the Counseling and Testing Center; and the Career Planning and Placement Service.

Through the programs and services in the Division of Student Affairs, the University strives to maintain a campus environment that is conducive to learning and that encourages all members of the academic community to act responsibly and to respect one another's rights.

Financial Aid

The University Financial Aid Office assists promising students who are unable to meet educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment. The financial aid issue of the Bulletin of the University of New Hampshire contains specific program information, and a financial aid brochure gives application procedures and deadlines.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance, which are available both to high school seniors and adult students.

Before applicants may be considered for assistance by the University, the following forms must be submitted: the Financial Aid Form, a copy of parents' tax return, and a copy of student's tax return. Applicants may obtain the Financial Aid Form from local high schools or from the UNH Financial Aid Office.

Students should meet the following priority deadlines and should not wait until being admitted to the University before applying for financial aid:
Undergraduate Students: February 15
Graduate Students: May 1 (For Perkins loans, UNH loans, and College Work-Study; for information about other aid for graduate students, refer to the Graduate Catalog.)

Grants and Scholarships Admitted undergraduate degree candidates who will attend UNH on a full- or part-time basis may be considered for tuition grants and University scholarships. The basic consideration is financial need, although some scholarships are awarded on the basis of scholastic attainment, participation in extracurricular activities, or meeting specific requirements of a donor.

The University participates in the federally sponsored Supplemental Educational Opportunity Grant Program, which is designed to assist needy students who are admitted degree candidates.

Pell Grant Program Students may apply directly to the federal government for a Pell Grant by utilizing the appropriate section of the Financial Aid Form or by completing a separate application available in the Financial Aid Office or from high school guidance counselors. Students must reapply each year for a grant.

Loan Programs Two loan funds are administered by the University: UNH Loan Fund and Perkins Loans (formerly NDSLs). Admitted undergraduate and graduate degree candidates who will attend the University on an at least half-time basis may be considered for these loans. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

Most states now have higher education loan plans established by the Higher Education Act of 1965. Contact your local bank, other lender, or the Financial Aid Office for information.

Part-Time Employment The College Work-Study Program, both academic year and summer, assists students who, as determined by the Financial Aid Office, need financial assistance for their educational expenses. Admitted undergraduate and graduate degree candidates attending at least half time are eligible for consideration.

Students who do not qualify for the College Work-Study Program may find part-time employment on or near campus.

University Housing

The University offers students a variety of housing possibilities, from the small minidorms (devoted to special interests) to large halls (housing as many as 600 students). Some halls are single sex; others are coeducational. An apartment complex for undergraduates, a graduate student dorm, and family housing are also available. The Department of Housing and Conferences is committed to providing a living environment that maintains high standards of health and safety. Full-time professional directors manage the residence halls and work with a student staff to offer special programs and enforce hall standards.

Undergraduate University housing is limited to full-time degree candidates; associate in arts degree and Division of Continuing Education students are not eligible for on-campus housing. Students are not required to live on campus. University housing is not guaranteed for the full four-year undergraduate period.

Applications for housing are sent to accepted freshmen and must be returned with the $200 housing deposit. All new freshmen are guaranteed two continuous years of housing if they meet all established deadlines. Transfer and readmitted students are not guaranteed housing. However, they are encouraged to place their names on the housing waitlist with the Department of Housing and Conferences.

The University reserves the right to adjust room and board charges and policies when necessary; however, such adjustments will be announced as far in advance as possible. For more information, contact the Department of Housing and Conferences (603-862-2120).

UNH Dining

University policy requires that all undergraduate students living in traditional residence halls purchase a 13- or 19-meal (weekly) dining plan and take their meals in UNH dining halls.

The dining halls offer a broad range of menu selections, meeting the diet requirements of most students. A student with unusually restricted menu requirements due to medical prescriptions or religion should ask UNH Dining if these special needs can be met by dining hall menus.

Residence halls are not equipped for meal preparation. Students who prefer to prepare their own meals should seek living accommodations with full kitchen facilities off campus or, if eligible, in the undergraduate apartment complex. Students living off campus or in the undergraduate apartment complex may purchase a 19- or 13-meal plan, 5-lunch plan, or a 35-meal commuter meal plan. Single meals may be purchased in the dining halls by students and their guests. For more information, contact the UNH Dining office.

Campus Life

Cultural Events Students at the University can participate in a rich cultural life. In addition to the numerous lectures, films, concerts, and University theatrical productions offered throughout the year, the UNH Celebrity Series, administered by the Student Affairs Allied Programs Office, brings artists of international stature to campus. The performing arts at UNH are an important part of undergraduate education and programs are frequently incorporated into classwork.

Student Activities and Organizations The Office of Student Activities serves as the center for student organizations and related activities and operates the student union. It provides a wide variety of services and programs for the entire University community.

Students participate in approximately one hundred recognized organizations, each with special interests, which include academics, politics, religions, careers, service, and social fraternities and sororities. Staff support is available to students in developing a new organization, finding leadership, and sponsoring programs and activities. A student activities fee, determined by the Student Senate, provides funds for the *New Hampshire*, the student newspaper; WUNH-FM, the student radio station; the *Granite*, the UNH yearbook; the Student Television Network; Student Senate; Student Press; Cool-Aid, the campus crisis referral service; two programming organizations, the Memorial Union Student Organization (MUSO) and the Student Committee on Popular Entertainment (SCOPE); and other organizations. Additional funds are available on request to other organizations for special programs.

Other special events on campus include Parents' Weekend, Homecoming, the Christmas Crafts Fair, Campus Winter Event, and spring dances.

Memorial Union The Memorial Union, the only New Hampshire state war memorial, is the University's community center. It serves as the focus for student programs and provides services for the entire University community. Students, faculty, and staff on the Memorial Union governing board work with the director to set policies for the building's operation and those student activities related to the building. Building services include the University Information Center and Ticket Office; the Cat's Closet store; a scheduling office for room and facility reservations; a computer center housing Project DISCovery; a campus copy center; and a food service operation consisting of a cafeteria, Pistachio's Sweet Shoppe, pub, and catering service. The games area has candlepin bowling lanes, pool and billiard tables, pinball machines, and table tennis tables. The Commuter/Transfer Center and lounge provide a focal point for commuter students.

Student Affairs Allied Programs Office In addition to presenting the professional performing arts, the Student Affairs Allied Programs Office coordinates parents' programs, issues selling permits, and serves as liaison with the UNH chaplains' group. The University chaplains are available to all students. They participate in religious education, contribute to the spiritual life of students as part of their learning environment, and provide appropriate cocurricular activities.

The Student Affairs Allied Programs Office also publishes the *Student Handbook* and *Semester Preview*. The handbook includes statements of privacy rights as required by the Family Educational Rights and Privacy Act of 1974.

Dean of Students Office The Dean of Students Office has a working knowledge of all University policies and procedures and interacts regularly with students, staff, and faculty. Students and others are encouraged to contact the Dean of Students Office whenever they have a question, concern, or problem about University life. The following areas of responsibility fall within the office: Freshman Orientation, Training in Academic Skills Center, residential life programs, American and Canadian exchange programs, women's issues, international students, advising fraternities and sororities, nonacademic policies and procedures, the ACCESS Office, the Non-Traditional Student Center, the University Child Care Resource and Referral Service, and the Commuter/Transfer Center.

Student Conduct Office The Student Conduct Office administers on-campus judicial affairs under the guidelines of the student conduct system. This system is designed to protect the rights of students accused of violating the University rules of conduct (as detailed in the *Student Handbook*), to educate students, and to deter and prevent further violations.

University Health Services

The University Health Services provide comprehensive primary health care, including laboratory examinations, X rays, physical therapy, pharmacy services, and limited mental health care. Both inpatient and outpatient care are available. The staff maintains close relationships with other specialists in the area to whom they may refer patients for surgical or subspecialist care. Three well-staffed and -equipped community hospitals are located nearby, and an emergency ambulance service is available in Durham at all times.

During the regular academic year, University Health Services is staffed by seven full-time physicians (three ephebiatricians, two internists, one gynecologist, and one family practitioner), registered nurse practitioners, physician assistants, nurses, and part-time consultants. Appointments with physicians, physician assistants, and nurse practitioners may be made upon request. An appointment is not necessary for medical problems requiring immediate attention; such cases are treated through the outpatient clinic on a walk-in basis.

Office of Health Education and Promotion This office provides confidential counseling and referrals, health workshops, and a resource library on health issues. Educational programs on alcohol/drug use and assistance services for students with alcohol and other drug problems are also available through the Office of Health Education and Promotion and reflect the University's commitment to promoting awareness of such problems and encouraging responsible behavior.

Health Fees A mandatory health fee is assessed all undergraduate and graduate degree candidates and all full-time non-degree candidates. The academic year 1988–1989 health fee was $170. Payment of the fee entitles the student to unlimited visits to Health Services physicians, nurse practitioners, and clinic nurses; unlimited routine X rays and laboratory procedures performed at Health Services; health educator visits; cold clinic; the first $50 of off-campus laboratory work when it is ordered by, and the specimen is collected by, a Health Services staff member for transmittal to the Health Services laboratory contractor; medicines for treatment of acute illnesses and injuries if the medicine is stocked in the Health Services pharmacy; family planning services; limited physical therapy; and one physical examination except for routine exams without specific purposes.

Services not included under the health fee are medicines for treatment of chronic illness; consultant visits at the health center; X rays performed outside of the Health Services Center; off-campus laboratory tests performed by the Health Service laboratory contractor in excess of the first $50 and laboratory tests performed in any other laboratory (e.g., Wentworth Douglass Hospital, Leary Lab, etc.); contraceptive devices or medicines; emergency room visits or visits to any other health care facility or person, including physician office visits and emergency room visits ordered by the Health Services staff. An optional student accident and sickness insurance policy is available through Health Services. Its cost is moderate ($179 for a full year in 1988–89), and it covers most health care needs not covered by the health fee, including major medical payments. It is specifically designed to work in conjunction with the student health fee and may supplement or replace other insurance. Pre-existing conditions may not be covered. Refer to the student health insurance brochure for details.

Health Record Requirement In order to provide effective health service, the University requires that students who have been formally accepted for bachelor's or associate's degree candidacy and who register for nine or more semester credit hours must have complete medical records on file with the University Health Service. These records consist of (1) a health history to be completed by students before registration on a form provided by the University Health Service and (2) proof of measles immunization after 1968. Students wishing exemption from this requirement on religious grounds must make a written request to the medical director of the University Health Service. It is the responsibility of students to complete the form before the beginning of classes. Any students failing to submit the completed form will not be allowed to register for classes in the subsequent semester.

Advising and Counseling Services

Every UNH student is assigned an academic adviser, who provides help in choosing courses and planning a program of study. Each college within the University also has an advising office. Other sources of help, for academic or personal problems, are described below.

University Advising Center The University Advising Center provides academic advising for undeclared students in the College of Liberal Arts. The advising center has four full-time advisers and a half-time director to assist students with program selection. Students are encouraged to use their period of undeclared status to explore areas of study that will help them select a major.

The advising center coordinates the services of part-time faculty advisers representing each of the five schools and colleges on campus. Each faculty member, available for appointments at the Advising Office, can give students the most current information on specific majors and departmental requirements.

Training in Academic Skills (TASk) Center The TASk Center offers a comprehensive program of academic-related services to all undergraduate students. Participation in the program enables students to work on an individual basis with a trained staff person to improve study skills and learning techniques. In addition to the study skills instruction, services include reading assessment, course information, clarification of academic goals, personal advising, and referral. Additional services such as subject area tutoring, individualized reading assistance, and graduate school preparation and advising are available to eligible students through the federally funded Special Services Program. For more information, contact the TASk Center.

Counseling and Testing Center The Counseling and Testing Center offers professional consultation, individual and group therapy, and educational workshops for a broad range of emotional, mental, and interpersonal problems. The center offers services without charge to students who may be facing a major crisis, confusion, depression, family difficulties, or other personal problems. In addition, the center provides psychological testing and administers many national tests that are required for admission to graduate school. For additional information, call 862-2090.

The center provides a drop-in intake system. Individual appointments are not necessary for the first visit. In addition, the senior staff provides psychological emergency consultation to Health Services 24 hours, 7 days a week during the regular academic year. When necessary, the center's staff assists with outside mental health referrals.

The staff, which includes certified licensed psychologists and counselors, is committed to the welfare and development of UNH students. The center sponsors a variety of student-oriented activities including personal skills groups on such topics as communication, values clarification, and life planning. The staff is available for consultation with faculty, administrative staff, and parents on matters relating to the welfare of students.

All information about a student's visits to the Counseling and Testing Center is confidential and cannot be released without the permission of the student.

Career Planning and Placement Service The Career Planning and Placement Service assists students in planning their careers and helps with eventual job placement. A number of options are provided to help students identify potential careers: a career planning workshop, a network of alumni and parents, and an extensive library about career opportunities. Job placement opportunities are offered through an on-campus recruiting program and job notices for both summer jobs and full-time employment. A mandatory orientation program for graduating students introduces them to some of the realities of the working world and to the services of the Career Planning and Placement Office. The service is available to all undergraduates and graduate students; early use is encouraged.

NHCUC Job Referral Service The New Hampshire College and University Council, of which UNH is a member, funds a Job Referral Service (JRS) for students. The service may be contacted through the University's Career Planning and Placement Service.

Other Services

ACCESS Office Students with a physical or mental disability that limits one or more major life activities, such as walking, seeing, hearing, speaking, working, or learning, are encouraged to inform the ACCESS Office (Accessing Career Challenges in Education through Specialized Services), Room 200, Memorial Union Building, of the enabling accommodations they require.

The University encourages disabled members of its community to use existing services and to become involved in the mainstream of campus life. Inquire through the ACCESS Office for information about priority scheduling, accessible classrooms, special parking arrangements, assistance in securing academic aides, accessible on-campus transportation, reading services, interpreters, and other special arrangements.

Commuter/Transfer Center The Commuter/Transfer Center, located in the Memorial Union, helps commuter and transfer students with off-campus living. The staff will answer questions about renting, area landlords, consumer issues, and other commuter-related problems. Lists of available rental houses, apartments, rooms, and names of people looking for roommates are published weekly.

Other services include transfer orientation, emergency housing, roommate file box, the housing work/exchange program, a ride board, babysitting pool for student parents, intramural signups and information, commuter adviser program, etc. Typewriters, calculators, jumper cables, and dictionaries are available for student use.

Non-Traditional Student Center The Non-Traditional Student Center (603-862-3647) offers programs and services to students returning to college after a number of years out of school. The center provides resource and referral information, peer support, workshops, social activities, and study and lounge areas. Students are encouraged to stop in for information, to study, or to visit with other students.

Child Care Resource and Referral Information about Seacoast area child care and assistance in finding appropriate care are available through the UNH Child Care Resource and Referral Service (603-862-2895). The University also operates on-campus daycare and preschool programs. Call (603) 862-2835 for further information.

SHARPP The Sexual Harassment and Rape Prevention Program (SHARPP) is dedicated to providing a safe environment for all members of the University community. The program offers campus-wide rape awareness workshops and a support group for survivors through Counseling and Testing. Sexual assault advocates are trained volunteer women who offer confidential assistance to students who have been sexually violated. For information, call the Dean of Students Office (603-862-2050).

Veterans' Information The UNH veterans' coordinator, located in the Registrar's Office (603-862-1595), provides counseling on all aspects of veterans' benefits as well as assistance in procuring and completing the required forms and certifications for veterans' benefits. The veterans' coordinator maintains a comprehensive directory to assist veterans in contacting state, local, and University resources for housing, daycare, career planning, employment, financial aid, tutorial assistance, remedial training, handicapped services, and Vietnam Veterans' Outreach. The coordinator also provides a framework for networking among campus veterans.

Fees and Expenses

The cost for the freshman year at the University averages about $7,850 for residents of New Hampshire and about $13,000 for nonresidents. See the chart below for a breakdown of these costs.

Fees and Expenses (1988–89)*	N.H. Residents	Non-Residents
Tuition	$2,370	$7,550
Room (average)	1,676	1,676
Board (19 meals/wk.)	1,324	1,324
Activity fee	58	58
Recreational/physical education fee	45	45
Memorial Union fee	100	100
Student services fee	24	24
Health fee	170	170
Books, class supplies	500	500
Total	$6,267	$11,447
Individual expenses	1,300	1,300
Athletic admissions ticket (optional)	75	75
Health insurance (optional)	179	179

**The University reserves the right to adjust charges for such items as tuition, board, student fees, and room rent. Such changes will be announced as far in advance as feasible.*

Tuition

Tuition is $2,370 ($7,550 for nonresidents) per academic year. Undergraduates registering for 12 credits or more per semester pay the full tuition.

Students are permitted to enroll for more than 20 credits only with the approval of their college or school dean. After midsemester, persons carrying more

than 20 credits will be billed a per-credit fee of $75 for each credit above 20 for resident students and $235 for nonresident students, whether or not a student has obtained the dean's approval. (No refund will be made if a student subsequently drops a course, bringing the credits to 20 or fewer.) Resident undergraduates registering for fewer than 12 credits pay $75 per credit hour, plus a registration fee of $15 per semester. Nonresident undergraduates registering for fewer than 12 credits pay $235 per credit hour, plus a registration fee of $15 per semester. The minimum charge for any recorded course is $75 for residents and $235 for nonresidents.

Students majoring in engineering (chemical, civil, electrical, mechanical) and computer science will be charged a tuition differential of $175 for both resident and nonresident students per academic year. Students in these programs (both resident and nonresident) who register for fewer than 12 credits pay a differential tuition of $5 per credit hour.

All admitted students must pay an enrollment fee—$175 for residents and $325 for nonresidents. The enrollment fee, less $75 (to cover new student services such as orientation, preregistration, and record preparation), will be credited to the tuition bill. If a student decides not to attend the University, these payments may be refunded on a prorated basis until Aug. 15, according to the guidelines set by the Office of Admissions.

Three-fourths of tuition charges will be refunded to students withdrawing or dropping courses within one week of registration; one-half after one week and within 30 days; and none thereafter. (See University Calendar.) A degree candidate who withdraws from UNH and subsequently enrolls as a special student within the following year will be billed for tuition and fees on the same basis as degree candidates. Students with outstanding financial obligations to the University must clear their accounts before their registration will be confirmed.

A $25 fee must be paid by all students dropping courses after the third Friday of classes. The $25 fee will not be charged to persons changing to a reduced load or withdrawing; in both of these cases, the regular tuition rebate policy will apply. If a student has received permission to add a course after the third Friday of classes, a $25 fee will be assessed for each course added. A change of section within the same course is accomplished by a "drop" of one section and an "add" of another; however, only one $25 fee is assessed under these circumstances.

Fees

Required fees for 1988–89 included a Memorial Union assessment fee ($100) for the use and administration of the student union; a recreation and physical education fee ($45) for the use of recreational facilities; a student activity fee ($58) for support of the undergraduate newspaper, yearbook, student government, student lawyer, student radio station, and other student organizations; a student services fee ($24) to provide partial support for programs provided by the Division of Student Affairs; a health fee ($170) to provide general health care through University Health Services.

There are no waivers or refunds of these fees. The services and facilities are available to all—the extent to which each student uses them cannot be the factor by which assessment is determined.

An optional student season athletic ticket may be purchased for $75. Optional student accident and sickness insurance is available for all degree candidates and full-time nondegree candidates. Participants in intercollegiate athletics are required to purchase the student accident and sickness insurance or demonstrate proof of comparable insurance to the respective athletic department. The 1988–89 cost for student accident and sickness insurance was $179 for a full calendar year.

Room and Board

Housing charges average $1,676 per academic year for a double room.

Students applying for a room on campus must include a $200 prepayment fee with the housing application. Written notification of cancelation of the room application or assignment received before August 15 will result in forfeiture of the fee only. Written notification of cancelation after August 15 and before closing registration day, however, will result in a charge of one-fourth of the full semester's room rent. If students fail to occupy assigned rooms by one day after registration day, their room agreements will be canceled and the students charged for one-half of the full semester's rent. Written notification of cancelation of room received by the Department of Housing and Conferences after registration day and within thirty days from registration will result in the students' being charged for one-half of the full semester's rent. For cancelation of room thirty days or more after registration, students will be charged for the full semester's rent.

Refunds on board plans will be granted only on approved waivers or withdrawal from the University. Cancelation of a meal plan before registration day will result in a 100-percent refund; after registration day but before the end of the first week of the semester, 75-percent refund; and after the end of the first week but before the end of the fourth week, 50-percent refund. Refunds after the fourth week through the end of the twelfth week will be based on the remaining food cost portion of the meal plan. No refunds will be made after the end of the twelfth week. Generally, rebates will not be allowed for missed meals except in the case of illness.

Rebates

Any amount owing to the University will be deducted from any rebate due to a student.

Deposits and Course Fees

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of applied music courses. A charge will be made for riding lessons and scuba, as noted in the sections on animal sciences and physical education. Some courses carry special fees to cover the costs of special equipment, field trips, etc.; these are noted in the course descriptions. Thompson School students pay curriculum fees to cover special costs in their programs (see the Thompson School catalog). Students will be charged a computer use fee for courses requiring computer access and/or common access accounts. For certain courses, there are also lab fees.

Other Expenses

Books and classroom supplies cost approximately $500. These may be purchased at the University Bookstore.

Personal expenses average $1,300. These vary with individual students and include clothing, laundry, recreation, incidentals, and travel.

Payment

All bills, including those for room and board in University buildings, are due and payable in full on or before registration day for each semester.

Parents and students who wish to make periodic payments should consult their local banks or other financial institutions that provide programs for budgeting educational expenses.

To graduate from the University of New Hampshire, students must fulfill three types of requirements: University (general education), degree, and major requirements.

In addition to the particular requirements for specific degrees and majors, all candidates for a bachelor's degree must obtain a passing grade in a minimum of 128 credits in courses numbered 400–799, must maintain a cumulative grade-point average of at least 2.00 for all courses taken at the University in which a grade is given, and must successfully meet, as soon as possible in their University careers, the general education requirements described below.

General Education Program

The general education program is designed to emphasize the acquisition and improvement of those fundamental skills essential to advanced college work, especially the abilities to think critically, to read with discernment, to write effectively, and to understand quantitative data. It aims to acquaint the student with some of the major modes of thought necessary to understanding oneself, others, and the environment. It seeks to develop a critical appreciation of both the value and the limitations of significant methods of inquiry and analysis. Its goal, moreover, is the student's achievement of at least the minimal level of literacy in mathematics, in science and technology, in historical perspectives and the comprehension of our own and other cultures, in aesthetic sensibility, and in the diverse approaches of the humanities and the social sciences to understanding the human condition.

General education is intended to serve as a foundation for any major. It aims to go beyond the mastery of job-related skills and educate students so that they learn how to learn. The program is based on the premise that change is the dominant characteristic of our times and that the truly useful education stresses intellectual adaptability and the development of those problem-solving abilities, cognitive skills, and learning techniques vital to lifelong learning.

General Education Requirements

Students must fulfill the following general education requirements:

1. one course in writing skills, which must be taken during a student's first year;
2. one course in quantitative reasoning, which must be taken during a student's first year;
3. three courses in biological science, physical science, or technology, with no more than two courses in any one area;
4. one course in historical perspectives;
5. one course in foreign culture;
6. one course in fine arts;
7. two courses in social science/philosophical perspectives; and
8. one course in works of literature and ideas.

General education requirements are under review. Students should check with their advisers for the most current information.

General education requirements shall not be waived on the basis of special examinations or placement tests, except for the College Board Advanced Placement tests and the College Level Examination Program (CLEP) tests. The required courses cannot be taken on a pass/fail basis. No single course may be counted in more than one general education category. Academic departments may or may not permit general education courses to count toward requirements for a major.

The specific courses that fulfill each category of the general education requirements are printed below. Any course appearing in this list will fulfill a general education requirement if taken after August 31, 1989.

1. Writing Skills
ENGL 401

2. Quantitative Reasoning
ADMN 424
CS 410
INCO 404B*
MATH 419, 420, 425, 536
PHIL 412, 550
PSYC 402
RECO 528
SOC 502

3. Biological Science, Physical Science, and Technology
Biological Science
ANSC 400, 401
BCHM 501
BIOL 402, 405, 406, 411, 412, 443
BOT 412, 503
ENTO 400, 402
HMP 501
INCO 404C*
MICR 501-502
PHED 607
PLSC 421, 535
SOIL 502
WILD 433
ZOOL 412, 474, 507, 508

Physical Science
CHEM 401, 402, 403, 404, 405, 409
ESCI 401, 402, 409, 450, 501
INCO 404D*
PHYS 401, 402, 406, 407, 408
SOIL 501
WARM 504

Technology
CIE 520
CS 406
EE 405, 431, 432
EC 635
FORS 502
INCO 404E*, 495
ME 401
PHIL 447
TECH 583

4. Historical Perspectives
ENGL 515
HIST 400, 401, 402, 405, 406, 410, 421, 435, 436, 510
HUMA 510C†, 511C†, 512C†, 513C†
INCO 404F*, 404G*
POLT 403, 508

5. Foreign Culture
ANTH 411, 500, 512, 515, 519
ENGL 581
FREN 503, 504, 525
GEOG 401, 402
GERM 503, 504, 525
GREK 503, 504
HIST 425, 563
INCO 404H*, 404J*, 404K*
ITAL 503, 504
JPN 503, 504
LATN 503, 504
POLT 557
RUSS 425, 503, 504, 525
SPAN 503, 504, 525, 526

6. Fine Arts
ARTS 431, 487, 532, 570, 571, 572, 573, 574, 597
DANC 461, 462, 463, 638
HUMA 480**, 510A†, 511A†, 512A†, 513A†
INCO 404L*, 404M*, 404N*, 480, 480A
MUSI 401, 402, 501, 502, 511
PHIL 421
THEA 435, 436, 438, 441, 450, 457, 583

7. Social Science/Philosophical Perspectives
ANSC 405
ANTH 412, 518, 625
CMN 402, 455
ECON 401, 402
EDUC 410
ENGL 505
FS 525
GEOG 581, 582
HMP 401
HUMA 510D†, 511D†, 512D†, 513D†, 650

INCO 401, 404O*, 404P*, 404R*, 404S*
LING 505
NURS 670
NUTR 405
PHIL 401, 417, 424, 435, 436, 530, 630, 660
POLT 401, 402, 521, 560
PSYC 401
RECO 411
SW 525
SOC 400, 500, 520, 530, 540
WS 401

8. Works of Literature and Ideas
CLAS 501, 511, 512
ENGL 511, 513, 514, 516, 518, 519, 521, 522, 523, 533, 585, 586, 631, 632, 657, 685
FREN 621, 651, 652
GERM 520, 521
HUMA 401, 480B**, 501, 502, 503, 510B†, 511B†, 512B†, 513B†, 519, 595, 651, 652, 653
INCO 404T*, 404U*, 404W*, 404Y*
ITAL 621
PHIL 520, 570, 572, 573, 600
PSYC 571
RS 416, 417
RUSS 521, 593
SPAN 622, 653, 654

Grades

Instructors assign grades as listed below; grade points per semester hour are indicated in parentheses. For all undergraduate courses, grading standards established by the Academic Senate are that a C indicates competent, acceptable performance and learning; B indicates superior performance and learning; and A indicates excellent performance and learning. These standards apply to all undergraduate courses, instructors, departments, subjects, and colleges. The University reserves the right to modify grading and honors practices.

A (4.00) Excellent
A- (3.67) Intermediate grade
B+ (3.33) Intermediate grade
B (3.00) Superior
B- (2.67) Intermediate grade
C+ (2.33) Intermediate grade
C (2.00) Satisfactory, competent
C- (1.67) Intermediate grade
D+ (1.33) Intermediate grade
D (1.00) Marginal grade
D- (0.67) Intermediate grade
F (0.00) Failure: academic performance so deficient in quality as to be unacceptable for credit
AF (0.00) Administrative F (usually indicates student stopped attending without dropping the course); is included in grade-point average
Cr Credit: given in specific courses having no letter grades, designated credit/fail
P Passing grade in a course taken under the student pass/fail grading alternative
W Withdrawal—assigned if withdrawal is later than fifth Friday of classes; is not included in grade-point average
WP Withdrawal—assigned if withdrawal is after midsemester and if student is passing; is not included in grade-point average
WF Withdrawal—assigned if withdrawal is after midsemester and if student is failing; is included in grade-point average
AU Audit—no credit earned
IC Grade report notation for student's incomplete coursework
IA Indicates "incomplete" in a thesis or continuing course of more than one semester; the grade earned will replace "IA" assigned in previous semesters
IX Grade not reported by instructor

Students earning a semester or cumulative grade-point average less than 2.00 are placed on "academic warning."

Pass/Fail While earning a bachelor's degree, students may choose the pass/fail grading alternative for a maximum of 4 credits per semester up to a total of 16 credits.

Pass/fail cannot be used for general education requirements, for courses required by a student's major or second major, for option or minor requirements, for ENGL 401, or for repeated courses. In addition, B.A. degree candidates may not use pass/fail for courses taken to meet the foreign language requirement, and no Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

The minimum passing grade for credit is a D -(0.67); any grade below this minimum is a fail. All grades will be recorded on the grade roster as A, B, C, D, F, or intermediate grades. The pass/fail marks will be placed on students' transcripts and grade reports by the Registrar's Office. The course will not be included in the grade-point calculation, but the pass or fail will be recorded, and in the case of a pass, the course credits will be counted toward degree requirements.

Students may not use the pass/fail alternative to repeat a course. Associate in arts students, see page 78.

Honors An undergraduate degree student, after completion of at least 12 graded semester hours in University of New Hampshire courses, is designated as an honor student for a given semester if the student has (a) completed at least 12 graded semester hours for that semester and earned at least a 3.20 semester grade-point average; or (b) earned at least a 3.20 cumulative grade-point average and at least a 3.20 semester grade-point average regardless of the number of graded credits that semester. These categories are used: 3.20 to 3.49 (honors); 3.50 to 3.69 (high honors); and 3.70 to 4.00 (highest honors).

Bachelor's degree candidates who have earned honors for their entire work at the University will be graduated with honors based on the final cumulative grade-point average, provided that a minimum of 64 graded semester hours have been completed in University of New Hampshire courses. The Latin equivalent of the honors classification will appear on the student's academic record and diploma. The student's honors classification will be noted in the commencement program.

Honors Program

The University of New Hampshire has a tradition of encouraging academic achievement through its twenty-one honorary societies, including active chapters of Phi Beta Kappa and Phi Kappa Phi. In 1984, the University took another step to recognize outstanding students by establishing an undergraduate honors program. The University Honors Committee, made up of representatives from all colleges of the University, the Office of Admissions, the Office of Student Development, and the Registrar's Office, supervises the operation and requirements of the program.

There are two ways to enter the University Honors Program:

1. The Office of Admissions identifies a number of qualified incoming freshmen who are then invited to submit an application to the honors program. The honors

**available only to honors program students and others who have obtained special permission.*
***Students may take either HUMA 480A or 480B but not both.*
†For students who complete the entire sequence of HUMA 510, 511, 512, and 513, enrolling in different discussion sections each time, a fifth general education requirement (in foreign culture) will be waived, although additional credit hours will not be granted.

committee reviews these applications and determines admission to the program.

2. Freshmen who achieve a grade-point average of 3.20 or better during their first semester are also invited to join the program.

Participation in the University Honors Program does not add courses to those required to graduate. The first two years of the program focus on general education requirements. Students take a minimum of four honors-designated general education courses, one of which is a freshman seminar based on a special topic. All students must attain a cumulative grade-point average of 3.20 by the end of their sophomore year in order to continue in the honors program.

The upperclass part of the honors program consists of honors work in the majors. A booklet describing these programs is available in department and college advising offices as well as in the Honors Program Office. Programs with "honors in major" work are animal and nutritional sciences, anthropology, arts, biochemistry, business administration, chemistry, chemical engineering, civil engineering, earth sciences, economics, English, entomology, family and consumer studies, forest resources, French, geography, German, health management and policy, history, hotel administration, linguistics, mathematics, mechanical engineering, microbiology, music, nursing, occupational therapy, physical education (exercise specialist option), physics, plant science, political science, psychology, Russian, sociology, Spanish, and theater. The University Honors Committee has developed a "University honors" program for students in majors that do not offer honors work. Contact the Honors Program Office for further information.

In order to satisfy honors program requirements, students must have a final cumulative grade-point average of 3.20. All courses used to achieve a University honors (with or without designation of major) or an honors in major degree must have a minimum grade of B-. Successful completion of University Honors Program requirements entitles the student to receive the designation "University honors" or "University honors in major" on his/her academic record and diploma.

Full-tuition and partial-tuition merit-based scholarships are available to a select number of incoming freshmen. Several partial-tuition scholarships are also awarded to upperclass students. For more information, please contact Robert Mennel, director, University Honors Program, Hood House.

Degree Requirements

Grading and honors policies as stated in this catalog apply to all undergraduate students.

Other requirements in this catalog apply to students who enter the University between July 1, 1989, and June 30, 1990. (Students who entered the University at an earlier time but who wish to change to the requirements of this catalog must apply to the appropriate office for the change.) Students will be held responsible for all work required for graduation and for the scheduling of all necessary courses.

Modifications tend to occur in major programs during the four-year period of students' undergraduate careers. Students are expected to conform to these changes insofar as they do not represent substantive alterations in their course of study.

Note: Although the University will try to provide sufficient facilities so that students may pursue any major or curriculum for which they meet the requirements, such a privilege cannot be guaranteed, since rapidly increasing enrollment sometimes results in the overcrowding of required specialized courses. On occasion, students may remain in a crowded curriculum if they are willing to take certain courses during the summer session.

Bachelor of Arts

1. At least 128 credits with a minimum cumulative grade-point average of 2.00 in all University of New Hampshire courses.

2. Completion of the University general education requirements. This is intended to ensure that all students receiving the bachelor of arts degree acquire reasonable exposure to and learning in the arts and humanities, social sciences, and natural sciences.

3. Proficiency in a foreign language at the level achieved by satisfactory work in a one-year, college-level course. This requirement may be fulfilled by achieving a score of 500 or better on a College Board foreign language achievement test, or by completing a full-year elementary course in any foreign language, or by completing a semester of a course in a foreign language beyond the elementary year. This requirement must be satisfied by the end of the sophomore year.

4. Satisfaction of major requirements by completing at least 32 credits of major coursework with grades of C- or better and a grade-point average of 2.00 or better. A major may require a senior paper or project and/or a comprehensive examination.

Bachelor of Fine Arts, Bachelor of Music, Bachelor of Science

Requirements for the B.F.A. degree are on page 24; for the B.M. degree, on page 30; and for the B.S. degree, on pages 35, 46, 60, and 67.

Associate in Arts

1. Completion of at least 64 credit hours with a minimum grade-point average of 2.00 based on a 4.00 scale.

2. Completion of general education requirements as follows:

a. one course in writing skills (no pass/fail allowed)
b. one course in quantitative reasoning (no pass/fail allowed)
c. one course in the biological sciences, or physical sciences, or technology (no pass/fail allowed)
d. three courses chosen from the following, with no more than one from each category: historical perspectives; foreign culture; fine arts; social science/philosophical perspectives; works of literature and ideas (no pass/fail allowed)

The Division of Continuing Education may prescribe up to four of the six required courses used to satisfy the general education requirements. Courses that may be used to meet these requirements will be available from an adviser.

3. A minimum of four courses freely selected by the student.

4. The remaining courses or credits may be earned in one of the career concentrations described on page 78 and/or in elective general education courses.

5. The last 16 hours of credit must be University of New Hampshire courses completed at UNH following admission and matriculation, unless permission is granted to transfer part of this work from another institution.

Dual Degrees

The opportunity to pursue simultaneously two undergraduate degrees enhances and broadens the education of certain students. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the program. Except for specific five-year degree programs (page 19), a student may not pursue two different degree levels simultaneously.

Requirements

1. Students desiring dual degrees must petition the college dean or deans involved for permission.
2. Students planning to take one degree in a highly prescribed curriculum should register as freshmen in the appropriate school or college for that curriculum.
3. It is expected that candidates for two degrees will complete 32 credits beyond those required for the first degree.
4. The two degrees, as awarded by the University of New Hampshire, must be different (e.g., B.A. and B.S., or B.S. and B.S. in chemistry). Transfer students already holding a baccalaureate degree from another accredited institution may pursue an additional baccalaureate degree at the University of New Hampshire provided they fulfill the previously listed requirements. The degree received at the first institution will be accepted by UNH as awarded by that institution.

Supervision As soon as a student is accepted as a candidate for two degrees, the appropriate dean(s) will appoint supervisors for each of the proposed majors. The supervisors and the student will work out a basic course plan for the two degrees and inform the appropriate dual degree dean(s) of the plan. The supervisors will maintain joint control over the student's academic program. The college offices and the supervisors will receive copies of grade reports and other records for students pursuing two degrees.

Minimum Graduation Average

A cumulative grade-point average of 2.00 in University of New Hampshire courses is the minimum acceptable level for undergraduate work in the University and for graduation. In addition, some majors require a grade-point average greater than 2.00 in certain courses or combinations of courses. The Academic Standards and Advising Committee examines the records of students periodically and may place academically deficient or potentially deficient students on warning, or may exclude, suspend, or dismiss those who are academically deficient.

Quota of Semester Credits

Students registering for more than 20 credits must receive the approval of the college dean.

Undergraduates are assigned class standing on the basis of semester credit hours of academic work completed with a passing grade, as follows: to be a sophomore—26 credit hours; to be a junior—58 credit hours; to be a senior—90 credit hours.

Residence

"Residence" means being enrolled in University of New Hampshire (including UNH at Manchester) courses after admission to and matriculation in a degree program. Students who are candidates for a bachelor's degree must attain the last one-quarter of total credits for the degree in residence unless granted permission by the Academic Standards and Advising Committee to transfer part of this work from other accredited institutions.

Withdrawal from the University

Students who leave the University are expected to file formal withdrawal notification with the registrar.

Majors, Minors, and Options

Majors and some interdisciplinary minors are described under their various schools and colleges; other interdisciplinary and intercollege minors are described in the section on Special University Programs.

Student-Designed Majors

See page 72 for requirements for a student-designed major.

Second Majors

Bachelor's degree students may choose to fulfill the requirements of two dissimilar major programs, provided they obtain the approval of their principal adviser and the dean(s) of the college(s) in which the programs are offered, and comply as follows:

1. If the two majors are offered in different schools or colleges within the University, the admissions requirements of each must be satisfied.
2. If the two majors have two distinct degrees, e.g., B.A., B.S., or some other designated degree, students must choose which of the two degrees is to be awarded and fulfill all requirements for that degree.
3. No more than eight credits used to satisfy requirements for one major may be used as requirements for the other major.

Minors

Students may earn a minor in any undergraduate discipline designated by the University. A list of minors is available from the advising coordinator in each college or school. Students must consult with the major adviser and the minor supervisor. A minor consists of 20 semester hours with C- or better and a 2.00 grade-point average in courses that the minor department approves. Courses taken on the pass/fail basis may not be used for a minor. No more than eight credits used to satisfy major requirements may be used for the minor. Students should declare an intent to earn a minor as early as possible and no later than the end of the junior year. During the final term, an application should be made to the dean to have the minor shown on the academic record.

Options

Some degree programs offer a selection of options (e.g., art history and art studio through the Department of the Arts). These areas of concentration allow students to specialize within a discipline. The choice of option is recorded on the student's transcript.

Degrees and Major Programs of Study

College of Liberal Arts

The teacher education division of the College of Liberal Arts coordinates the five-year graduate/undergraduate teacher education program. See page 25.

Bachelor of Arts
Anthropology
The Arts
  Art History
  Art Studio
Classics
Communication
English
English/Journalism
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Music
  Music History
  Music Theory
  Performance Study
  Preteaching
Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater

Bachelor of Fine Arts
Fine Arts

Bachelor of Music
Music
  Music Education
  Organ
  Piano
  Strings, Woodwind, Brass, or Percussion
  Theory
  Voice

College of Life Sciences and Agriculture

Bachelor of Arts
Botany and Plant Pathology
Entomology
Microbiology
Zoology

Bachelor of Science
Animal Sciences
  Animal Production and Agribusiness
  Bioscience and Technology
  Preveterinary Medicine
Biochemistry
Biology
Botany and Plant Pathology
Community Development
Entomology
Environmental Conservation
  Environmental Affairs
  Environmental Science
General Studies
Nutritional Sciences
Plant Science
  Industry
  Science
Resource Economics
Soil Science
Vocational/Technical and Adult Education
Water Resources Management
Wildlife Management

Bachelor of Science in Forestry
Forest Resources
  Forest Management
  Forest Science

College of Engineering and Physical Sciences

Bachelor of Arts
Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics

Bachelor of Science
Chemical Engineering*
  Energy
  Environmental Engineering
Chemistry*
Civil Engineering*
  Computer-Aided Engineering
  Constructed Systems
  Environmental Engineering
Computer Science*
Electrical Engineering*
  Computer Engineering
  Electrical Engineering Systems
  Student-Designed Option
Geology*
Hydrology*
Mathematics*
Mathematics Education*
  Elementary
  Middle/Junior High
  Secondary
Mathematics (Interdisciplinary)
  Mathematics—Chemistry
  Mathematics—Computer Science
  Mathematics—Economics
  Mathematics—Electrical Science

Mathematics—Fluid Dynamics
Mathematics—Mechanics
Mathematics—Physics
Mathematics—Statistics
Mathematics—Thermodynamics
Mechanical Engineering*
Energy
Physics*

Bachelor of Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology

Whittemore School of Business and Economics

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

School of Health Studies

Bachelor of Science
Communication Disorders
Family and Consumer Studies
Child and Family Studies
Consumer Studies
Health Management and Policy
Leisure Management and Tourism
Program Administration
Therapeutic Recreation
Tourism and Park Management
Medical Technology
Nursing
Occupational Therapy
Physical Education
Athletic Training
Exercise Specialist in Health Maintenance
Outdoor Education
Sports Communication
Teacher Certification

Thompson School of Applied Science, of the College of Life Sciences and Agriculture

Associate in Applied Science
Applied Animal Science
Applied Business Management
Civil Technology
Food Services Management
Forest Technology
Horticultural Technology

University of New Hampshire at Manchester

Associate in Arts
Concentrations
Administration
General Studies
Humanities
Social Science
Studio Arts

Associate in Science
Concentrations
Biological Sciences
Business Administration
Computer Information Systems
Sign Language Interpreting

Bachelor of Arts
English
Psychology

Division of Continuing Education

Associate in Arts
Career Concentrations
Computer Information Studies
Criminal Justice
Pre-Engineering and Physical Sciences

Five-Year Degree Programs

Bachelor of Arts and Master of Business Administration
Bachelor of Science and Master of Business Administration
Bachelor of Arts and Master of Education
Bachelor of Science and Master of Education

Interdisciplinary Major

Bachelor of Arts
International Affairs

Interdisciplinary Minors†

Biomedical Engineering
Environmental Engineering
Gerontology
History and Philosophy of Science
Hydrology
Illumination and Optical Engineering
Justice Studies
Marine Biology
Materials Science
Ocean Engineering
Oceanography
Plant Pest Management
Religious Studies
Technology, Society, and Values
Women's Studies

Advisory Committees

Genetics
Interdepartmental Biology
Prelaw
Preprofessional Health

Graduate School

Master of Arts
Master of Science
Master of Arts in Teaching
Master of Business Administration
Master of Education
Master of Occupational Education
Master of Public Administration
Master of Science for Teachers
Certificate of Advanced Graduate Study
Doctor of Philosophy

** Designated degree (the name of the specialization is included on the diploma; e.g., B.S. in Chemistry.)*
† For other interdisciplinary programs, see page 70.

Program Abbreviations

The following abbreviations are used to identify undergraduate and graduate courses offered at the University. An asterisk preceding the letters identifies those disciplines in which graduate programs are offered.

College of Liberal Arts

ANTH	Anthropology
ARTS	The Arts
CHIN	Chinese
CLAS	Classics
CMN	Communication
DANC	Dance
* EDUC	Education
* ENGL	English
FREN	French
GEOG	Geography
GERM	German
GREK	Greek
* HIST	History
HUMA	Humanities
ITAL	Italian
JPN	Japanese
LATN	Latin
LING	Linguistics
* MUSI	Music
* MUED	Music Education
PHIL	Philosophy
* POLT	Political Science
PORT	Portuguese
* PSYC	Psychology
RS	Religious Studies
RUSS	Russian
SCSC	Social Science
SW	Social Work
* SOC	Sociology
* SPAN	Spanish
THEA	Theater
WS	Women's Studies

College of Life Sciences and Agriculture

* ANSC	Animal and Nutritional Sciences
* BCHM	Biochemistry
BIOL	Biology
* BOT	Botany and Plant Pathology
CD	Community Development
EC	Environmental Conservation
* ENTO	Entomology
* FORS	Forest Resources
* GEN	Genetics
* MICR	Microbiology
NUTR	Nutritional Sciences
* PLSC	Plant Science
* RECO	Resource Economics
* SOIL	Soil Science
* VTAE	Vocational/Technical and Adult Education
WARM	Water Resources Management
* WILD	Wildlife Management
* ZOOL	Zoology

College of Engineering and Physical Sciences

* CHE	Chemical Engineering
* CHEM	Chemistry
* CIE	Civil Engineering
* CS	Computer Science
* ESCI	Earth Sciences
* EE	Electrical and Computer Engineering
ET	Engineering Technology
* MATH	Mathematics
* ME	Mechanical Engineering
* OE	Ocean Engineering
* PHYS	Physics
* ENGR	Engineering Ph.D.
TECH	Technology (nondepartmental)

School of Health Studies

* COMM	Communication Disorders
* FS	Family Studies
HMP	Health Management and Policy
LMT	Leisure Management and Tourism
MEDT	Medical Technology
* NURS	Nursing
OT	Occupational Therapy
* PHED	Physical Education
SHS	School of Health Studies

Whittemore School of Business and Economics

* ADMN	Administration
* ECON	Economics
HOTL	Hotel Administration

Separate Departments and Programs

AERO	Aerospace Studies
DCE	Division of Continuing Education (all courses)
GERO	Gerontology
INCO	Intercollege
JUST	Justice Studies
MILT	Military Science
PIP	Program for International Perspectives
TSAS	Thompson School of Applied Science
UNHM	University of New Hampshire at Manchester

College of Liberal Arts

Stuart Palmer, Dean
John T. Kirkpatrick, Associate Dean
Arnold S. Linsky, Senior Faculty Fellow
Pauline Soukaris, Faculty Fellow

Humanities Division
Department of the Arts
Department of English
Department of French and Italian
Department of German and Russian
Department of Music
Department of Philosophy
Department of Spanish and Classics
Department of Theater and Dance

Social Science Division
Department of Communication
Department of Geography
Department of History
Department of Political Science
Department of Psychology
Department of Social Work
Department of Sociology and Anthropology

Teacher Education Division
Department of Education

Bachelor of Arts
Anthropology
The Arts
- Art Studio
- Art History

Classics
Communication
English
English/Journalism
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Music
- Music History
- Music Theory
- Performance Study
- Preteaching

Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater

Bachelor of Fine Arts
Fine Arts

Bachelor of Music
Music Education
Organ
Piano
Strings, Woodwind, Brass, or Percussion
Theory
Voice

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help students achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and realities of the present so that they may recognize and act upon their obligations to the future.

The college seeks to meet the educational needs of each student through the development of interests and skills, which, combined with the individual's potential, makes possible the living of a richer, more useful life.

Degrees

The College of Liberal Arts offers three degrees: bachelor of arts, bachelor of fine arts, and bachelor of music.

Bachelor of Arts These programs primarily provide a broad liberal education along with a major in one of the fields listed on this page. Requirements for the bachelor of arts degree and information regarding these majors are presented on pages 16 and 23.

Bachelor of Fine Arts This curriculum provides training for students who plan to enter a professional graduate school. Requirements for the bachelor of fine arts degree are outlined on page 24.

Bachelor of Music This curriculum provides professional training in performance, in musical theory, and in music education, and it allows students to develop their talent to a standard equivalent to the one achieved at conservatories of music. Requirements for the bachelor of music degree and information regarding the curriculum are presented on page 30.

Five-Year Program: B.A.-M.B.A. The College of Liberal Arts and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.A. degree in French, history, philosophy, or psychology and an M.B.A. degree. Information about the program can be obtained from those departments or from the undergraduate counselor in the Whittemore School.

Combined Programs of Study In addition to pursuing a single major, students may combine programs of study as follows:

Minors: See page 17; see also interdisciplinary minors, pages 19 and 21.
Second Majors: See page 17.
Dual-Degree Programs: See page 16.
Student-Designed Majors: See page 72.
Other combined programs and interdisciplinary opportunities: see page 70.

Interdisciplinary Minors

History and Philosophy of Science

Why have people in different periods had such strangely diverging views on such questions as the motion of the heavens, or the nature of the human body, or the logic that governs human actions and desires? And what do these differences say about the truth of our own views? It is a puzzling reality of world history that the human understanding and experience of nature, society, and the mind have varied greatly with place and time. This minor provides students with an opportunity to explore this intriguing variety—both in terms of its historical origins and its philosophical implications. The minor is highly interdisciplinary, offering courses in such diverse departments as economics, history, mathematics, philosophy, and psychology. It presupposes no specialized scientific background and may be combined with any undergraduate major. Five 4-credit courses are required for the minor, with no more than three from any single department.

Students interested in minoring in history and philosophy of science should contact the coordinator, Shigehisa Kuriyama, 411 Horton Social Science Center.

ECON 615, History of Economic Thought
ECON 698, Topics in Economics*
ECON 798, Economic Problems*
HIST 521, History of Science: Space, Time, and Motion
HIST 522, History of Science: Biology and Medicine
HIST 622, History of American Thought
HIST 651, European Intellectual History
HIST 652, European Intellectual History
HIST 789, Seminar in the History of Science
HUMA 651, Humanities and Science
MATH 419, Evolution of Mathematics
PHIL 424, Science, Technology, and Society
PHIL 435, The Human Animal
PHIL 630, Philosophy of the Natural Sciences
PHIL 683, Technology: Philosophical and Ethical Issues
PHIL 725, Philosophy of the Social Sciences
PHIL 780, Special Topics in Philosophy*
PSYC 571, The Great Psychologists
PSYC 591, Special Topics in Psychology*

PSYC 770, History of Psychology
PSYC 771, Psychology in 20th Century Thought and Society

*with approval

Justice Studies

This interdisciplinary minor spans the social sciences and humanities, from criminology to philosophy of law, focusing on the relationship of law and legal systems to issues of social policy. Interested students may plan a course of study that combines various perspectives and ways of reasoning about problems of justice: jurisprudential, historical, philosophical, and scientific. Students with career interests in law, criminal justice, government, and social services are able to pursue the intellectual and practical concerns of their potential careers in conjunction with their regular coursework. The justice studies minor may be combined with any undergraduate major field.

Required Courses
POLT 507, Politics of Crime and Justice, or
SOC 515, Introductory Criminology
JUST 601, Field Experience
JUST 797, Special Topics in Justice Studies

Elective Courses
Students elect two additional courses from a list approved and published yearly by the Justice Studies Executive Committee. Cooperating departments include history, humanities, philosophy, political science, psychology, social work, sociology, family studies, health management and policy, leisure management and tourism, resource economics and community development. (No course taught solely through DCE satisfies the justice studies minor requirements.)

Departmental offerings that are currently accepted for the minor include the following:
CD 717, Law of Community Planning
FS 794, Families and the Law
HIST 559, History of Great Britain
HUMA 650, Humanities and the Law: The Problem of Justice in Western Civilization
HMP 734, Health Law
LMT 772, Law of Recreation Resources and Leisure Services
PHIL 635, Philosophy of Law
PHIL 660, Law, Medicine, and Morals
POLT 507, Politics of Crime and Justice
POLT 508, Supreme Court and the Constitution
POLT 513, Civil Rights and Liberties
POLT 520, Justice and the Political Community
RECO 718, Law of Natural Resources and Environment
SW 525, Introduction to Social Welfare Policy: Provisions
SOC 515, Introductory Criminology
SOC 655, Sociology of Crime and Justice

Students who are interested in minoring in justice studies should consult with the coordinator, Susan White, 213 Horton Social Science Center.

Religious Studies

The religious studies minor offers a scholarly investigation and analysis of various religious phenomena in a multi-disciplinary and cross-cultural manner. Included are such approaches as comparative religion, history of religion, philosophy of religion, psychology of religion, sociology of religion, and religious literature. It entails no sectarian or theological bias. It uses a number of scholarly methods and tools to investigate various religious traditions, as well as such cross-cultural aspects of religion as prayer, belief, mythology, male and female images and roles, ritual, scripture, sectarianism, religious movements, religion and society, and religion and politics.

Students minoring in religious studies must take a survey of world religions (presently provided by RS 416, Masterpieces of Eastern Religious Literature and Ideas); RS 417, (Masterpieces of Western Religious Literature and Ideas); RS 699, Senior Seminar; and the equivalent of two other 4-credit courses—for a total of at least five courses, one of which must be at the 600 or 700 level. The two "other" courses may include RS 599, Special Topics, and RS 695, 696, Independent Studies, or any course accepted for the minor by the Religious Studies Executive Board or approved by petition to the board. Currently, such acceptable courses include the following:

ENGL 518, The Bible as Literature
HIST 575, The Ancient Near East
HIST 639, 640 Three Medieval Civilizations
HIST 642, The Age of Reformation
HIST 651, European Intellectual History
HIST 661, 662, England in the Tudor and Stuart Periods
HIST 663, Russia: Origins to Modernization
HIST 683, Religion in World History
PHIL 417, Philosophical Reflections on Religion
PHIL 520, Introduction to Eastern Philosophy
PHIL 571, Medieval Philosophy
PHIL 710, Philosophy of Religion
POLT 522, Dissent and the Political Community
ANTH 616, Anthropology of Religion
SOC 797, Special Topics: Q—Religious Movements.
SPAN 526, Latin American Civilization and Culture

Students wishing to minor in religious studies or who would like more information should consult with the coordinator, Bernadette Komonchak, 209 Murkland Hall.

Women's Studies

The women's studies minor provides students with an interdisciplinary introduction to the status of women in various cultures and historical eras, as well as to the contribution of women to various fields of endeavor. The goal of the minor is to demonstrate the usefulness of gender as a category of analysis. Women's studies courses offer students critical perspectives on such basic questions of the social order as assumptions about gender roles and gender identity.

For the women's studies minor, students must complete 20 credits of women's studies courses. These must include WS 401, Introduction to Women's Studies, and WS 798, Colloquium in Women's Studies, normally taken at the beginning and end of the course sequence, respectively. In between, students should select other women's studies courses or courses from departmental offerings that have been designated women's studies courses or that have the approval of the women's studies coordinator.

Other women's studies courses are WS 595, Special Topics in Women's Studies; WS 795, Independent Study; and WS 796, Advanced Topics in Women's Studies.

Departmental offerings include the following regularly repeated courses:

ADMN 780, Issues for Men and Women as Managers
ANTH 625, Female, Male, and Society
CMN 567, Images of Gender in the Media
ECON 658, Women and Work
EDUC 410, Women and Education
ENGL 585, Introduction to Women in Literature
ENGL 586, Introduction to Women Writers
ENGL 685, Women's Literary Traditions
ENGL 785, Major Women Writers
HIST 565, Women in Modern Europe
HIST 566, Women in American History
NURS 595, Women's Health
PSYC 551, Psychology of Sex Roles
SW 701, Women and Aging

Students may complete the minor requirements by selecting from other courses that are offered as special topics by the departments. In the past, such offerings have included the following: ARTS 487, Themes and Images in Art: Major Mythic Images of Women; POLT 701, The Courts and Public Policy; and others.

Students who wish to minor in women's studies should consult with the

coordinator, 303A Dimond Library, 862-2194.

Special Centers

Center for the Humanities

The Center for the Humanities, located in Murkland Hall, was established in 1986 to strengthen the arts and humanities at UNH. It currently involves about a dozen departments and more than 125 faculty members from across the University, representing such fields as literature, fine arts, poetry, philosophy, history, religious studies, and foreign languages and literature.

Participation in the activities of the center is open to faculty members from across the University who are interested in the humanities, broadly defined. The center acts as a forum for discussion and intellectual cross-fertilization regarding humanistic issues and perspectives; it fosters and supports creative research in the humanities, both within and between particular disciplines; it assists humanities faculty (broadly defined) in their educational and curricular activities in general, and in the development of interdisciplinary courses and programs in particular; it serves the humanities faculty, students, programs, and community by assisting in the development and dissemination of educational and research materials; it fosters and develops relevant outreach activities in the humanities for the state and region; and it is a focus for the humanities within the University, the state, and the region.

Institute for Policy and Social Science Research

The Institute for Policy and Social Science Research, located on the first floor of Hood House, provides financial and administrative support for social and policy-related research at the University. It works to raise the contribution that UNH faculty and students can make to public decision makers in universities, communities, New Hampshire, and the Northeast.

Work of the institute is conducted within a set of broad themes. These reflect concern for sustaining natural environments, achieving peace and social equity, providing public education, implementing microcomputer decision support systems, and sustaining economic development. The institute helps faculty to secure external research funds, aids in the dissemination of results, conducts short courses for senior public officials, offers research facilities to house interdepartmental groups, and provides students with opportunities for internships in public offices.

Major Programs of Study

The bachelor of arts programs provide a broad liberal education with a concentration involving a minimum of 32 credits in a major field. Departments may specify certain (but not more than 13) required courses. Students must declare a major before the beginning of the junior year. A bachelor of fine arts degree program and a bachelor of music degree program are also available (see Arts and Music). The objectives, opportunities, and departmental requirements of these programs are described below.

Anthropology

(For descriptions of courses, see page 87.)

The anthropology major, offered by the anthropology section of the Department of Sociology and Anthropology, provides an introduction to the various branches of anthropology and an appreciation of its place among other academic disciplines. At the same time, the major encourages intensive study of particular topics within the field, according to the interests and talents of students. It provides both a broad basis for the education of general students and sufficient background for those who wish to pursue a career in anthropology at the graduate level. Concentrations in archaeology and social change and development are also available.

Majors must complete a minimum of 36 credits with grades of C- (1.67) or higher and a grade-point average of 2.00 or better, distributed as follows: ANTH 411, 412, 518, 600, one topical course, one ethnographic-area course, and any other three courses in anthropology or related disciplines approved by the supervisor.

Students wishing to major in anthropology should consult with the anthropology chairperson.

A minor consists of five 4-credit courses in anthropology with a C- or better in each course.

The Arts

(For descriptions of courses, see page 88.)

The courses offered by the Department of the Arts provide an opportunity, within the liberal arts framework, for serious art students to acquire a thorough knowledge of the basic means of visual expression, to acquaint themselves with the history of art, or to prepare themselves for a career in art teaching. In addition, these courses offer foundation experience for students who are interested in art but are majoring in other departments in the University. The Department of the Arts offers programs leading to a bachelor of arts degree and a bachelor of fine arts degree. Certification for art teaching in the public schools is also offered in cooperation with the Department of Education (see Education, page 25).

Bachelor of Arts Curriculum The arts major leading to a bachelor of arts degree is offered with two options: studio and art history.

Candidates applying for admission to the bachelor of fine arts program and all students wishing to transfer from other schools into the arts major, art studio option, are required to submit a portfolio. Students already matriculated at the University may declare the arts major, art studio option, after having completed two studio courses in the Department of the Arts with an average of C+ or above; one of these must be ARTS 532, Introductory Drawing. Students enrolling as freshmen at the University may become arts majors in the studio arts option by either of two methods: (a) by admission through acceptance of a portfolio submitted during the senior year of high school; or (b) by entering the University as an undeclared major and taking two courses in the Department of the Arts with an average of C+ or above; one of these must be ARTS 532, Introductory Drawing. There is no portfolio requirement for those entering the art history option of the arts major. The University reserves the right to retain selections from a student's work for a period of not more than two years.

Art Studio Option Students selecting the art studio option must complete a minimum of twelve courses (48 credits), of which the following are required: ARTS 532 (Introductory Drawing); one course from the following: ARTS 501 (Ceramics); ARTS 525 (Woodworking), or ARTS 567 (Introductory Sculpture); one course from the following: ARTS 536 (Introduction to Printmaking/Intaglio), ARTS 537 (Introduction to Printmaking/Lithography), or ARTS 551 (Photography); one course from the following: ARTS 544 (Water Media I) or ARTS 546 (Introductory Painting); three electives in a studio concentration; two additional studio electives; three art history courses (two 500-level and one 600-level).

While these courses represent the minimum departmental requirements for the studio option, students may wish to plan a program involving greater depth in one or several of the studio areas.

Art History Option Students selecting the art history option must complete a minimum of eleven courses (44 credits), of which the following are required: ARTS 532, (Introductory Drawing); two 500-level art history courses; ARTS 696, (Methods of Art History); six additional courses in art history at the 600 level or above, of which at least two must be in the Pre-Renaissance areas, at least one from the Renaissance/Baroque area, at least one from the modern area, and at least one from architectural history; and one additional studio course. Art history majors will receive preferential placement only in the following studio course: ARTS 532. Students majoring in art history are strongly advised to take ENGL 501, Introduction to Prose Writing, and two foreign languages, one of which should be German.

Bachelor of Fine Arts Curriculum The bachelor of fine arts curriculum provides training for students who plan to enter professional graduate school or pursue careers as professional artists. The basic unit of nine courses consists of drawing (ARTS 532 and one section of ARTS 632); beginning painting (ARTS 546); introductory sculpture (ARTS 567); sophomore seminar (ARTS 598); introductory photography (ARTS 551); and four art history courses, at least one of which must be at the 600 level or above. This unit is designed to provide a common body of concepts and techniques and is intended to raise the level of creative achievement for all students in the B.F.A. degree curriculum.

During the junior and senior years, students will concentrate on six courses, two of which must be at the 600 level, in one of the major program areas of the department. The programs are (1) painting; (2) sculpture; and (3) individualized programs. Individualized programs may be designed in the following subject areas: (A) ceramics; (B) drawing; (C) graphics; (D) photography; and (E) wood furniture design. Proposals for individualized programs are accepted only by permission of the department chairperson, the major adviser, and the Departmental Bachelor of Fine Arts Faculty Committee. Advanced students will also be required to take three art electives. Finally, each senior will be required to take ARTS 798, Seminar/Senior Thesis, which culminates in the mounting of an exhibition of the student's work. (Printed copies of suggested sequences of courses may be obtained from the Department of the Arts. Also, see the following listing.)

The four courses in art history required in this program are used as University electives.

Candidates applying for the bachelor of fine arts program are required to submit a portfolio.

Suggested Sequences of Courses
B.F.A.—Painting

Freshman Year	Fall	Spring
ARTS 532, Introductory Drawing	4	—
ARTS 573, Art of the Modern World	4	—
non-art academic	8	8
ARTS 546, Introductory Painting, or ARTS 544, Water Media I	—	4
ARTS 632, Intermediate Drawing, first course	—	4
Sophomore Year		
ARTS 567, Introductory Sculpture	4	—
art history elective	4	—
non-art academic	4	4
ARTS 598, Sophomore Seminar	—	4
ARTS 632, Intermediate Drawing, second course	4	—
ARTS 646, Intermediate Painting, second course	—	4
art history elective (600 or above)	—	4
Junior Year		
ARTS 646, Intermediate Painting, second course, or ARTS 645, Water Media II	4	—
ARTS 551, Introductory Photography	4	—
non-art academic	8	4
ARTS 746, Advanced Painting	—	4
ARTS 796, Independent Study—Painting	—	8
Senior Year		
ARTS 798, Seminar/Senior Thesis	8	—
ARTS 746, Advanced Painting	4	—
non-art academic	4	8
art elective	—	4
art history elective (600 or above)	—	4

B.F.A.—Sculpture

Freshman Year		
ARTS 532, Introductory Drawing	4	—
ARTS 573, Art of the Modern World	4	—
non-art academic	8	8
ARTS 632, Intermediate Drawing	—	4
ARTS 567, Sculpture	—	4
Sophomore Year		
ARTS 667, Sculpture Workshop, first course	4	—
art history elective	4	—
ARTS 546, Introductory Painting, or ARTS 544, Water Media I	4	—
non-art academic	4	8
ARTS 667, Sculpture Workshop, second course	—	4
ARTS 598, Sophomore Seminar	—	4
Junior Year		
ARTS 667, Sculpture Workshop, third course	4	—
art history elective	4	—
non-art academic	4	4
ARTS 796, Independent Study—Sculpture	—	8
ARTS 767, Bronze Casting	—	4
Senior Year		
ARTS 798, Seminar/Senior Thesis	8	—
ARTS 551, Introductory Photography	4	4
non-art academic	4	8
art history elective (600 or above)	—	4

Art Education Curriculum The program in art education is organized into a five-year, teacher-education sequence.

This curriculum is designed to prepare teachers of art in the public schools. Completion of the B.A. or B.F.A. degree before a fifth-year internship is necessary for teacher certification. The satisfactory completion of the B.A. or B.F.A. curriculum and the fifth-year internship will satisfy the initial certification requirements for teachers of art in the public schools of New Hampshire and in most other states.

Minor in Architectural Studies The minor in architectural studies provides students with an interdisciplinary introduction to the history, theory, and methods of architecture and its symbolism. The program allows students who are interested in this field to receive programmatic recognition for their work. It is designed to assist those who (a) are contemplating enrollment at a school of architecture; (b) are particularly interested in architectural history; (c) want to supplement their technical majors (e.g., civil engineering) with strong academic minors; or (d) plan to pursue careers in preservation, education, community service, and public relations.

The minor in architectural studies consists of 20 credits (ordinarily five courses) distributed in the following way:

Two courses in architectural history chosen from
- ARTS 574, Architectural History
- ARTS 654, 17th- and 18th-Century American Architecture
- ARTS 655, Early Modern Architecture: Revolution to World War I
- ARTS 656, Contemporary Architecture: The Buildings of Our Times
- ARTS 698, Seminar in Art History

The course in architectural graphics and design:
- ARTS 455, Introduction to Architecture

A beginning course in drawing:
- ARTS 532, Introductory Drawing

An elective chosen in consultation with the program coordinator of the architectural studies minor (an additional course in architectural history, a studio course, or some other appropriate elective)

Admission to the minor will be authorized by the program coordinator. Interested students should consult with the coordinator in advance of selecting the minor.

Minor in Art The minor in art consists of five courses chosen from the offerings of the department, two of which must be at the 500 level or above. Students minoring in art preregister for studio courses with departmental majors.

Classics

(For descriptions of courses, see page 98.)

The classics major is offered by the classics section of the Department of Spanish and Classics. The minimum requirements for a major in classics are 40 credits offered by the classics section. Twenty-four of these must be in Greek and/or Latin. A classics major must complete as a minimum a 700-level course in one of the classical languages. Students will be encouraged to take courses in related fields such as ancient history, classical art, modern languages, and English, and to take part in overseas study programs in Greece and Italy.

The supervisor for majors is John C. Rouman.

Departmental Honors The honors program in classics is designed primarily and specifically for students of superior ability, demonstrated achievement, and high interest in the study of both Greek and Latin. Students may apply for admission to the program during their junior year. Applicants must have completed at least LATN 504 and GREK 504, either LATN 631 or GREK 631, one 700-level literature course in Latin, and one 700-level literature course in Greek. Applicants must have a minimum grade-point average of 3.67 in their Latin, Greek, and classics courses, as well as a 3.50 overall average. Students meeting these criteria may apply to the program by writing to the supervisor for classics and seeking the approval of the classics faculty. Each student admitted to the honors program receives a faculty adviser who is responsible for arranging the student's subsequent program. The faculty adviser will be appointed to teach Introduction to Classical Scholarship, either LATN 795I or GREK 795P, depending on the student's classical language of primary interest. The honors student must complete satisfactorily an honors thesis and a final oral examination covering aspects of Greco-Roman studies and classical scholarship. In addition to the course in classical scholarship, the honors student's total program shall include no less than either four 700-level courses in Greek and two 700-level courses in Latin, or four 700-level courses in Latin and two 700-level courses in Greek, depending on which classical language is the object of the student's primary interest and the focus of the student's research course in classical scholarship.

Communication

(For descriptions of courses, see page 98.)

The Department of Communication offers a major that emphasizes a range of integrative studies in human communication, including rhetorical studies, media studies, and interpersonal/small group studies. Students are taught analysis of communication transactions through historical, critical, and empirical investigations. Students examine verbal, nonverbal, and mediated messages across a wide spectrum of communication interactions: intrapersonal, interpersonal, group, and mass. They explore connections and interrelationships among various types of communication, theoretical perspectives, and methodological approaches.

While the major emphasizes critical analysis and understanding grounded in theory and research, application of understanding to a variety of communication settings and processes is an important dimension of study.

Students wishing to declare communication as a major should contact the supervisor for majors, Professor Wilburn Sims, for application information and requirements.

Majors must complete nine courses (36 credits). The distribution of required courses for the major is as follows:

1. CMN 455, 456, and 457. *These courses are prerequisites for all other courses in the major.* Students must earn a grade of C or better in each of these courses to proceed in the major.
2. Three 500-level courses (12 credits), one from each of the following groups:
   a. Media Studies: CMN 505, 515, 519, 533, 556, 567, 596
   b. Rhetorical Studies: CMN 500, 504, 507, 597
   c. Interpersonal Studies: CMN 503, 506, 530, 572, 583, 598
3. Three 600- and/or 700-level courses (12 credits). A maximum of 4 credits of independent study (CMN 795) may be counted.

Transfer students must complete 18 credits of their communication coursework at UNH to complete the major satisfactorily. Exchange students may transfer no more than 10 approved credits from another institution to be applied toward completion of the communication major at UNH.

Education

(For descriptions of courses, see page 107.)

The Department of Education coordinates the University's teacher education programs. No undergraduate education major is offered at UNH; students interested in teaching major in other programs in addition to receiving specialized teacher training.

The teacher education programs at the University are accredited by the New Hampshire State Board of Education and by the National Council for the Accreditation of Teacher Education. UNH participates in the Interstate Certification Compact; consequently, completion of the approved teacher preparation program of the University qualifies students for certification as teachers in most states.

UNH offers approved programs leading to teacher certification in agricultural occupations, art, biology, chemistry, earth sciences, elementary education, education of the emotionally handicapped or mentally retarded, English, English as a second language, French, general science, general special education, German, home economics, Latin, mathematics, middle school mathematics, music, nursery school/kindergarten, physical education, physics, Russian, social science, Spanish, speech/language pathology, speech and drama, trades and industrial education, and vocational education.

Five-Year, Undergraduate-Graduate Program The major avenue for becoming certified to teach at the elementary, middle, or high school level is an integrated undergraduate-graduate program culminating in a fifth-year, year-long internship. Before the internship, students earn a bachelor's degree outside the field of education. The internship offers 12 graduate credits, which students usually couple with other graduate work leading to a master's degree. A number of UNH master's degree programs may be elected, including two offered by the Department of Education that are specifically designed for preservice teaching. (See Graduate Catalog for description.)

Step 1. Register for EDUC 500 (preferably in freshman or sophomore year).

EDUC 500, Exploring Teaching, provides an early experience in the schools as a teacher aide and teaching assistant. Students may select this four-credit course at any time; however, most should choose it before completing their sophomore year. Working side by side with experienced teachers, students explore various teaching roles so that they may make realistic decisions about teaching as a career.

Step 2. The second phase of the teacher education program includes a minimum of four credits in each of four areas of study: EDUC 700, Educational Structure and Change; EDUC 701, Human Development and Learning: Educational Psychology; EDUC 703, Alternative Teaching Models; and EDUC 705, Alternative Perspectives on the Nature of Education. In addition, EDUC 707, Teaching Reading through the Content Areas, is required for some secondary-level certification programs.

A number of variable-credit modules are available to students in each of the required four course areas, including experiences and workshops in local schools. Certain courses in other departments may be substituted for these requirements. Working closely with advisers, students may develop highly individualized programs, choosing from many alternatives. Since credit in these four areas of study may be taken at either the undergraduate or graduate level, students have greater flexibility for fulfilling the requirements of their college and major departments.

Additional requirements for elementary school teaching include one course in elementary school reading (EDUC 706, Introduction to Reading Instruction in the Elementary Schools) and one course in mathematics appropriate for elementary school teaching (one of the following: MATH 621, Number Systems for Elementary School Teachers; MATH 622, Geometry for Elementary School Teachers; MATH 623, Topics for Elementary School Teachers; MATH 703, Mathematics Education, K-6; EDUC 741, Exploring Mathematics with Young Children).

Step 3. Apply for admission to the fifth-year internship and master's degree program.

The final phase of the teacher education program consists of a year-long internship (EDUC 800, 801). Students must apply for the fifth-year internship and master's degree program during the fall of their senior year so that they will have enough time to explore a variety of career and/or graduate study options and conclude their program plans before second semester of that year. Opportunities exist for admitted graduate students to take courses toward their master's degree in the second semester of their senior year.

Before the internship, students will have completed a B.A. or B.S. program with a major outside the field of education. They will have, therefore, a broader general education and greater depth in their area of specialization, as well as opportunities for careers outside of education. For secondary school certification, students must have completed an approved major program, or its equivalent, in the subject they intend to teach. Candidates for elementary school certification may choose from relevant majors offered at the University.

If accepted into the internship and master's degree program, students have several options from which to choose, including selection of additional courses for further specialization, and selection of workshops and courses offered for credit in intern-site schools. During the internship, students have an opportunity to work with resident supervisors and other interns in various team-teaching arrangements.

Financial Aid A limited number of paid internships are available. Students are hired by participating school districts. Other financial assistance is possible through the Office of Financial Aid, the Graduate School, and various scholarships.

Criteria for Admission to Fifth Year To be eligible for an internship, students must satisfy the following criteria: (1) favorable rating from school personnel who have worked with them in Exploring Teaching and in any other clinical experience; (2) favorable rating from UNH staff supervising Exploring Teaching and other clinical experience; (3) favorable recommendation from instructors of professional coursework; (4) favorable recommendation from their major program, including approval of the major program as appropriate for secondary school teaching; (5) admission to the UNH Graduate School, which requires an above-average cumulative grade-point average, Graduate Record Examination scores, and appropriate letters of recommendation (minimum grade-point average for accepted students is 2.75; minimum GRE score, 900 combined; average GRE score, 1050 combined; average grade-point average, 3.00); and (6) available space in the program.

For further information, contact Randy Schroeder, the coordinator of teacher education.

Undergraduate Certification Option Because of the specialized orientation of majors in mathematics, music education, physical education, nursery/kindergarten, and vocational/technical and adult education, an undergraduate option for teacher certification in these areas may be elected. This option requires the same education components listed previously, with the election of one semester of student teaching (EDUC 694) instead of the year-long internship. Successful completion of EDUC 500 and positive recommendation from school-site staff are required for continuation in the program. Final

screening takes place before the student-teaching semester. Application for acceptance into student teaching must be filed by February 15 of the junior year.

Academic standards for admission to the option include a minimum 2.50 grade-point average in the major and a minimum 2.20 cumulative grade-point average at the time of application for student teaching.

These programs have limited capacity, and admission to the University or satisfaction of minimum academic standards as stated previously does not guarantee admission to the teacher education programs.

For further information, contact Randy Schroeder, coordinator of teacher education.

General Science Certification General science certification is an interdisciplinary program that prepares students to teach science in middle and junior high schools. Students may major in the following areas: animal science, biochemistry, biology, botany, chemistry, chemistry and physics teaching, earth science, entomology, environmental conservation, forest resources, plant science, physics, soil science, wildlife management, and zoology. In addition, students must select at least one offering from each of the following basic areas: biology, chemistry, field natural history, physics, and earth science.

For further information, contact Professor Judith Kull, Department of Education.

English

(For descriptions of courses, see page 112.)

Through studying a wide variety of literary materials, English majors deepen their understanding of history, culture, language, and human behavior. They also gain skill in writing, reading, and critical thinking. Upon graduation, English majors traditionally enter a broad range of vocational fields and areas of graduate study.

The Department of English offers three majors: the English major, the English teaching major, and the English/journalism major. It also offers courses in writing nonfiction, fiction, and poetry; courses in linguistics; courses in film; and courses for honors in English.

The English Major The English major has two chief objectives: to provide all students with a common core of literary experience and to provide each student with the opportunity of shaping a course of study to suit individual interests. The flexibility and freedom inherent in the second of these objectives places a responsibility upon students to devise a program that has an intelligent rationale. For example, students who intend to pursue graduate study in English literature should choose more than the minimum number of advanced literature courses and should seek a broad, historical background. Students with special interests in linguistics or writing may, on the other hand, wish to elect only the minimum number of advanced literature courses required for the major. All students should secure the assistance and approval of their advisers in formulating an early plan for the major program.

For the English major, students must complete a minimum of 40 credits of major coursework including ENGL 519, two additional 500-level courses, and seven courses numbered 600 and above. In selecting these courses, students must be sure to meet the following distribution requirements:

1. Two courses in literature before 1800: either two advanced courses (numbered 600 or above), or one advanced course and ENGL 513.

2. Two courses in literature since 1800: either two advanced courses, or one advanced course and one course from the following list: ENGL 514, ENGL 515, ENGL 516.

Students interested in majoring in English should consult the chairperson.

The English Teaching Major This major is designed for students wishing to teach English in middle or high schools. Completion of this undergraduate major does not in itself, however, meet state certification requirements. To meet these requirements, students should enroll in the undergraduate major and, by September 15 of their senior year, apply for the fifth-year teaching internship and master's degree program. (For a full description of the program, see page 25.) Undergraduate English teaching majors must pass the following English courses with an average of 2.50 or better: ENGL 514, 516, 519, 619, 657, 710, 718 or 791, 792, and two additional literature courses numbered 600 or above. ENGL 513 may be substituted for one of these two courses.

Students who are interested in majoring in English teaching should consult the director of the English teaching program.

The English/Journalism Major The English/journalism major is designed for students considering careers in print journalism or related fields. Students who complete the program are ready for entry-level writing or editing positions on newspapers or magazines.

The program allows students to develop their writing, reporting, and editing skills while developing a strong background in English literature. English/journalism majors must complete the literature requirements of the standard English major. In addition, they must complete ENGL 621 (Newswriting), at least two other on-campus journalism courses, and an internship (ENGL 720) approved by the director of the journalism program. Many journalism students work for the campus student newspaper, *The New Hampshire*. Many students hold summer jobs in journalism and some have part-time journalism jobs during the school year.

Students interested in the English/journalism major should see Tory Poulin, administrative assistant in the Department of English, or a program faculty member.

Writing Programs The Department of English offers courses for students interested in becoming writers. Up to four consecutive creative writing workshops can be taken in fiction or in poetry, as well as a course in form and theory of either genre. The instructors for these courses are professional writers. Interested students should inquire at the departmental office.

French

(For descriptions of courses, see page 119.)

The French major provides knowledge of the language, literature, and culture of France and other French-speaking countries. An undergraduate major in French is useful in a number of careers, such as teaching, business, law, and social service. Prospective teachers should see page 25. In addition, they should include LING 505 (which also satisfies a general education requirement for group 7) in their overall program and make special note of the FREN 791 requirement which does not count toward completion of a major in French. Students interested in nonteaching careers are urged to consult with members of the French faculty and with other appropriate departments early in their academic careers.

A major consists of 40 credits in courses numbered 631 or above, in which readings are in French. FREN 631, 651, 652, and 790 are required of majors. Majors are encouraged to take courses in the literature of other countries as well as in fields such as music, art, philosophy, history, political

science, and sociology that provide insight into nonliterary aspects of culture.

A minor in French consists of 20 credits in French courses numbered 503 and above. No more than one course conducted in English (e.g., FREN 621, 622, 525) will be counted toward the minor, although students may elect to take more than one such course provided they earn more than 20 credits. Members of the department supervise the work of both majors and minors.

The department offers a junior year abroad at the University of Burgundy in Dijon, France (see FREN 685-686). This program is open to all qualified students at the University of New Hampshire who have completed FREN 631, 651, and 652 by the end of their sophomore year. Early consultation with the director of the program is urged.

Each year, the French government offers a teaching assistantship in a French secondary school to a graduating French major nominated by the department. Applications are accepted early in the fall semester.

Five-Year, Dual-Degree Program in French and Business Administration The dual-degree program permits students to earn both a B.A. in French and an M.B.A. in five years instead of the normal six. Students must meet all requirements for both the French major and the M.B.A. program offered by the Whittemore School of Business and Economics. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the departmental adviser to the program early in their freshman year.

Geography

(For descriptions of courses, see page 121.)

Geography is best defined as the discipline that describes and analyzes the variable character, from place to place, of the earth as the home of man. As such, geography is an integrating discipline, studying many aspects of the physical and cultural environment that are significant to understanding the character of areas or the spatial organization of the world.

Geography aims to provide its students with a basis for understanding the world in which we live.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography provides an excellent core discipline for a liberal education. Those who would understand geography must also know something of the earth sciences, as well as economics, cultures, politics, and processes of historical development.

Students who have a strong interest in the spatial organization of the world and the distinctive character of its major regions and who also want a broad educational experience can achieve these goals effectively by majoring in geography.

Students with degrees in geography have found their education valuable in such fields as urban and regional planning, locational analysis for industry and marketing organizations, cartography, geographical information systems (GIS), library work, military intelligence, international studies, the Foreign Service, travel and tourism, and journalism.

Students planning careers as scholars or teachers in the field should concentrate their coursework in geography and appropriate related disciplines and should plan to go on to graduate study after completing an undergraduate major in geography. Students from this department have been admitted to first-rate graduate schools in all parts of the United States.

Students who major in geography are required to take GEOG 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits. The seven courses should include GEOG 570; 572; any two courses in the group 581, 582, or 583; 590, 797; and one additional intermediate-level course in geography.

The department also offers an alternative concentration in urban geography. This concentration consists of six courses drawn from the geography major curriculum (401 or 402, 572, 582, 583, 590, and 797) and at least three additional courses from the following list: HIST 624, POLT 703, and CD 508, 614, and 717.

A minor consists of five courses (20 credits) in geography.

Students interested in majoring in geography should consult with the supervisor, William H. Wallace.

German

(For descriptions of courses, see page 122.)

The German major is offered by the Department of German and Russian. This program is of interest to the following groups of students:

1. Those who have a special interest in the German language, literature, and culture.

2. Those who intend to enter fields in which a background in foreign languages and literatures is desirable, such as international banking, trade, science, library science, government service, and international service organizations.

3. Those who plan to teach German in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level should plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject. Dual majors are also possible. For certification requirements, see dept. chairperson.

4. Those who intend to pursue graduate study in German language and literature or foreign language education in preparation for teaching careers at the high school or university level.

A major consists of a minimum of 36 credits in German language, literature, and culture beyond GERM 503. GERM 504, 525, 526, 631, 632 (or their equivalents), and 16 other credits, 12 of which must be taken in Durham on the 600 and 700 levels, are required of all majors. GERM 521 and 791 do not count for major credit but are recommended as electives.

A minor consists of 20 credits in German courses numbered 503 and above. Either 521 or 525 may be included; 791 may not.

Study Abroad (see also INCO 685-686) The University allows both German majors and minors and other students to attend approved study abroad programs for UNH credit. Programs frequently chosen include a work-study term in Hamburg or semester or year programs at universities such as Bonn, Freiburg, Marburg, or Munich. With the exception of the Institute of European Studies (I.E.S.) program in Vienna, Austria (conducted in English), all programs require a minimum of two years of college German. For intensive language study at any level, students may attend Goethe-Institut centers in Germany and Austria for one or more eight-week courses. For details, see the foreign study coordinator, Center for International Perspectives, or the Department of German and Russian. Financial aid applies to all approved programs.

Greek

(For descriptions of courses, see page 123.)

The Greek major is offered by the classics section of the Department of Spanish and Classics. The supervisor for majors is John C. Rouman.

The minimum requirements for a major in Greek are: 32 credits in Greek, including GREK 401-402. Students are encouraged to take courses in related fields such as Latin, classics, and ancient

history, and to take part in overseas study programs in Greece.

For the honors program in classics, see page 25.

History

(For descriptions of courses, see page 124.)

The history major provides both an awareness of the past and the tools to evaluate and express one's knowledge. Its requirements expose a student to the breadth of the human past, allow concentration in an area of special interest, and offer training in critical reading and writing.

Students majoring in history must complete 32 credits in history courses with a grade of C- or better and an overall average in these courses of 2.00 or better. History majors must complete HIST 500, Introduction to Historical Thinking, in the semester following declaration of major. Majors must take HIST 797, Colloquium in History, during their senior year. In addition to 500 and 797, a major must take at least six courses, of which a minimum of three must be at the 600 level or above. These courses must include a minimum of one semester course each from Groups I, II, and III listed in the Description of Courses. For transfer students, a minimum of four of the semester courses used to fulfill the major requirements must be taken at the University of New Hampshire and at least two of these must be numbered 600 or above. General education courses offered by the department may be counted for major credit or for general education credit, but not for both.

Students intending further work in history beyond the bachelor's degree are urged to take HIST 775, Historical Methods.

Students intending to major in history should consult with the chairperson of the department. Suggested programs for students with special interests or professional plans are available in the department office.

Five-Year, Dual-Degree Program in History and Business Administration The dual-degree program permits students to earn both a B.A. in history and an M.B.A. in five years instead of the normal six. All requirements for both the history major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the history department adviser early in their sophomore year.

Undergraduate Awards for Majors Each spring the members of the departmental undergraduate committee choose one or more senior majors to receive the William Greenleaf Prize in History. Award candidates must have a minimum grade-point average of 3.20 in history courses and must submit a major paper completed for a history course or written specifically for this award. Individuals may nominate themselves or may be nominated by faculty members. Phi Alpha Theta, the history honor society, is open to majors who have a minimum grade-point average of 3.30 in history courses.

Humanities

(For descriptions of courses, see page 127.)

The humanities program is devoted to examining the fundamental questions and issues of western civilization. Through reading and studying diverse texts in the arts, music, literature, history, philosophy, and science, students seek answers to questions that thoughtful human beings must address in the course of leading their lives. Whether these questions come from Socrates (What is justice?), from Sir Thomas More (What is obligation to God?), from Raphael (What is beauty?), from Newton (What are the laws of nature?), or from Martin Luther King (What is freedom?), they direct our attention to enduring human concerns and to those texts that have suggested or illustrated the most profound and powerful answers.

The humanities major consists of a minimum of 36 credits of academic work, including the following core requirements:

Integrated Core Courses (HUMA 501, 502, 503, *or* 510, 511, 512, 513) Each student takes at least two courses (8 credits) from the 501, 502, 503 sequence *or* at least two courses (8 credits) from the 510, 511, 512, 513 sequence, preferably in the freshman and/or sophomore year.

Seminar in the Humanities (HUMA 600) Each student takes at least one offering (4 credits) of the Seminar in the Humanities, preferably before the end of the junior year. This seminar provides an opportunity for in-depth reading, viewing, and/or listening to texts and artifacts. The emphasis is on the multiple perspectives and methodologies that can be brought to bear upon these works from several humanistic disciplines.

Research Seminar in the Humanities (HUMA 700) Each student participates in the research seminar (4 credits) in the final semester of the senior year. The seminar provides a context within which students may discuss and receive directions in the course of completing a major research paper. At the end of the seminar, students present their research to the faculty and their fellow students.

Additional Requirements Beyond the 16 credits of core requirements, each student must fulfill the following requirements: (1) a minimum of 8 additional credits in 600- or 700-level humanities program courses; (2) an additional 12 credits from humanities program offerings or from the offerings of other departments and programs, with the advice and approval of each student's major adviser or the program coordinator. These offerings should bear more or less relation to the student's particular interests and senior research paper, as seem appropriate in each individual case.

Inquiries about the humanities major should be directed to Warren R. Brown, coordinator of the humanities program, 2 Murkland.

Latin

(For descriptions of courses, see page 130.)

The Latin major is offered by the classics section of the Department of Spanish and Classics. The supervisor for majors is John C. Rouman.

The minimum requirements for a major in Latin are 32 credits in Latin, excluding LATN 401-402. Students are encouraged to take courses in related fields such as Greek, classics, and ancient history, and to take part in overseas study programs in Italy.

For the honors program in classics, see page 25.

Linguistics

(For descriptions of courses, see page 132.)

Linguistics is the study of one of the most important characteristics of human beings —language. It cuts across the boundaries between the sciences and the humanities. The program is an excellent liberal arts major or preprofessional major for law, medicine, clergy, and others. Dual majors with a foreign language, business administration, and the like, are quite feasible.

Students interested in the major or the minor should consult with the program coordinator or with any professor who teaches linguistics courses. To declare a major in linguistics, a student must first submit a proposal, signed by a faculty sponsor, to the Linguistics Committee. Information is available from the Advising Center, Murkland Hall.

A minor in linguistics is also available and consists of any five linguistics courses approved by the linguistics coordinator.

Requirements for the Major

1. LING 505, Introduction to Linguistics
2. LING 506, Introduction to Comparative and Historical Linguistics; or ENGL 752, History of the English Language
3. LING 793, Phonetics and Phonology
4. LING 794, Syntax and Semantic Theory
5. Two years college study (or equivalent) of one foreign language
6. One year study (or equivalent) of a second foreign language from a different language family or subfamily (Old English may count as the second foreign language if the first foreign language is not in the Germanic family); or PSYC 712, Psychology of Language (and its prerequisites); or PHIL 745, Philosophy of Language (and its prerequisites)
7. Four elective courses from the list below.

Area Courses

Anthropology: 795, 796, Reading and Research in Anthropology: B) Anthropological Linguistics.

Communication: 572, Language and Behavior; 672, Theories of Language and Discourse.

Communication Disorders: 522, The Acquisition of Language.

Computer Sciences: 760, Semantic Issues in Natural Language Processing; 762, Introduction to Natural Language Processing.

English: 715, Applied Linguistics: Teaching English as a Second Language; 716, Problems in Applied Linguistics; 718, English Linguistics and Literature; 752, History of the English Language; 778, Brain and Language; 779, Linguistic Field Methods; 790, Special Topics in Linguistic Theory; 791, English Grammar; 793, Phonetics and Phonology; 794, Syntax and Semantic Theory. French, German, Greek, Latin, Russian, Spanish: 791, Methodology of Foreign Language Teaching.

Latin: 795, 796, Special Studies in Latin.

Linguistics: 505, Introduction to Linguistics; 506, Introduction to Comparative and Historical Linguistics; 790, Special Topics in Linguistic Theory; 793, Phonetics and Phonology; 794, Syntax and Semantic Theory; 795, 796, Independent Study.

Philosophy: 550, Logic; 618, Recent Anglo-American Philosophy; 745, Philosophy of Language.

Psychology: 511, Introduction to Perception, Language, and Thought; 712, Psychology of Language.

Russian: 734, History and Development of the Russian Language.

Sociology: 797F, Socio-Linguistics.

Spanish: 601, Spanish Phonetics; 733, History of the Spanish Language.

Other courses may be substituted, with the permission of students' advisers and the Linguistics Committee, when they are pertinent to the needs of the students' programs.

Music

(For descriptions of courses, see page 137.)

The Department of Music offers two degree programs: the bachelor of arts and the bachelor of music.

The Department of Music is a member of the National Association of Schools of Music. Prospective B.A. majors in music are advised to consult with Paul Verrette.

Bachelor of Arts Program The bachelor of arts program offers students an opportunity to major in music within the liberal arts curriculum. This program is intended for those who wish to pursue the serious study of music and to acquire at the same time a broad general education; it is recommended for those considering graduate study leading to the M.A. or Ph.D. degrees, or the five-year undergraduate-graduate program in teacher education.

To be admitted formally to the B.A. program, students must give evidence of satisfactory musical training by taking an admission audition. Students must declare music as a major before the beginning of the junior year, but it is highly recommended that they declare as early as possible, considering the large number of required courses. Admission to the upper level of the degree program will be subject to review by the Department of Music faculty.

The bachelor of arts degree is offered with four options: music history, performance study, music theory, and preteaching. All students must complete a minimum of 32 credits of coursework in music, of which the following are required: MUSI 471-472, 473-474, 501-502, 571-572, 573-574, and one course from 771, 781, or 782. In addition, the requirements for each option are given below.

A public performance is given during the senior year. For students in the music history option, this must be a lecture or lecture-recital; for those in performance study, a full recital; for students in the music theory option, a lecture, lecture-recital, or a recital including at least one original composition; for those in the preteaching option, a half recital is the minimum. A more detailed description is available from the Department of Music.

Music History Option Advanced theory (3 credits); advanced history and literature (12 credits); any one of 541–550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization.

Music Theory Option Advanced theory (12 credits); advanced history (3 credits); any one of 541–550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization. The emphasis in this option is on musical composition and/or theory.

Performance Study Option Advanced theory or literature (3 credits); performance study (16 credits—two credits per semester). Qualified students may concentrate in voice, piano, strings, woodwinds, brass, or percussion. Those choosing voice must successfully complete, in addition to the foreign language requirement, one of the following course sequences: ITAL 401-402, GERM 401-402, FREN 401-402.

Music Preteaching Option MUED 500; MUSI 751-752; MUSI 779; techniques and methods (8 credits); 8 credits from MUSI 441–453 inclusive; 8 credits from any one of MUSI 541–550; piano proficiency (See page 25.)

Bachelor of Music Program The bachelor of music degree program is offered to students who wish to develop their talent in performance, composition, or music education to a high professional level. The program is recommended to those considering graduate study leading to the master of music or doctor of musical arts degrees.

To be admitted to the B.M. program, students must demonstrate a high degree of musical competence or significant creative ability during an audition or examination. Selectivity is exercised as appropriate to the professional requirements of each programmatic option. Students must formally declare the B.M. as a degree program before the beginning of the sophomore year. Continuation into the upper level of the program is subject to review by the department faculty.

The bachelor of music curriculum offers concentration in the following areas: option 1, piano; option 2, organ; option 3, voice; option 4, strings, woodwinds, brass, or percussion; option 5, theory (composition); option 6, music education.

Requirements for the degree include 128 semester credits (132 in music education); a minimum 2.00 grade-point average in all courses completed at the University of New Hampshire; general education requirements; and specific curriculum requirements as indicated. Courses are generally to be completed in their arranged sequence.

Students in music education must maintain a minimum 2.50 grade-point average in the option and have a 2.20 cumulative average at the time of application for student teaching (February 15 of

junior year). Techniques and methods courses must include MUED 545, 741, 747, 749, and 751.

A public performance is required during the senior year. (For students in the performance options this must be a full recital; for those in theory, a lecture, lecture-recital, or a recital including at least one original composition; for those in music education, a half recital is a minimum.) A more detailed description is available from the Department of Music.

Freshman Year
All Options: general education requirements; MUSI 471-472, 473-474.
- Option 1. MUSI 542 (8 credits).
- Option 2. MUSI 544 (8 credits).
- Option 3. MUSI 541 (8 credits); MUSI 542 (2 credits); Music Laboratory—Choral (2 credits).
- Option 4. Performance Study—major instrument (8 credits); MUSI 542 (2 credits); Music Lab—instrumental (2 credits).
- Option 5. MUSI 542 (2 credits); Performance Study—brass (1 credit); Performance Study—woodwind (1 credit), or Techniques and Methods.
- Option 6. Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Techniques and Methods (4 credits); MUED 500; EDUC 500.

Sophomore Year
All Options: general education requirements; MUSI 571-572, 573-574.
- Option 1. MUSI 542 (8 credits).
- Option 2. MUSI 544 (8 credits).
- Option 3. MUSI 541 (8 credits); MUSI 542 (2 credits); Music Laboratory—choral (2 credits).
- Option 4. Performance Study—major instrument (8 credits); MUSI 542 (2 credits); Music Lab—instrumental (2 credits).
- Option 5. MUSI 542 (2 credits); MUSI 501-502; Performance Study—strings (1 credit), or Techniques and Methods.
- Option 6. Performance Study—major instrument (2 credits); MUSI 501-502; Music Laboratory (2 credits); Techniques and Methods (6 credits).

Junior Year
Options 1–5: general education requirements.
- Option 1. MUSI 542 (8 credits); MUSI 501-502; MUSI 771-772; MUSI 455.
- Option 2. MUSI 544 (8 credits); MUSI 501-502; MUSI 771-772; MUED 540 and 741.
- Option 3. MUSI 541 (8 credits); MUSI 542 (2 credits); MUSI 501-502; a second foreign language—German, French, or Italian (8 credits); Music Laboratory—choral and/or opera workshop (4 credits).
- Option 4. Performance Study—major instrument (8 credits); MUSI 501-502; MUSI 751-752; Ensemble (2 credits); Music Laboratory—instrumental (2 credits).
- Option 5. MUSI 771-772; MUSI 775-776; MUSI 779; MUSI 781, 782; MUSI 542 (2 credits).
- Option 6. MUSI 751-752; MUSI 779; Performance Study—major instrument (2 credits); Music Laboratory (2 credits); music history or literature (3 credits); EDUC 700; EDUC 701; and one social science.

Senior Year
Options 3, 4, and 6: one course from 771, 781, 782.
- Option 1. MUSI 542 (8 credits); MUSI 455; MUSI 735; two 3-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.
- Option 2. MUSI 544 (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 3-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.
- Option 3. MUSI 541 (8 credits); MUSI 542 (2 credits); two 3-credit courses in music literature and/or advanced theory; Music Laboratory—choral, ensemble, and/or opera workshop (4 credits).
- Option 4. Performance Study—major instrument, (8 credits); two 3-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory—instrumental (2 credits); ensemble (2 credits).
- Option 5. MUSI 773; MUSI 777 (6 credits); MUSI 542 (2 credits); two 3-credit courses in music literature; two 4-credit courses elected outside the Department of Music.
- Option 6. MUED 787-788; MUED 791-792; EDUC 705; EDUC 694; Performance Study—major instrument (2 credits); Music Laboratory (1 credit); general education requirement.

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.

Minor in Music All students minoring in music must complete a minimum of 20 credits of coursework in music, of which the following are required: MUSI 471-472, MUSI 473-474, MUSI 501-502. MUSI 411-412 may be substituted for MUSI 471-472 and MUSI 473-474.

Philosophy

(For descriptions of courses, see page 144.)

Philosophy has always been the heart of liberal education, deepening and enriching the lives of those who pursue it. It is also excellent preparation for a variety of vocational and professional endeavors.

The Philosophy Major The following courses constitute the program required of all majors: PHIL 530, 570, 572, 573, 618, 620, 640, 701, and 702.

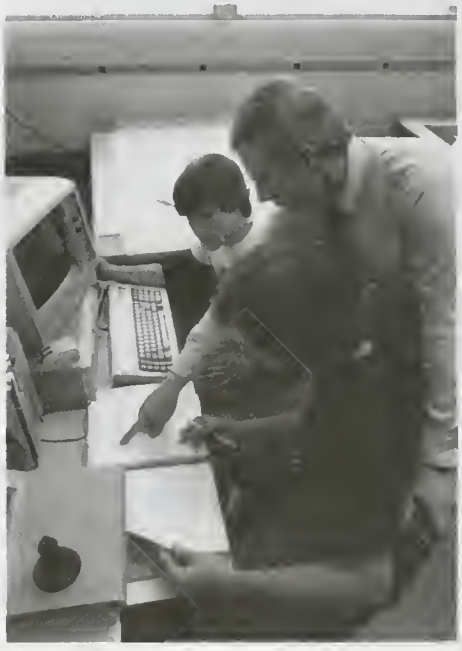
Special-Interest Program Students may add to the above major a special-interest program of value in planning for post-graduate education or entry into such areas as law, medicine, business, education, theology, or social work. Special advisers are prepared to provide informal counsel to philosophy majors interested in these areas.

Graduate Preparatory Emphasis This emphasis is strongly recommended for students who plan to do graduate work in philosophy. Beyond the nine program courses, such students should select, with their advisers' approval, three additional philosophy courses above the 400 level, for a total of twelve courses. One of these should be 550.

Departmental Commendation Students accepted for departmental commendation will register for 699 (usually during the second semester of the senior year) and will write, under the guidance of an adviser, an original paper in philosophy. If completed successfully, students will receive a letter of commendation.

Philosophy Minor Any five philosophy courses constitute a minor.

Five-Year, Dual-Degree Program in Philosophy and Business Administration The dual-degree program permits students to earn both a B.A. in philosophy and an M.B.A. in five years instead of the normal six. Students must meet all requirements for both the philosophy major



and the M.B.A. program offered by the Whittemore School of Business and Economics. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult the departmental adviser to the program early in their sophomore year.

Political Science

(For descriptions of courses, see page 150.)

The study of government and politics, to which the courses and seminars of the Department of Political Science are devoted, includes the development of knowledge of political behavior by individuals and groups as well as knowledge about governments: their nature and functions; their problems and behavior; and their interactions—at the national and international levels and at the local, state, and regional levels.

Much of the learning offered by the Department of Political Science can also be regarded as essential for good citizenship, since political knowledge helps to explain both the formal institutions by which societies are governed and the issues that encourage people toward political interest and political action. In addition, such learning is especially valuable to students planning to enter local or national government or other public service, including foreign service, and it will be of great help to those who intend to study law and enter the legal profession. For teaching, particularly at the college level, and for many types of government service, graduate work may be indispensable, and an undergraduate major in political science will provide the most helpful foundation for further study in the field. Such an emphasis will also be valuable for students seeking careers in journalism, international organizations, and the public affairs and administrative aspects of labor, financial, and business organizations.

The major program in political science consists of at least nine courses (36 credits) and not more than 12 courses (48 credits) to be distributed in the following way:

1. Two 400-level courses. These introductory courses should be completed by majors by the end of the sophomore year.
2. Six 500- and/or 600- level courses. Of these, at least one shall be chosen from each of the four fields in which the department's courses are organized: American politics, comparative politics, international politics, and political thought.
3. One 700-level course.

Students are required to take two 400-level political science courses and one 500-level political science course before they can declare a political science major. Of course, these courses (if C- or better) will count toward the major.

Internships and Advanced Study In addition to the courses regularly offered, the department will have available selected topics, advanced study in political science, and internships. Interested students should check with the department office to learn of the offerings for a given semester.

The department also offers several internship opportunities giving students experience in various aspects of government, policymaking, and the legal system at the local, state, and national levels. Students need not be political science majors, but a student must have taken certain course prerequisites for each kind of internship. In addition, students must have junior or senior standing and normally have a 3.00 average or higher to be eligible for consideration. Washington placements are made either through the Department of Political Science or through the Washington Center for Learning Alternatives; major credit must be arranged through the department.

Psychology

(For descriptions of courses, see page 153.)

The psychology major provides students with a broad education, while also allowing some specialization. The program exposes students to the scientific study of behavior and encourages an increased understanding of the behavior of humans and animals.

Students who wish to declare psychology as a major following admission to the University should consult with the department's academic counselor for application procedures and criteria.

Students majoring in psychology must complete 36 credits with a minimum grade of C- in each course and a 2.00 overall average in all major requirements. Students with a first major in psychology may not use any psychology courses to fulfill general education requirements. The distribution of the major requirements is as follows:

1. PSYC 401, 402, and 502
2. Two 500-level courses other than PSYC 502. Of these, one must be from group (a) below and one from group (b):
   a) PSYC 511, 512, 521, 522, 531
   b) PSYC 552, 553, 571, 581, 582
3. Three 700-level courses. Of these at least one must be taken from each of the following groups:
   a) PSYC 702, 703, 704, 705, 710, 711, 712, 713, 721, 722, 723, 731, 732
   b) PSYC 747, 752, 755, 761, 762, 770, 771, 781, 783, 791 (may repeat but not duplicate content), 793, 794, 795. Note: A maximum of 4 credits of PSYC 793, 794, and 795 combined may be applied toward the 36 credits required for the major.
4. One additional course from courses approved for major credit.

Transfer students who elect to major in psychology must complete at least 18 credits in the program at UNH to qualify for the degree in psychology. Transfer students must earn a total of 36 approved credits for completion of the psychology major. The distribution of these credits will be determined by the department's academic counselor. Transfer students should note that courses are allotted only the number of credits granted by the original institution (after adjustments for semester-hour equivalents). Thus, students transferring from an institution at which courses carry less than 4 credits each must make up for any credit deficit created by acceptance of transfer credits into the psychology major.

Specific course selections should be discussed with advisers. Exceptions to the requirements for the major require a petition to the department.

Psychology majors planning to go on to graduate study in psychology should include PSYC 703 or 704 among their courses.

The minor in psychology consists of five psychology department courses (20 credits), including PSYC 401 and at least two courses at the 500 level or above. All courses to be applied to the minor must be approved by the psychology department.

See the department's secretary for further details on the major or minor in psychology.

Advising System Undergraduate advising in the department is conducted jointly by the department's academic counselor and the full-time faculty. The academic counselor has primary responsibility for advising freshman and sophomore psychology majors and is the initial contact for all majors in a state of transition (readmitted, transfer, newly declared students, etc.). The academic counselor assists students in all phases of educational planning and decision making, including preregistration, long-range academic planning, degree and program requirements, and career selection and planning. Junior and senior psychology majors are assigned to a faculty adviser with appropriate consideration for student preferences. The advising relationship with a

faculty member is designed to encourage refining career and educational decisions.

Five-Year, Dual-Degree Program in Psychology and Business Administration The dual-degree program permits students to earn both a B.A. in psychology and an M.B.A. in five years instead of the normal six. Students must meet all requirements for both the psychology major and the M.B.A. program offered by the Whittemore School of Business and Economics. A maximum of 16 credits may be counted toward both degrees. Candidates for the five-year, dual-degree program typically have a background of work experience in addition to a solid academic record. Students interested in this program should consult with the departmental adviser to the program early in their sophomore year.

Undergraduate Awards for Majors Each spring the faculty chooses psychology undergraduates as the recipients of the following awards: the Herbert A. Carroll Award for an outstanding senior in psychology, the George M. Haslerud Award for an outstanding junior in psychology, and the Fuller Foundation Scholarship for an outstanding junior in psychology with demonstrated interests in clinical psychology. Psychology majors with at least a 3.00 grade-point average are eligible for these awards. Faculty nominate students from the eligibility list and final selection of recipients is made by vote of the full-time psychology faculty.

Russian

(For descriptions of courses, see page 156.)

The Russian major provides students with an opportunity to study one of the world's most important languages, its culture, and its literature. In addition to the intrinsic value of Russian as a liberal arts experience, the Russian major leads to a number of careers, such as teaching, translation and interpreting, government, and foreign service. It is also a valuable asset in preparing for careers in law, business, economics, and international trade, and it can serve as a dual major with business administration, international affairs, the natural and physical sciences, and other liberal arts fields such as English, history, political science, sociology, philosophy, theater and communication, linguistics, and other foreign languages.

The Russian major consists of a minimum of 40 credits above RUSS 504. Specific course requirements are RUSS 505-506, RUSS 521, RUSS 425 or 525, RUSS 631-632, RUSS 691, RUSS 733, and RUSS 734, plus an additional 4 credits from among other offerings in Russian.

The minor in Russian consists of a minimum of 20 credits above RUSS 402 and must include RUSS 503-504 and RUSS 631, RUSS 632, RUSS 691, or RUSS 733.

The Russian program offers for credit an annual summer five-week, six-week, or ten-week language seminar in the USSR. Students wishing to major in Russian should contact Aleksandra Fleszar in Murkland Hall 9.

Social Work

(For descriptions of courses, see page 157.)

The social work major prepares graduates for professional entry-level social work practice within the context of a liberal arts education. It also prepares students for admission to graduate schools of social work and other graduate professional programs in human service professions. It is an accredited program, based on standards set by the national accreditation board—the Council on Social Work Education.

Social work majors pursue a program that deals with the origin, development, and organization of health and welfare institutions; methods of social work practice; and the relationship of the social work profession to contemporary social issues and problems. Social work majors gain direct experience and a better understanding of the field by required participation in a social welfare setting. The details of the field experience will be arranged between the student and the field work coordinator.

Social work majors are required to take BIOL 401, SW 524, 525, 550, 551, 622, 623, 640, 640A, 641, 641A, and SOC 601. Students wishing to major in social work should consult with the chairperson, Betty Holroyd Roberts, in Murkland Hall.

Sociology

(For descriptions of courses, see page 158.)

Sociology involves the study of human beings in social contexts. It focuses on the ways in which social relationships among individuals, groups, and organizations are created and maintained. It also examines the causes and consequences of change in these social units.

Major issues studied in sociology include socialization, social psychology, deviance and social control, formal organizations, equality and inequality within society, and social structure. Specific phenomena are also studied, including the family, health and illness, gender, race and ethnic relations, and criminology. Central to the program is the acquisition of

skills in methods of social research, statistical analysis, and sociological theory.

Majors must complete a minimum of 36 semester credits with grades of C- or better in each of these courses and a grade-point average of 2.00 or better in sociology courses. SOC 400 (or 500), 502, 599, 601, and 611 or 612 are required; majors must take 599 no later than the junior year. At least two of the additional major courses must be at the 600 or 700 level (excluding 795 or 796).

It is possible to select a concentration within the major by taking electives in a specific area, such as social psychology, aging, or criminal justice. Further, students interested in social work or in high school teaching can develop programs in conjunction with the appropriate departments.

Students interested in majoring in sociology should consult with the chairperson of the Departmental Committee for Undergraduate Studies in Sociology for guidance in selecting a concentration. It is the responsibility of all sociology majors to obtain the latest information from the department office.

A minor consists of any five 4-credit courses in sociology with a C- or better in each course and a grade-point average of 2.00 or better in such courses.

Spanish

(For descriptions of courses, see page 160.)

The major in Spanish is offered by the Department of Spanish and Classics. It is designed for students who wish to acquaint themselves more thoroughly with the language, culture, and literature of the Spanish-speaking peoples. In addition, the department offers courses in Portuguese.

Students who major in Spanish may prepare themselves for a variety of fields in which proficiency in the Spanish language and knowledge of Hispanic cultures are desirable. Such fields might include international relations, business administration, government work, social service, and communications. In addition, students can prepare to teach Spanish at the elementary and secondary levels and in bilingual education programs through the foreign language teacher education program. The undergraduate major also provides a basis for graduate study in preparation for scholarly research and teaching at the college level. When combined with coursework or a dual major in other disciplines, the major prepares students for work in Spanish-speaking areas of the world as well as in bilingual regions of the United States.

The UNH study abroad program in Granada, Spain, open to majors and nonmajors, offers students the opportunity to live and study abroad for a semester or a full academic year. Financial aid is available for eligible students. Contact the departmental program directors for further information.

The major consists of a minimum of 40 credits. Specific course requirements are (1) language and culture: 525 or 526, 601, 631-632; (2) introductory literature: 650; and either the sequence 651-652 or 653-654; (3) three courses at the 700 level. The Spanish minor consists of 20 credits above 501, including 631-632.

Interested students should talk to the chairperson for Spanish or an adviser in the department.

Theater and Dance

(For descriptions of courses, see pages 103 and 162.)

The theater major emphasizes the strengths of general theater training within a broad liberal arts context, with opportunity for specialization and individual development. Students interested in performance, technical, and historical aspects will find opportunities for personal and preprofessional growth in theater, its drama, and the dance in its various forms. The program affords means for independent study and application of basic theories in special projects and for active personal involvement in lecture and laboratory classes. Students also are encouraged to participate in all phases of University Theater productions. Theater is a broad-based major, allowing its undergraduates to integrate specific training with other academic disciplines.

The required curriculum for theater majors consists of a basic course in communication (CMN 402 or its equivalent); Introduction to Theater (THEA 435); two full courses from each of three areas (history/theory, technical, performance) including History of Theater I (THEA 436) or History of Theater II (THEA 438), Stagecraft (THEA 459), Voice and Diction I (THEA 549), and Acting I (THEA 551); plus two upper-level courses in an area of choice. In addition, majors must complete two two-credit project courses plus Senior Seminar (THEA 697) and Senior Project (THEA 698). Individual programs may be planned through consultation with specific advisers.

In addition to general liberal arts preparation, three specific course sequences are available within the theater major: (1) courses leading to a theater major with a concentration in dance (ballet, modern, and theater dance); (2) courses leading to a major that when combined with requirements of the Department of Education qualify students for secondary school certification; (3) courses leading to a major that when combined with requirements of the Department of Education prepare students for elementary school certification with an undergraduate specialization in youth drama.

All students interested in majoring in theater should consult with the chairperson of the Department of Theater and Dance. Students wishing to transfer to the University of New Hampshire to major in theater must first have the approval of the theater faculty.

College of Life Sciences and Agriculture

Thomas P. Fairchild, Dean
Robert O. Blanchard, Associate Dean
Emery P. Booska, Business Manager

Department of Animal and Nutritional Sciences
Department of Biochemistry
Department of Botany and Plant Pathology
Department of Entomology
Department of Forest Resources
Department of Microbiology
Department of Plant Science
Department of Resource Economics and Community Development
Department of Vocational/Technical and Adult Education
Department of Zoology

Bachelor of Arts
Botany and Plant Pathology
Entomology
Microbiology
Zoology

Bachelor of Science
Animal Sciences
- Animal Production and Agribusiness
- Bioscience and Technology
- Preveterinary Medicine

Biochemistry
Biology
Botany and Plant Pathology
Community Development
Entomology
Environmental Conservation
- Environmental Affairs
- Environmental Science

General Studies
Nutritional Sciences
Plant Science
- Industry
- Science

Resource Economics
Soil Science
Vocational/Technical and Adult Education
Water Resources Management
Wildlife Management

Bachelor of Science in Forestry
Forest Resources
Forest Management
Forest Science

The objectives of the College of Life Sciences and Agriculture are to give students a fundamental education in the biological, physical, and social sciences and to introduce them to the arts and humanities. In addition, specific technical courses are provided in students' interests and majors.

The diverse programs in the College of Life Sciences and Agriculture prepare graduates for careers in areas concerned with improving the quality of life. Preparation can vary from fundamental studies of cancer cells to community service planning, resource protection to genetic engineering, and career teaching to molecular biology and biotechnology.

A blend of the basic and applied aspects of life sciences and agriculture, coupled with careful selection of supportive courses, ensures graduates the background and experiences necessary to be competitive in the job market. Potential employers include federal, state, and local governments, where graduates are employed as watershed, soil, and forest managers; associates in biomedical and agricultural research laboratories; marketing analysts and extension specialists; nutrition supervisors and environmental regulators; and information educators and communications experts.

Community governments employ graduates as service planners and land-use specialists, teachers in traditional and vocational education, public health technicians, and urban pest control specialists.

Positions are available in private and commercial organizations in production agriculture, food processing, landscaping, agribusiness, sales, and private planning. Graduates may also pursue entrepreneurial careers as greenhouse, nursery, farm, and forest managers; or as consultants, arborists, and environmental planners.

For those graduates with international aspirations, the Peace Corps and the Foreign Agriculture Service employ farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

Additionally, departments prepare students for advanced study in their chosen field of interest where graduate study is required for attaining their career goals.

Degrees

The college offers three undergraduate degrees: the bachelor of arts, the bachelor of science, and the bachelor of science in forestry.

Bachelor of Arts Students majoring in botany and plant pathology or in entomology may elect to earn either a bachelor of arts degree or a bachelor of science degree. The degree requirements in the College of Life Sciences and Agriculture for the bachelor of arts are almost the same as for a bachelor of science plus the addition of a foreign language requirement (see page 16 for B.A. degree requirements).

Bachelor of Science For the bachelor of science degree, a total of at least 128 credits is required. (Some programs, such as wildlife management and water resources management, require more than 128 credits.) In addition, students must complete general education requirements; obtain a written recommendation for graduation from their adviser, department chairperson, and college dean; and achieve a 2.00 cumulative grade-point average for all courses taken at the University of New Hampshire.

Some of the courses prescribed in the following degree programs partially fulfill the general education requirements. Students should see their adviser for specific information.

Five-Year Program: B.S.-M.B.A. The College of Life Sciences and Agriculture and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.S. in plant science and an M.B.A. degree. Information about the program can be obtained from the Department of Plant Science or from the undergraduate counselor in the Whittemore School.

Bachelor of Science in Forestry Students majoring in forest resources earn a professional degree designated as a bachelor of science in forestry (see page 39.)

Advising System

A member of the faculty whose area of interest is closely related to the student's is appointed as an adviser to assist the undergraduate in planning his or her academic program.

Undeclared Major

Students may select a major upon entering the college or may wait until registration for the sophomore year. Students who are uncertain about choosing a specific major may remain undeclared during their freshman year. In most cases they should take the following courses, after which they should be ready to declare a major:

Fall	Spring
CHEM 403	CHEM 404
BIOL 411	BIOL 412
General Education Requirement	General Education Requirement
An introductory course in any department in the college	RECO 411*

**or other elective course to meet a general education requirement.*

Undeclared freshmen should explore possible majors by taking courses in the areas or programs that interest them most. They should talk to faculty, students, and their adviser concerning requirements, job opportunities, etc., in the various programs and should be prepared to declare a major when they preregister for the first semester of the sophomore year.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows:

Minors: See page 17; see also pages 19 and 36.
Second Majors: See page 17.
Dual-Degree Programs: See page 16.
Student-Designed Majors: See page 72.
Other combined and interdisciplinary opportunities: see page 70.

Interdisciplinary Minor in Plant Pest Management

The interdisciplinary minor in plant pest management provides a broad but comprehensive foundation in the concepts and practices employed in managing the major groups of pests that affect agricultural crops. It covers both the integrated pest management systems used in modern agriculture in developed countries and the agricultural practices used in developing countries. It is designed for students majoring in plant science, botany and plant pathology, or entomology, with career interests in commercial agriculture, agricultural industries, agricultural consulting, USDA regulatory service, economic entomology, plant pathology, integrated pest management, or extension. It also provides a strong background for students interested in pursuing advanced degrees required for these areas.

Further information may be obtained from the chairperson of each participating department or any instructor teaching one of the courses. The minor consists of five courses as outlined below:

Select one:
BOT 651, Plant Pathology
BOT 653, Forest and Shade Tree Pathology
Select one:
ENTO 402, Introductory Entomology
ENTO 503, Principles of Applied Entomology
ENTO 506, Forest Entomology
Select one:
BOT 754, Principles of Plant Disease Control
ENTO 722, Toxicology
ENTO 721, Principles of Biological Control
Required:
PLSC 507, Weed Science
ENTO 726, Integrated Pest Management

Genetics Program

An undergraduate degree in genetics is not offered at the University of New Hampshire. In the Graduate School, the M.S. and Ph.D. degrees are offered in an interdepartmental genetics program, involving the departments of animal sciences, biochemistry, botany and plant pathology, forestry resources, microbiology, plant science, and zoology. For some of the courses offered in the program, see the genetics entry in the course descriptions of this catalog as well as other genetics courses offered by the cooperating departments within the genetics program. Students interested in preparing for graduate work in genetics at UNH or elsewhere should contact the chairperson of the genetics program early in their undergraduate careers for advice on courses.

General Science Certification

Students majoring in animal sciences, biochemistry, biology, botany and plant pathology, entomology, environmental conservation, forest resources, plant science, soil science, wildlife management, or zoology may seek certification to teach science at the middle or junior high school level.

For further information, contact the coordinator of teacher education in the Department of Education.

Major Programs

Animal Sciences

(For descriptions of courses, see page 85.)

The undergraduate animal sciences program at UNH provides students with fundamental and applied education in nutrition, reproduction, genetics, physiology, pathology, cell biology, and large animal management. Courses are offered in all areas of dairy, light horse, and livestock production.

The Department of Animal and Nutritional Sciences is housed in Kendall Hall, a modern five-story animal research facility. This building houses the New Hampshire Veterinary Diagnostic Lab; an electron microscopy facility; and nutrition, physiology, and cell culture labs, all of which provide opportunities for students interested in basic animal sciences. The department maintains a light horse center and offers an equine program with courses in management, equine diseases, equine discipline, physical performance, and horsemanship specializing in dressage and combined training. Dairy facilities include housing for more than 100 milking-age cows and the Ritzman Nutrition Laboratory, which is nationally known for its research contributions in dairy cattle nutrition. Beef cattle, sheep, and miniature swine are maintained at the Burley-Demerritt farm. Extensive poultry facilities also permit research and teaching in poultry science.

The program consists of options in (1) animal production and agribusiness, (2) bioscience and technology, and (3) preveterinary medicine. In addition to satisfying the specific requirements of one of the three options, all animal science majors must complete certain courses to satisfy animal sciences and general University education requirements.

The department also offers a program in human nutrition. (See page 41.)

Students in the animal production and agribusiness option are encouraged to pursue one or more areas of concentration such as equine studies, dairy and livestock production, agribusiness, education, and/or journalism. This option permits students to design a curriculum for a particular career; e.g., cooperative extension, vocational education, sales and service, stable management, riding instruction, dairy herd management, or agricultural journalism.

Students in the bioscience and technology option often specialize in nutrition, reproduction, genetics, or cell biology. This curriculum prepares students for advanced training in graduate school programs or in various medical professions; entry-level positions in biomedical, biotechnical, pharmaceutical, and other scientific companies; or technical positions in many research and medical units.

The preveterinary medicine option is designed to meet the academic requirements of most veterinary schools. Requirements may be met within three years allowing students to apply to veterinary school during their senior year. However, most students finish their senior year, thus allowing more time for electives, concentration in areas of secondary interest, and completion of graduation requirements.

Employers in agriculture prefer to hire an agricultural graduate with extensive knowledge in a related field (e.g., computer science) rather than a graduate in one of these areas with no knowledge of agriculture. Hence, animal science students are encouraged to obtain training in a field that complements study in animal sciences. Such areas may include cell biology, biotechnical skills, communications, computer science, education, or business. This is generally accomplished by taking either a concentration of courses or obtaining a minor in your "specialty" area. Attainment of sufficient training in a "specialty" area enhances opportunity for

employment. A careers course is offered to help students select and prepare for a particular career area.

Development of optional career goals is important for preveterinary students. Admission to schools of veterinary medicine is highly competitive. Therefore, students in this option are urged to prepare for alternative careers as they complete preveterinary requirements.

All animal science majors are required to complete ANSC 406 and 605; CHEM 403-404; and ENGL 501. In addition, the requirements in one of the three following options must also be completed:

Animal Production and Agribusiness Option ANSC 401; ECON 402 or RECO 411; BOT 412 or PLSC 421; MATH 420, 425, or RECO 528; ZOOL 412; ZOOL 507-508; BCHM 501; ANSC 502 or MICR 503; ANSC 612; ANSC 620, 607, 617, or 614; ANSC 404, 550, 552, or 556; ANSC 610 and one 700-level ANSC course.

Bioscience and Technology Option BIOL 411-412; PHYS 401-402; MATH 425; MATH 426 or RECO 528; MICR 503 or BIOL 541; ZOOL 507-508 or 518-519; CHEM 545 or 651-652; BIOL 604; BCHM 602 or 751-752; and three 700-level ANSC courses.

Preveterinary Medicine Option BIOL 411-412; PHYS 401-402; MATH 425; MATH 426 or RECO 528; MICR 503; ZOOL 507-508; BIOL 604; CHEM 651-652; BCHM 656; and one 700-level ANSC course.

General Science Certification See page 27.

Biochemistry

(For descriptions of courses, see page 91.)

Biochemistry is the study of the chemistry of life processes. The program in biochemistry in based on fundamental courses in chemistry and the biological sciences in addition to basic courses in physics and mathematics. The department offers advanced courses in specialized areas of modern biochemistry, genetics, and molecular biology.

Two curricula are offered to meet the educational needs of students with differing professional aspirations.

Biochemistry Curriculum A Provides intensive preparation in chemistry and biochemistry and basic courses in the biological sciences, microbiology, and genetics. The strong emphasis on depth in fundamental principles makes this curriculum ideal for students planning on graduate study in biochemistry, molecular biology, genetics, and biotechnology and for students seeking admission to professional schools in dentistry, medicine, or pharmacy. Students entering curriculum A should register for CHEM 405-406, MATH 425-426, and BIOL 411-412 in their freshman year.

Biochemistry Curriculum B Provides a fundamental education in chemistry, biochemistry, and the biological sciences. Students entering the major from the biology program will normally take this curriculum. Flexibility is designed into this curriculum to permit the student to elect studies emphasizing biochemistry in such fields as medicine, genetics, analytical studies, marine studies, neurobiochemistry, biotechnology, and nutrition. This curriculum develops the educational strength required for technical positions in research and service programs of universities, medical schools, hospitals, and government laboratories. In addition it offers excellent preparation for positions in industrial laboratories and sales groups. Students entering this curriculum should register for CHEM 403-404, MATH 425-426, and BIOL 411-412 in their freshman year.

Students interested in electing a biochemistry major are advised to consult with the department chairperson or a faculty member as early as possible to ensure the most effective curricular planning.

General Science Certification See page 27.

Biology

(For descriptions of courses, see page 91.)

The biology program is appropriate for those who desire to prepare for professional careers in biology or any of the disciplines that make up biology (such as animal sciences, biochemistry, botany, entomology, forestry sciences, microbiology, nutrition, plant science, or zoology); for those preparing for entry into graduate school in any of the life science disciplines; for those wishing to teach biology in secondary schools; and for those preparing for entry into medical, dental, or veterinary schools. Completion of a four-year undergraduate program in biology or a biological science plus a fifth-year internship is necessary for biology teacher certification. A two-year biology core curriculum is designed around a group of courses offered specifically for students in the biological sciences. This core curriculum is taken by all students in any of the biological sciences programs.

Students can, and are encouraged to, declare biology or one of the departmental programs as a major in their first year. A faculty adviser will be assigned based on students' major interests. Majors in biology and in all biological science departmental programs take the same core curriculum for the first two years. On completion of the second year, students may choose one of the departmental programs, biology, or another interdepartmental program as their major. Those wishing to prepare for secondary school education should indicate so at this time.

The major and supporting courses in the following list generally will be taken in the sequence given. However, students should discuss their second-year courses with their faculty adviser since these may vary slightly. Faculty advisers will help students plan courses in the junior and senior year to ensure that they meet the program degree requirements. Students planning to teach should enroll in EDUC 500 during their sophomore year and should consult with the Department of Education for advice on courses to take in that field.

A minor in marine biology is also available. Students interested in marine study should plan to major in the biological sciences and minor in marine biology. For a description of the marine biology minor, see page 71.

Major Core Curriculum Note that, except for science courses, University general education requirements (see page 14) are not included.

Freshman Year
BIOL 411-412; CHEM 403-404; MATH 425-426 or MATH 425 plus RECO 528

Sophomore Year
BIOL 604; BIOL 541 or MICR 503; PHYS 401-402; CHEM 651-652 or CHEM 545 and BCHM 602; EDUC 500*

Junior and Senior Years
Students majoring in biology will pursue an interdepartmental curriculum that meets their needs and interests. Curricula that are presently being developed and are expected to be in place during spring 1989 include (1) marine and freshwater biology; (2) ecology and evolutionary biology; (3) molecular, cellular, and developmental biology; and (4) general biology. Students majoring in one of the other biological science disciplines (animal sciences, biochemistry, botany, entomology, forestry sciences, microbiology, nutrition, plant science, or zoology) will pursue requirements designated for their majors by the appropriate department.

**for teacher preparation*

Students interested in the biology major should contact James E. Pollard, coordinator of the biology program, or Robert O. Blanchard, associate dean, College of Life Sciences and Agriculture.

General Science Certification See page 27.

*Botany and Plant Pathology**

(For descriptions of courses, see page 92.)

The botany and plant pathology program explores the fundamental nature of plants. Botany graduates with suitable undergraduate backgrounds may enter the field of secondary education or find jobs with agricultural and pharmaceutical industry. Those students who have an interest in university teaching and/or research, governmental research, and advanced research positions with industry should expect to complete graduate education in the field.

The principal areas of concentration in the department are (1) plant physiology; (2) cell biology; (3) ecology; (4) phycology, (5) freshwater biology; (6) biological oceanography; (7) plant pathology; (8) systematic botany; (9) plant anatomy and morphology; (10) mycology; (11) morphogenesis; and (12) plant biotechnology and genetic engineering.

Two botany and plant pathology degrees are offered: bachelor of science and bachelor of arts. Candidates for the bachelor of arts degree are required to take the following courses in addition to the core curriculum of all biological science majors: BOT 503, Evolution of Plants; BOT 566, Systematic Botany; BOT 606-608, Plant Physiology and Lab; and BOT 758, Plant Anatomy, or BOT 762, Morphology of Seed Plants. Also required are two botany electives.

Candidates for the bachelor of science degree are required to take the biology core plus BOT 503, 566, 606-608, 758 or 762, and BOT 601, Terrestrial Plant Ecology. Also required are three botany electives, one of which will be taken in the field of phycology, and one in the field of mycology/plant pathology.

**NOTE: The Department of Botany and Plant Pathology and the Department of Plant Science plan to merge into a single Department of Plant Biology by the fall semester of 1989. This will enhance the programs offered by both departments and strengthen the graduate program. Students who are currently enrolled in programs in either department or who enroll before the merger takes place (academic year 1989–90) will follow their premerger program to completion. Students or advisers with questions should contact the chair of the Department of Botany and Plant Pathology.*

These required courses, except for BIOL 411 and 412, cannot be used to fulfill general education requirements. Majors must maintain a grade of C- (1.67) or better with a grade-point average of 2.00 in required courses. Beyond that, the program of each individual is selected by the student and adviser to meet particular needs.

Students interested in majoring in botany and plant pathology are invited to consult with the chairperson.

General Science Certification See page 27.

Community Development

(For descriptions of courses, see page 101.)

The community development program deals with broad aspects of community problem resolution, including applied economic, social, political, and technical matters. Communities are viewed as systems subject to meaningful analysis. Emphasis is placed on community administration, planning, and the development process of helping people learn how to work together, organize their efforts, and analyze community problems in a democratic, decision-making framework. The curriculum takes an interdisciplinary approach and includes field experience as a vital component, along with classroom and independent study.

Students majoring in community development are encouraged to concentrate in one of the curriculum's specialized areas, which include community change and dynamics, community administration, community analysis, and community planning. These areas of specialty provide the necessary background and training to prepare graduates for entry-level positions with local governments and agencies throughout the nation. The community development program also provides a firm base for graduate study in a variety of areas such as regional planning, public administration, rural sociology, economic development, and law.

The option of a minor in community development provides a unique opportunity for students to increase their scope of knowledge and to understand the broader application of their major. The minor complements majors in both technical fields and liberal arts.

Local governments in New England are turning to full-time professional administrators to assume responsibility for the day-to-day administration, management, and planning activities that were previously carried out by part-time town officials. Officials at the New Hampshire Municipal Association estimated that New Hampshire needs at least twenty-five new graduates in community and public administration to fill local government professional needs. In addition to professional administration or planning positions in local or regional government, employment opportunities are also available with public agencies and organizations at the state, national, and international levels. The program also provides preparation for graduate work in public administration, regional planning, or for law school.

Students interested in a community development major or minor may consult with the program coordinator or with the chairperson of the Department of Resource Economics and Community Development.

Required Courses

I. All of the following (20 credits):
CD 415, Community Issues and Perspectives
CD 508, Applied Community Development
RECO 528, Applied Statistics I (or its equivalent)
CD 795, 796, Investigations in Community Development

II. One of the following (4 credits):
RECO 506, Population, Food, and Resource Use in Developing Countries
GEOG 583, Urban Geography

III. At least 12 credits of the following:
RECO 606, Land Use Economics
CD 607, Community Administration and Development
CD 614, Community Planning
CD 627, Community Economics and Finance
CD 710, Community Development Seminar
CD 717, Law of Community Planning
LMT 620, Community Conflict and Consensus

IV. Two courses from two of the following groups (at least 6 credits):
A: RECO 702, SOIL 609, or BIOL 541
B: SOC 560, SOC 642, or SOC 645
C: ADMN 580, ADMN 712, or ADMN 713

Courses (or their equivalents) expected to satisfy general education requirements:
CMN 403, Public Speaking
MATH 420, Finite Mathematics
BOT 412 or ZOOL 412, Introductory Botany or Principles of Zoology
RECO 411, Resource Economics Perspectives
SOC 500, Introduction to Social Psychology
ENGL 401, Freshman English
ENGL 501, Introduction to Prose Writing

CD minor requirements:
CD 415, Community Issues and Perspectives
CD 508, Applied Community Development
CD 795-796, Investigations in Community Development
One additional course selected from CD Group III.
One additional course selected from CD Group IV.

Entomology

(For descriptions of courses, see page 115.)

The Department of Entomology offers courses for students who wish to specialize in the study of insects and noninsect terrestrial arthropods, insect pest management, and insects in relation to people. There are employment opportunities for graduates in federal and state agencies, public institutions, and commercial and industrial firms in the areas of crop protection, forestry, conservation, and public health.

Students receive a fundamental education in the major fields of entomology, including general biology of insects and other arthropod groups, forest entomology, economic entomology, medical entomology, insect morphology, taxonomy, and insect pest management. Outstanding students are encouraged to pursue graduate study.

Entomology majors are expected to complete 24 semester credits successfully in courses offered by the department. Courses in other departments may be taken in lieu of the above with the consent of the major adviser. Majors are required to take the following courses: ENTO 402, 503, 705; BIOL 411-412; CHEM 403-404; CHEM 545; BCHM 602; PHYS 401-402; MATH 425; RECO 528; BIOL 604; MICR 503; plus four courses from related disciplines approved by their academic adviser.

Students may earn either a bachelor of science or bachelor of arts degree in entomology.

Those contemplating a career in entomology are advised to consult with the chairperson of the Department of Entomology.

General Science Certification See page 27.

Environmental Conservation

(For descriptions of courses, see page 116.)

The program in environmental conservation gives a broad background for understanding environmental and resource problems and their solutions. Economic activity within our biological ecosystems requires understanding of both areas, and development of policies and planning are essential to resolving environmental problems.

Students must choose an option (environmental affairs or environmental science) or develop a concentration that is related to specific career goals (for example, in the areas of environmental education, ecology, journalism, or business). Students choosing the latter route must incorporate a minor into their concentration. In addition to courses in the options or concentrations, students must complete the sixteen core courses listed below.

A minor of five courses in environmental conservation is available for students majoring in other areas. Permission is required.

The following 16 courses are required of all majors:

1. EC 401, Orientation to Environmental Conservation
2. BIOL 411, Principles of Biology I
3. BIOL 412, Principles of Biology II
4, 5. Ecology electives (Two of the following): BIOL 541, General Ecology; BOT 601, Terrestrial Plant Ecology; BOT 742, Physiological Ecology; FORS 527, Forest Ecology; WILD 433, Wildlife Ecology; WILD 772, Wildlife Energetics
6. RECO 411, Resource Economics Perspectives
7. Economics elective (One of the following): RECO 676, Economics of Water Use and Quality Management; RECO 606, Land Use Economics; RECO 611, Marine Resource Economics; RECO 706, Economics of Resource Development; FORS 643, Economics of Forestry; ECON 668, Economic Development
8. EC 635, Contemporary Conservation Issues
9. EC 702, Natural Resources Policy
10. WARM 504, Freshwater Resources
11. EC 637, Practicum in Environmental Conservation (4 cr.; this practicum will be an independent project involving field work on an actual conservation activity during the senior year) or EC 601, Internship in Environmental Conservation
12. EC 710, Environmental History
13. EC 799, Senior Thesis Seminar
14, 15. One speaking skills course (CMN 403 or beyond) and one writing skills course (ENGL 501 or beyond)
16. CS 406, Introduction to Computers and Programming, or RECO 528, Applied Statistics I

Students should plan to work for a master's degree if they wish to be professional conservationists. The undergraduate degree offers an education in environmental conservation with the opportunity for specialization or generalization in related fields.

All students must complete the University general education requirements.

Students interested in a major may consult with the program coordinator, John Carroll, James Hall.

General Science Certification See page 27.

Forest Resources

(For description of courses, see page 118.)

The forest resources program has the objective of combining a broad general education with technical forestry education to produce qualified professional foresters. The forest management and forest science options of the forest resources major leading to the bachelor of science in forestry degree (B.S.F.) are approved and accredited by the Society of American Foresters (SAF). The SAF is recognized by the Council on Postsecondary Accreditation and the U.S. Department of Education as the accrediting body for forestry in the United States.

Professional foresters are employed in a variety of forest-land management and wood-utilization positions. Some graduates work with natural resource protection and the improvement of environmental quality. Others are employed in the production and utilization of raw materials; still others become involved with wildlife, watershed, and recreation management. There are rapidly expanding opportunities in urban forestry.

Technical, administrative, and managerial skills are required of most professional foresters. This program provides a foundation in scientific knowledge, as well as technical and managerial skills, with elective freedom to cultivate special abilities and interests. The curriculum leads some students into graduate studies; these opportunities may be enhanced by careful selection of suitable courses in the undergraduate program.

Students majoring in forestry must complete 31 credits of classroom lab work and 6 credits of field training for the degree of bachelor of science in forestry. The University general education requirements are included in this total.

Besides these formal courses, all forestry majors are required to have at least one summer of forestry work experience (FORS 500). Students are responsible for their own summer work, though assistance is available from the faculty.

In addition to the normal University fees and tuition, forest resources students are required to pay certain course transportation fees and the cost of meals in connection with some planned field sessions.

Before the junior year, students must choose a single area of concentration from the following options and must earn 28 credits within that concentration.

Forest Management Option This option is designed for students who intend to develop a career in forest resource man-

agement. Requirements: FORS 753, Decision Sciences in Natural Resource Management; FORS 754, Wood Products Manufacture and Marketing; LMT 661, Intro. to Tourism Management; one course in administration, 500 level or higher; three courses (12 credits) in advanced forestry, wildlife, hydrology, soils, resource management, urban forestry, or administration.

Forest Science Option In this option, students may prepare for specialization in specific forest sciences, primarily as background for entry to graduate study. There are concentrations identified in four areas: biological science, wood science, quantitative science, and forest hydrology. Specific course requirements will be established by the forestry faculty.

Minors With permission of the faculty, it is also possible to minor in such areas as wildlife management, water resources management, soil science, or business administration.

Freshman Year	Fall	Spring
FORS 400*, Orientation in Forestry	0	—
FORS 423, Dendrology	2	—
FORS 425, Field Identification of Trees and Shrubs	2	—
FORS 426, Wood Science and Technology	—	4
ENGL 401, Freshman English	4	—
BOT 412, Introductory Botany	(4)	4
MATH 425, Calculus I	4	—
ENGL 501, Introduction to Prose Writing	—	4
RECO 528, Applied Statistics I	—	4
FORS 542, Forestland Measurement and Mapping	—	2
elective, general education requirement	(4)	—
	16	18
Sophomore Year		
FORS 527, Forest Ecology	4	—
FORS 544, Forest Biometrics	—	2
FORS 546, Forest Mensuration	—	2
SOIL 501, Soils and the Environment	4	—
CHEM 403, General Chemistry	4	—
ENTO 506, Forest Entomology	—	4
CS 406 or CS 410, Introduction to Computers and Programming or Introduction to Computer Programming	(4)	2
RECO 411 or ECON 402, Resource Economics Perspectives or Principles of Economics (micro)	(4)	4
WILD 433, Wildlife Ecology	4	—
elective, general education requirement	—	4
FORS 500, Summer Work Experience	0	—
	16	18
Junior Year		
FORS 629, Silviculture	3	—
FORS 643, Economics of Forestry	4	—
FORS 652, Forest Resources Measurements and Mapping	—	2
BOT 653, Forest and Shade Tree Pathology	4	—
FORS 660, Forest Fire Protection	—	2
FORS 757, Basics of Remote Sensing	—	2
electives, general education requirement	4	8
option requirement, (management or science)	2	4
	17	18
Senior Year		
FORS 745, Forest Management	4	—
WARM 603, Watershed Management	4	—
social science electives, (CD 415, EC 702, or EC 718)	4	—
electives, general education requirement	—	4
option requirement, (management or science)	6	12
	18	16

FORS 400 is required of all forestry majors.

Students interested in the forestry program may consult with Theodore Howard.

General Science Certification See page 27.

General Studies

General studies is a flexible curriculum for students with a broad, general interest in several areas of life sciences and agriculture. It cuts across departmental lines and in some respects resembles a self-designed major. It is not intended to be a catch-all for students from other colleges but is designed to serve the needs of life sciences and agriculture students. Students majoring in general studies should take CHEM 403-404 and BIOL 411-412. Six additional courses in the college (or closely related courses approved by the adviser), two of which must be at the 600 level or above, are required. These courses should be interrelated in such a way that they will help students meet their goals for employment or further study.

Freshmen who are unsure of a major should not declare general studies as a major but should remain undeclared for a semester or two (see p. 35).

Microbiology

(For descriptions of courses, see page 136.)

Microbiology explores the fundamental nature of living organisms that cannot be seen by the unaided eye. The primary emphasis is on prokaryotes, especially bacteria and viruses. Students completing a major in microbiology are well prepared for positions in city, state, or federal government; in industry; at universities; or at research institutes. They are also prepared for graduate studies in the biological sciences as well as for admission to graduate professional programs (dentistry, medicine). The principal areas of concentration in the department are (1) general, (2) medical, (3) environmental, (4) marine, (5) microbial cytology, and (6) genetic engineering and biotechnology.

In addition to satisfactory completion of the biology core curriculum, microbiology majors must complete a minimum of 28 credits from microbiology department offerings. All students must take MICR 503 (General Microbiology); MICR 701 (Taxonomy and Ecology); and a course in biochemistry (BCHM 602 or 656). Students desiring a general curriculum in microbiology may choose any 600- or 700-level courses in the microbiology department to complete the 28-credit-hour requirement. For students who want a particular concentration within the major, the following courses are recommended:

Medical Concentration Pathogenic Microbiology (MICR 602); Immunology (MICR 705); Virology (MICR 706)

Environmental Concentration Environmental Microbiology (MICR 600); Host-Microbe Interactions (MICR 712)

Marine Concentration Marine Microbiology (MICR 707); Microbial Biogeochemistry (MICR 708)

Microbial Cytology Concentration Microbial Cytology and Electron Microscopy (MICR 710)

Genetic Engineering and Biotechnology Concentration Microbial Genetics (MICR 704)

The Problems in Microbiology course (MICR 795-796) is available by special permission and allows students the opportunity to conduct semi-independent research projects in conjunction with departmental faculty. The particular curriculum of each student is determined in consultation with the student's faculty adviser. Students must receive a minimum

grade of C- in each course and a 2.00 overall average in their major requirements.

Students considering graduate school or postgraduate professional school or applying for certification as a registered microbiologist through the American Society for Microbiology are strongly advised to take a course in quantitative analysis (CHEM 517) and the two-semester course in organic chemistry (CHEM 651-654).

Students planning to major in microbiology are strongly encouraged to enroll in MICR 503 and organic chemistry in their sophomore year. Requirements in the biology core curriculum may be deferred until the subsequent year if necessary.

Students may obtain a minor in microbiology by successfully completing MICR 503 and four additional departmental courses at the 600 or 700 level. BCHM 602 or 656 may be substituted for one of these courses.

Departmental Honors Honors in microbiology will be awarded to students who complete 16 credit hours of honors courses in microbiology, including a minimum of 4 credits in a senior research project, and who maintain a minimum grade-point average of 3.20 in the major. Students interested in the microbiology honors program should apply to the department before their junior year.

Students interested in declaring a major or minor in microbiology or in being admitted to the microbiology honors program are advised to consult Thomas G. Pistole.

Nutritional Sciences

(For descriptions of courses, see page 142.)

The science of nutrition is the study of the nutrients in food and the body's handling of these nutrients. As an applied science, nutrition is based mainly on biochemistry and physiology and also encompasses aspects of other sciences such as anthropology, economics, genetics, mathematics, microbiology, pathology, animal sciences, and zoology. Consequently, the nutritionist must cooperate with workers in many different fields. The integrated nutrition program at UNH is designed to permit specialized study in human and/or animal nutrition.

Students interested in careers in the nutritional sciences are required to complete a core of basic courses in the biological and physical sciences while taking specialized courses in nutrition. Two curriculum plans are offered. One, which has been approved by the American Dietetics Association (ADA), prepares the student to apply for a dietetic internship while meeting the requirements for a B.S. degree in nutritional sciences. Completion of such an internship is recommended for advanced membership in the ADA and is a requisite for most employment opportunities in clinical dietetics and community nutrition. The core requirements are as follows: CHEM 403-404, 545 and 546, or 651-652; ZOOL 507-508 or 518-519; ENGL 401 and 501; BCHM 656 or 751-752; NUTR 475, plus 12 additional credit hours from recommended courses in nutrition.

The second curriculum plan will also allow students to receive a B.S. degree in nutritional sciences while fulfilling requirements for admission into graduate programs in biological research, medical school, and schools of dentistry. Students following this plan are required to complete the core requirements of the biology program, NUTR 475, and 12 additional credit hours from recommended courses in nutrition.

*Plant Science**

(For descriptions of courses, see page 149.)

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may major or minor in plant science. A core curriculum of physical and biological sciences is required. Students may then select courses that relate these sciences to their specific interests. Two curriculum options, the science option and the industry option, are offered to plant science majors. The following courses or their equivalents are required for these options:

	Science Option	Industry Option
PLSC 401, Plant Science Orientation	x	x
PLSC 421, Concepts of Plant Growth	x	x
BIOL 604, Principles of Genetics	x	
PLSC/BOT 606, 608, Plant Physiology and Lab	x	x
PLSC 566, 651, 652, 653, 654, or 678 (elective in crop production)		x
PLSC 507, Weed Science		x
PLSC 612, Genetics of Domesticated Plants		x
PLSC 672, Plant Propagation	x	x
PLSC 682, Sustainable Food Systems		x
PLSC 684, Practicum		x
PLSC 795, 796, Special Topics	x	
PLSC 797, Senior Seminar	x	x
BIOL 411-412, Biology I and II	x	
BOT 412, Intro. Botany		x
BOT 651 or 653, Plant Pathology or Forest and Shade Tree Pathology	x	x
CHEM 403, 404, General Chemistry	x	x
CHEM 545, 546, Organic Chemistry and Lab	x	
BCHM 501 or CHEM 545, 546, Biological Chemistry or Organic Chemistry		x
BCHM 656, Phys. Chem. & Nutrition	x	
ENTO 402, Intro. Entomology	x	
ENTO 402 or 503, Intro. Entomology or Applied Entomology	x	
MATH 425, Calculus I	x	
MATH 426 or RECO 528, Calculus II or Statistics	x	
MICR 503, General Micro.	x	
PHYS 401, 402, Physics I and II	x	
RECO 411, Resource Econ. Perspectives		x
RECO 501 or 504, Marketing or Farm Business Mgt.		x
SOIL 501, Soils & the Environment	x	
SOIL 501 or 502, Soils & the Environment or Soil Plant Relationships		x

NOTE: The Department of Botany and Plant Pathology and the Department of Plant Science plan to merge into a single Department of Plant Biology by the fall semester of 1989. This will enhance the programs offered by both departments and strengthen the graduate program. Students who are currently enrolled in programs in either department or who enroll before the merger takes place (academic year 1989–90) will follow their premerger program to completion. Students or advisers with questions should contact the chair of the Department of Plant Science.

Students in the industry option are required to take a minor or an approved concentration.

Because of the diversity of employment possibilities, the industry option curriculum is flexible. Students will find opportunities in management of farms, greenhouses, golf courses, or nurseries; teaching; journalism; park or highway planning commissions; sales or brokerage aspects of wholesale and retail marketing; and food and feed processing firms. Students should pursue the science option to prepare for graduate study and careers in research or teaching. Minor programs in administration, economics, English (journalism program), leisure management and tourism, resource economics, or vocational/technical and adult education can be tailored to accommodate specialized interests and complement fundamental requirements.

Students interested in a plant science major or minor may consult with the department chairperson.

A five-year dual-degree program leading to a B.S. degree in plant science and an M.B.A. degree (business administration) is available. Superior students preparing for a business career in agricultural enterprises should notify the department of their interest in their sophomore year. They will be considered for Graduate School enrollment in their junior year.

General Science Certification See page 27.

Resource Economics

(For descriptions of courses, see page 155.)

This program offers training in resource economics, including public resource policy, resource management, natural resource economics, and community economics and finance. Training is also available in agricultural economics, including agribusiness, farm management, food marketing, agricultural policy, and world food supplies.

Students majoring in resource economics will normally concentrate in one of the following three areas: natural resource economics, agricultural economics or community economics. In addition, students must satisfy general education requirements, which lead to a broad university education. Majors interested in the economic or business aspects of agriculture will be expected to take courses in the animal sciences and plant science departments.

Students majoring in any of the social sciences, life sciences, and agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics or agribusiness. By doing so, their basic training can be supplemented in a specific area of interest, such as resource development and natural-resource policy for social science majors, farm management and agricultural marketing for agricultural majors, and community economics and finance for students interested in local government and development.

Required Courses

All of the following:
ECON 401, Principles of Economics (Macro)
SOC 400 (Intro. Sociology*) or POLT 401 (Politics and Society*) or CD 415 (Community Issues and Perspectives*)
CMN 403 (Public Speaking) or VTAE 650 (Microcommunications)
RECO 510, Accounting & Finance for Small Business
BOT 412, Introductory Botany*
ZOOL 412, Principles of Zoology*
SOIL 501 (Soils and the Environment*) or WARM 504 (Freshwater Resources*)
RECO 411, Resource Economics Perspectives
MATH 420 (Finite Mathematics) or 425 (Calculus I)
ECON 605 (Intermed. Microeconomic Analysis)
ECON 611 (Intermediate Macroeconomic Analysis) or ECON 635 (Money & Banking)
RECO 528 (Applied Statistics I) or ADMN 424 (Business Statistics)

At least six of the following, of which two must be 700 level†:
RECO 501, Agricultural and Natural Resource Product Marketing
RECO 504, Farm Business Management
RECO 506, Population, Food, and Resource Use in Developing Countries
RECO 604, Agribusiness Finance
RECO 606, Land Use Economics
RECO 611, Marine Resource Economics
RECO 615, Linear Programming Methods
RECO 627, Community Economics and Finance
RECO 676, Economics of Water Use and Quality Management
RECO 704, Agricultural and Food Policy
RECO 706, Economics of Resource Development
RECO 708, Environmental Economics
RECO 710, Resource Economics Seminar
RECO 756, Rural and Regional Development

** or equivalent to satisfy General Education Requirements*
† a grade of C- or better required

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. Private business, public institutions, and government agencies currently have a strong demand for specialists trained in natural resource development; land and water use policy; farm and small business management; agricultural, fisheries, and forestry marketing; and community development. In many cases, students may wish to improve their qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Students interested in a major or minor in resource economics or agribusiness may consult with the department chairperson.

Soil Science

(For descriptions of courses, see page 160.)

Soil scientists are concerned with proper management of our soil resources, both in rural and urban environments, and with the essential role of soil in food and fiber production.

Career opportunities are excellent for graduates of the soil science program. There is a growing awareness that planning, design, and construction of public and private facilities must be compatible with the soil upon which these facilities are placed. Thus, the increasing urbanization of the Northeast has created a demand for soil scientists competent to advise on soils considerations during planning and development stages. There is also a growing role for soil scientists who wish to work with plant scientists and foresters in improving food and fiber production.

Students in the soil science program are given a strong analytical background for studying physical, chemical, and biological properties of soils, as well as their classification and management. Graduates are well prepared for further study in graduate school and professional certification is available through the American Registry of Certified Professionals in Soils.

Core Courses

ESCI 401, Principles of Geology I
BOT 412, Introductory Botany
BOT 606, Plant Physiology
CHEM 403-404, General Chemistry
CHEM 406, 407, Quantitative Analysis
SOIL 501, Soils and the Environment
SOIL 601, Soil Morphology and Genesis
SOIL 702, Chemistry of Soils
SOIL 703, Chemical Analysis of Soil
SOIL 704, Soil Genesis and Classification
SOIL 706, Soil Mapping

In addition, at least eight courses supportive of the student's specific area of interest must be chosen in consultation with the academic adviser. If national certification as a professional soil scientist is desired, the following will be required:

one course in each of the following: organic chemistry/biochemistry; physics; statistics; economics; and engineering.

two courses in each of the following: communication; crop science/forestry.

three courses in mathematics/computer science.

Students interested in the soil science major should consult with Robert Harter.

General Science Certification See page 27.

Vocational/Technical and Adult Education

(For descriptions of courses, see page 163.)

The Department of Vocational/Technical and Adult Education focuses on the preparation of students: as teachers of vocational/technical education, as participants in international agricultural education, as extension educators, and as adult educators concerned with human resource development.

This program complements a student major in technical subject matter within departments throughout the University and thus can serve as a viable dual major or minor.

Flexibility is maintained among individual programs, with credits allowed for qualified students through (1) the Occupational Competency Testing and Evaluation program, (2) internships in industry, (3) the Cooperative Extension Service, and (4) within other informal educational settings. Opportunity is provided for vocational teacher certification.

Students who desire to major or minor in vocational/technical and adult education should consult with a member of the faculty of the department.

Students majoring in vocational/technical and adult education will normally concentrate in one of four areas, although programs for teacher education can be developed in other areas of vocational/technical education on an individual basis.

Areas of concentration are described below.

Agricultural Education Teacher Certification This program prepares individuals for careers as teachers of general and vocational agriculture. Individuals completing this concentration are eligible for state certification in New Hampshire and most other states. Recent occupational experience in the field of production agriculture or agribusiness is required for state certification.

Individuals are encouraged to complete a dual major in a technical agricultural field. For further information, contact William H. Annis or David L. Howell.

VTAE Required Courses	Credits
VTAE 702, Concepts of Vocational/ Technical and Adult Education	4
VTAE 650, Microcommunications	4
VTAE 752, Youth Organizations	4
VTAE 666, Teaching Vocational Education to Students with Special Needs or	4
EDUC 750, Introduction to Exceptionality	4
VTAE 791, Planning for Teaching	4
	20–22

Education Required Courses	
EDUC 500, Exploring Teaching	4
EDUC 700, Educational Structure and Change	4
EDUC 701 (Human Development and Learning) or FS 525 (Human Development)	4
EDUC 705, Alternative Perspectives on the Nature of Education	4
EDUC 694B, Supervised Teaching in Voc./Tech. and Adult Education	8
	24

The technical agriculture courses are selected from the following areas: (1) animal science; (2) plant science; (3) agricultural mechanization; (4) resource economics; (5) entomology; (6) botany; (7) forestry (5th-year program); (8) some courses from the Thompson School of Applied Science or similar out-of-state institutions may be appropriate.

Additional Programs Programs for teacher education can be developed in other areas of vocational/technical education on an individual basis.

Trade and Industrial Teacher Certification Trade and industrial education, with emphases in, but not limited to, building trades, mill carpentry, welding, and food service, is formulated in three categories of courses to fulfill degree requirements. The degree requirements are 44 credits in general education, 44 credits in professional education, and 40–50 credits in technical subject matter or documented recent occupational experience. Technical subject matter is culminated in a competency test where credit (up to 30 credits) is awarded for successful completion of a written and practical exam. The competency exam is used to evaluate a student's previous occupational experience, when appropriate. Recent occupational experience in the field of specialization is required for state certification. For further information, contact David Howell.

VTAE Required Courses	Credits
VTAE 702, Concepts of Vocational/ Technical and Adult Education	4
VTAE 650, Microcommunications	4
VTAE 666, Teaching Vocational Education to Students with Special Needs or	4
EDUC 750, Introduction to Exceptionality	4
VTAE 791, Planning for Teaching	4

Required Education Courses	
EDUC 500, Exploring Teaching	4
EDUC 700, Educational Structure and Change	4
EDUC 701 (Human Development and Learning) or FS 525 (Human Development)	4
EDUC 705, Alternative Perspectives on the Nature of Education	4
EDUC 694B, Supervised Teaching in Voc./Tech. and Adult Education	8

Technical Courses
VTAE 696, Field Experience
VTAE 500, Competency Exam

International Agricultural Education This program prepares individuals for careers in international agriculture. The Peace Corps; U.S. Agency for International Development; and private agencies, business, and industry would be possible overseas employment opportunities. For further information, contact David L. Howell.

VTAE Required Courses (27 credits minimum)	Credits
VTAE 702, Concepts of Vocational Technical and Adult Education	4
VTAE 650, Microcommunications	4
VTAE 666, Teaching Vocational Education to Students with Special Needs or EDUC 750, Introduction to Exceptionality	4
VTAE 696, Field Experience	8–16
VTAE 630, Development of Food and Fiber in Third World Countries	3
VTAE 752, Youth Organizations	4
VTAE 783, Conducting and Supervising Adult Education Programs	4

Technical Agriculture (44 credits: one area should include 20 credits; each of the others, 8.)

8–20 credits	Animal science
8–20 credits	Plant & soil science
8–20 credits	Agribusiness
8–20 credits	Agricultural mechanization

Recommended International Courses
PIP 401, International Perspectives: Science, Business, and Politics
PIP 501, North-South Issues in International Affairs
ANTH 500, Peoples and Cultures of the World
RECO 506, Population, Food, and Resource Use in Developing Countries
Foreign language

Extension Education This program prepares students for careers with the Cooperative Extension Service and within other informal educational settings. It includes opportunity for selected formal courses and for field experience valuable for the student's professional development. The most beneficial focus in this area may be a dual major or minor along with concentra-

tion in a technical subject matter field within the College of Life Sciences and Agriculture or within other colleges and schools of the University. For further information, contact David L. Howell.

VTAE Required Courses	Credits
VTAE 702, Concepts of Vocational Technical and Adult Education	4
VTAE 650, Microcommunications	4
VTAE 695, Investigations in Vocational/Technical and Adult Education	2–4
VTAE 696, Field Experience	16
VTAE 783, Conducting and Supervising Adult Education Programs	4
Recommended Courses	
CD 415, Community Issues and Perspectives	4
CD 705, Planned Change in Nonmetropolitan Communities	4
CD 710, Community Development Seminar	2–4
SOC 560, Rural-Urban Sociology	4
SOC 500, Introduction to Social Psychology	4
PSYC 401, Introduction to Psychology	4
RECO 504, Farm Business Management	4
RECO 604, Agribusiness Finance	4

Water Resources Management

(For descriptions of courses, see page 164.)

There is a critical need for individuals educated and trained to understand how changes in land use affect water quantity and quality. The B.S. degree program in water resources management is designed to educate students in the principles of land management, biology, geology, water quality, and hydrology specifically as they relate to the management of water resources. The need and rationale for both land and water resources management is stressed and is interpreted within the context of existing social, economic, and cultural conditions.

This professional degree program is designed for students who intend to pursue careers in agencies that must form or implement policy at all levels of government, in public and private utilities that manage land and water resources, in private consulting firms that offer water resource management services, and in any of a wide variety of not-for-profit organizations that address land and water resource issues. We seek to train individuals to gather information from disciplinary experts, synthesize this information, and formulate ecologically and economically rational management alternatives.

A minimum of 134 credits is required for graduation with a B.S. in water resources management. Of these credits, 40 credits are allotted to general education. To best meet the needs of the water resource management program and also to meet the requirements of the general education program, specific general education courses are required in several categories. The remaining 94 credits fulfill the requirements of this degree. Of these, 70 credits are core credits required of all majors. The remaining 24 credits are alternatives that allow the students to tailor their education to specific areas of interest.

In addition to formal courses, all water resource management majors are required to have at least one summer of relevant work experience (WARM 500). Students are responsible for identifying appropriate summer work, although assistance is available from the faculty.

Water resource management students will be required to pay occasional special fees in addition to normal tuition and University fees. The special fees will defray the costs of travel, lodging, and meals for some field sessions.

Students who are interested in the water resource management B.S. program should contact William B. Bowden in the Department of Forest Resources.

General Education	Credits
ENGL 401, writing skills	4
MATH 425, quantitative reasoning	4
BIOL 411, science	4
CHEM 403-404	8
elective, historical perspectives	4
elective, foreign culture	4
elective, fine arts	4
RECO 411 and CD 415, social science and philosophical perspectives	8
	40

Core Water Resources Management Degree Requirements	
MATH 426, Calculus II or RECO 528, Applied Statistics I	4
PHYS 401, Intro Physics I or PHYS 407, General Physics I	4
PHYS 402, Intro Physics II or PHYS 408, Gen Physics II	4
BIOL 412, Prin of Biol II	4
BIOL 541, Gen Ecology	4
BOT 717, Gen Limnology	4
Various, computer expertise	4
CD 614, Community Planning	4
ESCI 401, Prin of Geology I or ESCI 409, Environ Geology	4
ESCI 705, Prin of Hydrology	4
RECO 676, Econ of Water Mgt	4
EC 635, Conservation Issues	4
FORS 542, Forest Measure and Map	2
FORS 757, Basic Remote Sensing	2
SOIL 501, Soils and Environment	4
WARM 500, Work Experience	0
WARM 504, Freshwater Resources	4
WARM 603, Watershed Management	4
WARM 700, Issues in Water Resources Management	4
WARM 775, Land Use Seminar	4
	70

A total of 24 additional credits must be taken, from a combination of courses devised by the student and his or her adviser that suitably defines a coherent area of professional specialization.

Wildlife Management

(For descriptions of courses, see page 165.)

The wildlife curriculum is for students interested in the ecology, conservation, and management of wild animals. It is designed to provide a knowledge of wildlife species and of the total forest and field environment of which they are a part. It prepares the student for work with public and private agencies in wildlife management and is a base for graduate study as needed for research and teaching.

Fieldwork is carried out during the academic year on wildlife areas near the campus. In June each year a two-week field session is held for all students who have completed the sophomore year. Majors are assisted and encouraged to obtain summer employment related to their career objectives.

The degree earned is a bachelor of science with a major in wildlife management. The program is administered in the Department of Forest Resources.

In addition to the normal University fees and tuition, wildlife students are required to meet special fee charges in connection with regularly planned field sessions.

Freshman Year	Fall	Spring
WILD 433, Wildlife Ecology	4	—
BOT 412, Intro. Botany	4	—
CHEM 403, General Chemistry	4	—
ENGL 401, Freshman English	4	—
ZOOL 412, Principles of Zoology	—	4
BOT 566, Systematic Botany	—	4
MATH 420 Finite Math or MATH 425, Calculus I	—	4
INCO 491, Computer Literacy	—	2
Elective*	—	4
Sophomore Year		
WILD 515, Wildlife Habitat Mgt.	3	—

ZOOL 518, Vertebrate Morphology	4	—
ENGL 501, Intro. to Prose Writing	4	—
Elective*	4	—
RECO 528, Applied Statistics I	—	4
ZOOL 542, Ornithology	—	4
RECO 411, Resource Economics Perspectives	—	4
Elective*	—	4
FORS 542, Forestland Measurement & Mapping	—	2
Junior Year		
ZOOL 712, Mammalogy	4	—
FORS 629, Silviculture	4	—
BOT 601, Terrestrial Plant Ecology	4	—
WILD 635, Wildlife Mgt. Techniques	2	—
WILD 609, Wildlife Seminar	Au	—
Elective*	4	—
ANSC 614, Diseases & Parasites of Wildlife	—	3
ANSC 616, Wildlife Disease Lab	—	1
WILD 772, Wildlife Energetics	—	2
WILD 610, Wildlife Seminar	—	Au
Elective*	—	4
Elective	—	4
Senior Year		
WILD 737, Wildlife Population Dynamics	4	—
WILD 609, Wildlife Seminar	2	—
Elective*	4	—
Elective	4	—
Elective	4	—
WILD 738, Wildlife Management	—	4
WILD 610, Wildlife Seminar	—	2
Elective*	—	4
Elective	—	4
Elective	—	4

**Electives should be used to satisfy remaining general education requirements and the wildlife major requirements in the areas of policy and administration, communication skills, and physical sciences (one course in each area—pertinent courses are listed in the detailed wildlife curricula guidelines available from the department).*

Students interested in the wildlife management major may consult with the program coordinator, William Mautz, Pettee Hall.

General Science Certification See page 27.

Zoology

(For descriptions of courses see page 165.)

The zoology major provides students with a strong background in the biology of animals, from protozoa to mammals, and in areas from cell biology to ecology. Students receive instruction in a core of fundamental courses required for many types of advanced training including medical or graduate schools and teacher training. Ample time is available to concentrate in specialized disciplines such as marine and freshwater biology, limnology, ecology, physiology, cell and developmental biology, and neurobiology. Active research programs maintained by the faculty provide undergraduates with opportunities to participate in research projects and to gain special preparation for careers in research.

The University's access to the coastal zone and the lakes region of New Hampshire, combined with the presence of two marine laboratories, one estuarine laboratory, and one freshwater laboratory provides an unusual opportunity for the study of the biology of marine and freshwater organisms.

Zoology majors must complete 32 credits from courses in the biological sciences approved by the department with a 2.00 average and at least a C- (1.67) in each course. Minimum requirements for the zoology major are as follows: Completion of the biology core curriculum and ZOOL 518 or 628, ZOOL 519, ZOOL 629 or 728, and another biological science course as an elective.

Students who are interested in a zoology major should consult the department chairperson.

General Science Certification See page 27.

College of Engineering and Physical Sciences

Otis J. Sproul, Dean
Donald W. Melvin, Associate Dean

Department of Chemical Engineering
Department of Chemistry
Department of Civil Engineering
Department of Computer Science
Department of Earth Sciences
Department of Electrical and Computer Engineering
Department of Mathematics
Department of Mechanical Engineering
Department of Physics

Bachelor of Science
Chemical Engineering*
- Energy
- Environmental Engineering

Chemistry*
Civil Engineering*
- Computer-Aided Engineering
- Constructed Systems
- Environmental Engineering

Computer Science*
Electrical Engineering*
- Computer Engineering
- Electrical Engineering Systems
- Student-Designed Option

Geology*
Hydrology* (Interdisciplinary)
Mathematics*
Mathematics Education*
- Elementary
- Middle/Junior High
- Secondary

Mathematics (Interdisciplinary)
- Mathematics—Chemistry
- Mathematics—Computer Science
- Mathematics—Economics
- Mathematics—Electrical Science
- Mathematics—Fluid Dynamics
- Mathematics—Mechanics
- Mathematics—Statistics
- Mathematics—Thermodynamics
- Mathematics—Physics

Mechanical Engineering*
- Energy

Physics*

Bachelor of Arts
Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics

Bachelor of Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology

**Designated degree (the name of the specialization is included on the diploma; e.g., B.S. in Chemistry)*

The College of Engineering and Physical Sciences provides an optimal opportunity for students to achieve educational objectives appropriate to their interests in engineering, mathematics, and the physical sciences. The college offers a vigorous professional education in each of its ten primary disciplines leading to the bachelor of science, and a broad liberal education coupled with majors in mathematics and each of the three physical sciences leading to the bachelor of arts. All programs include an opportunity for study in the arts, humanities, and social sciences.

The key to an undergraduate program in the college is flexibility, with a strong emphasis on personal and individualized education. In addition to specific programs, a number of options are available. Special programs can be developed to meet the specific interests of individual students.

MATH 425 and 426 (Calculus I and II) or the equivalent in transfer credits or advanced placement approved by the Department of Mathematics are required by all departments of the college for their majors. Prerequisites for calculus are three years of college-preparatory mathematics, including a half-year of trigonometry.

Accreditation The baccalaureate-level programs in chemical, civil, electrical, and mechanical engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The baccalaureate-level programs in electrical and mechanical engineering technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology. The baccalaureate-level program in computer science is accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board.

Degrees

Bachelor of Science The programs leading to the bachelor of science degree, offered in each of the departments of the college, emphasize the preparation of students for a professional career and continuing or graduate education.

The degree requirements for the bachelor of science include the University general education requirements (page 14) and the specific departmental requirements for graduation. A minimum grade-point average of 2.00 must be achieved. Graduation credit requirements established by the departments range from 128 to 133. There are enrollment limitations in some programs, and it is not possible to guarantee all change of major requests.

Bachelor of Arts Programs leading to a bachelor of arts degree are offered in the departments of chemistry, earth sciences, mathematics, and physics. These programs provide a broad liberal education along with a major in one of these fields. The University requirements for the bachelor of arts degree are on page 16.

Bachelor of Engineering Technology The engineering technology program emphasizes applied engineering in two curricula, electrical and mechanical technology. The program enables the student with an appropriate associate degree from a T.A.C.-A.B.E.T. accredited technical institute to obtain a B.E.T. degree in electrical or mechanical engineering technology in two years at UNH. This program emphasizes design and applications and uses the latest techniques and equipment. Student projects and liaisons with New Hampshire industries further enrich the program.

Five-Year Program: B.S.-M.B.A. The College of Engineering and Physical Sciences and the Whittemore School of Business and Economics offer a joint program leading to a bachelor of science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a master of business administration (M.B.A.) in five years rather than the normal six. In order to receive both degrees in five years, students in the program may have to take more than 16 credits per semester in several semesters (though no more than five courses or 20 credits). Provision has been made to count 14–24 credits toward both undergraduate and graduate degree requirements. All other University and departmental requirements for each degree must otherwise be met.

The program first "pre-admits" qualified students to take one M.B.A. course in each semester of their junior year. The preadmission process should be completed by April 1 of the sophomore year. The program is carried out jointly by representatives from the Whittemore School and the College of Engineering and Physical Sciences. Juniors enrolled in the program should submit a formal application to the Graduate School (in the second semester of the junior year) in order to be admitted to the M.B.A. program by March 1; they will be judged by academic standards with special emphasis on maturity and experience.

Most of the fourth year is occupied by core M.B.A. courses, while the fifth year is used for M.B.A. electives (some of which might be taken in the undergraduate major department) and for completing all requirements for the undergraduate degree. The M.B.A. will be granted only if the bachelor's degree requirements are successfully completed.

The details of each student's curriculum are worked out jointly with the departmental undergraduate B.S. adviser and with an adviser for the M.B.A. program.

Undergraduate advisers: Stephen S.T. Fan, chemical engineering; Robert Henry, civil engineering; Kondagunta Sivaprasad, electrical and computer engineering; Godfrey Savage, mechanical engineering. M.B.A. adviser: George Abraham, Whittemore School.

Interdisciplinary Majors

Bachelor of Science in Hydrology

The hydrology major is an interdisciplinary major offered by the departments of earth sciences and civil engineering. The coordinator of the program is S. Lawrence Dingman of the Department of Earth Sciences. For details of this program please see B.S. in hydrology under earth sciences (page 53).

Bachelor of Science in Mathematics

Mathematics–Chemistry option
Mathematics–Computer Science option
Mathematics–Economics option
Mathematics–Electrical Science option
Mathematics–Fluid Dynamics option
Mathematics–Mechanics option
Mathematics–Physics option
Mathematics–Statistics option
Mathematics–Thermodynamics option
For details of these programs, please see p. 56 under mathematics.

Interdisciplinary Minors

Interdisciplinary minors have been developed in biomedical engineering, environmental engineering, hydrology, illumination and optical engineering, materials science, ocean engineering, and oceanography. These programs enable students to obtain experience in the specialized area and to retain identification with their major professional area. (For University requirements, see page 17.)

Biomedical Engineering

The biomedical engineering minor encompasses the application of engineering science, technology, and problem-solving techniques to the fields of medicine and biology. Biomedical engineers participate in the development of diagnostic and therapeutic medical instrumentation, physiological sensors, aids for the disabled, biomaterials, clinical instrumentation systems, the application of computers to medical problems, and the study of the physical mechanisms underlying physiological processes. Biomedical engineers generally continue their studies at the graduate level and/or find employment in health-related industries and medical centers.

Engineering students electing this minor must complete the curriculum prescribed below. Since upperclass engineering curricula are heavily loaded with major courses, students should begin the program as early as possible to complete the zoology courses. An intent to minor form should be obtained from the dean's office and returned by the end of the sophomore year. During the final semester, application should be made to the dean to have the biomedical engineering minor shown on transcripts.

Required courses include ZOOL 507-508, Human Anatomy and Physiology (or ZOOL 518, 519); EE 787, Human Physiological Control Systems; EE 784, Biomedical Instrumentation (or approved elective for non-ECE students); and CHE 695, EE 695, or ME 696 (a biomedical engineering research project), normally to be completed over a two-semester period for a total of 4 credits.

Students intending to pursue the minor should consult early in their freshman year with the biomedical engineering minor adviser, Glen C. Gerhard, Department of Electrical and Computer Engineering.

Environmental Engineering

The environmental engineering minor is intended primarily for students in engineering and physical sciences. Students contemplating such a minor should plan on a strong background in the sciences and mathematics (including differential equations).

The minor provides a comprehensive introduction to major areas of interest in environmental protection, namely air pollution and water pollution, through the three required courses. Further breadth in environmental engineering or depth in specific areas can be attained through the choice of appropriate elective courses.

Requirements for the minor include a minimum of five courses totaling at least 18 credits, chosen from the following: (1) three required courses: CHE 609, Fundamentals of Air Pollution and Its Control; CIE 643, Engineering Aspects of Environmental Pollution Control; CHE 772, Physicochemical Processes for Water and Air Quality Control, or CIE 644, Water and Wastewater Engineering; (2) a minimum of two elective courses from the following list: CHE 604, Chemical Engineering Thermodynamics; CHE 605, Mass Transfer and Stagewise Operations; CHE 606, Chemical Engineering Kinetics; CHE 772, Physicochemical Processes for Water and Air Quality Control; CIE 644, Water and Wastewater Engineering; CIE 740, Rural Wastewater Treatment; CIE 743, Environmental Sampling and Analysis; CIE 744, Environmental Limnology; CIE 746, Wastewater Treatment Plant Design; CIE 747, Introduction to Marine Pollution and Control; CIE 748, Solid Waste Disposal; CIE 749, Water Chemistry; CIE 742, Hazardous Waste Management; CIE 755, Design of Water Transmission Systems; CIE 756, Wastewater Microbiology; or 695, Engineering Projects (CHE, CIE, EE, ME).

Choice of elective courses should be made in consultation with the minor area adviser, Nancy Kinner, civil engineering, or Stephen S. T. Fan, chemical engineering. Students normally start this program in the junior year and should declare their intention to enter the program as early as possible during the sophomore year. During the final semester, students should apply to the dean to have the minor shown on the transcript.

Hydrology

The minor in hydrology is open to all students in the University. It consists of a minimum of five courses totaling at least 18 credits. Students must earn grades of C (2.00) or better and take no pass/fail courses. No more than 8 major requirement credits may be used. All courses in the program shall be selected by students in consultation with the hydrology minor adviser in the Department of Earth Sciences.

Required courses include (1) ESCI 401, Principles of Geology I, or ESCI 409, Environmental Geology; (2) at least two of the following: FORS 603, Hydrology and Water Management; ESCI 705, Principles of Hydrology; ESCI 710, Groundwater Hydrology; (3) any of the following courses: ESCI 561, 703, 734, 762; CIE 643, 741, 742, 744, 745, 749; FORS 757, 758; RECO 676; BOT 717, 719; SOIL 501 and 502; WARM 504.

Students are encouraged to declare their intention to enter the program before the end of the junior year. During the final semester, students should apply to the dean to have the minor shown on the transcript.

Illumination and Optical Engineering

The illumination and optical engineering minor is open primarily to juniors and seniors in the College of Engineering and Physical Sciences who desire an interdisciplinary exposure to the practical and technical aspects of light, vision, color, optics, and fiber optics. Students must have completed MATH 425, 426, 527, PHYS 407, 408, and CS 410 or equivalent in order to take EE 760, 761, 762, and 763. Some of these four courses, as well as some of the courses listed below, may have additional prerequisites.

Requirements for the minor include a minimum of five courses totaling at least 18 credits, distributed as follows: (1) two required courses: EE 761, Optical Engineering; and EE 762, Illumination Engineering; (2) at least one of the following: EE 695, Electrical Engineering Projects (in illumination or optics); EE 760, Introduction to Fiber Optics; EE 763, Lighting Design and Application; PSYC 710, Visual Perception; PHYS 607, Optics; (3) two additional courses that are not expressly specified as being required in the student's major curriculum, chosen from either the foregoing or the following: EE 711, Digital Systems; EE 757, Fundamentals of Communication Systems; EE 781, Physical Instrumentation; EE/ME 771, Linear Systems and Control; EE/ME 772, Control Systems; EE, Introduction to Digital Image Processing; PHYS 505, General Physics III; PHYS 506, General Physics IV; PHYS 718, Introduction to Solid State Physics; ME 710, Solar Heating Systems; ME 774, Computer-Aided Engineering; ARTS 455, Introduction to Architecture; MATH 644, Probability and Statistics for Applications; MATH 645, Linear Algebra for Applications.

Students should declare their intent to enter this minor program before the second semester of their junior year after consultation with the minor adviser, Joseph B. Murdoch, Department of Electrical and Computer Engineering. During the final semester, students must apply to the dean to have the minor shown on their transcript.

Materials Science

The minor, administered by the Department of Mechanical Engineering, is open to all students of the University and offers a broad introduction to materials science. Students should contact the minor supervisor by midsemester of their junior year.

The students must complete at least 18 credits and a minimum of five courses as follows: required courses ME 561 with ME 545 and ME 564; one course from the group ME 760, ME 761, and ME 766; additional courses from the group ME 695 (materials), 696 (materials), 730, 760, 761, 766, CHEM 517, 518, 545, CHE 701.

Interested students may consult James E. Krzanowski, Department of Mechanical Engineering.

Ocean Engineering

The ocean engineering minor is described under marine sciences on p. 71.

Oceanography

The oceanography minor is described under marine sciences on p. 71.

Other Programs

Independent Study and Projects All departments within the college offer courses in independent study or in projects, the content varying with the current scientific and technological needs and with student and faculty interest.

Permission of the instructor and/or the department chairperson is required. (See the course descriptions for the independent study and project courses and for specific requirements.) The initiative for independent study courses in any area rests with the student.

Special Provisions "The requirement of a given course in any prescribed curriculum may be waived by the faculty of a student's college. The student's petition must be approved by his/her major adviser and the dean of the college. This power will usually be delegated by the faculty to the dean or to a committee." (Senate Rule 05.21(s): Waiver of Requirements in a Prescribed Curriculum)

This rule offers students the opportunity to develop a somewhat individualized plan of study with intellectual incentives and opportunities in addition to those in a regular curriculum.

In addition, upon the recommendation of the department chairperson, superior students may be allowed to count credits from up to two 800-level courses toward both a bachelor's degree and a master's degree, provided that the students have been admitted to the master's program.

Research Opportunities The talents and expertise of the faculty in all departments are reflected in the number of ongoing research projects. Undergraduates are included in many of these research projects with the intent of discovering and fostering their creative talents. In funded research projects, students may have an opportunity to receive pay while learning.

Some flavor of the multiplicity of the research programs is reflected in special facilities, a few of which are the Analog Computer Facility, Antenna Systems Laboratory, Bioelectronics Laboratory, Computation Science Center, Electronics Laboratory, Engineering Design and Analysis Laboratory, Fluid Mechanics Laboratory, Materials Laboratories, Mechanics Research Laboratory, Sanitary Engineering Laboratory, Solid State Laboratory, Space Science Center, Wind Tunnel and Water Tunnel Facility, and X-ray Laboratory.

Students have the opportunity to acquire applied experience in business and industry by working with faculty members who undertake client-sponsored professional projects in management and technical areas for business and industry, and for state and local governments.

Preparing for Teaching Students interested in mathematics education (elementary or secondary), chemistry and physics teaching, earth science teaching, or general science teaching should refer to the Department of Education section (p.25) and to the appropriate department for a description of the requirements.

Combined Programs of Study In addition to pursuing a single major, students may combine programs of study as follows:

Minors: See page 17; see also pages 19 and 47 and Departmental Programs of Study in this section.

Second Majors: See page 17.

Interdisciplinary Majors: Many of the departments in the college offer ways of combining a major with another field of interest. See the descriptions that follow.

Dual-Degree Programs: See page 16.

Student-Designed Majors: See page 72.

Other combined and interdisciplinary opportunities: page 70.

Departmental Programs of Study

In addition to the following departmental majors and options, departmental minors are offered in chemical engineering, chemistry, civil engineering, electrical engineering, engineering technology, geology, mathematics, mechanical engineering, and physics.

Chemical Engineering

(For descriptions of courses, see page 94.)

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material.

The practice of chemical engineering includes the conception, development, design, and application of physicochemical processes and their products; the economic development, design, construction, operation, control, and management of plants for these processes; and activities relating to public service, education, and research.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petrochemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers are also working in increasing numbers in the emerging areas of energy engineering, pollution abatement, and biochemical and biomedical engineering; in addition, they are employed by many government laboratories and agencies as well as private industries and institutions.

The curriculum trains students to enter the diverse areas of employment or graduate study. The considerable number of electives in the curriculum provides flexibility for individuals to design programs that fulfill their needs and interests. They also provide an opportunity for students to elect departmental options or interdisciplinary minors in their programs.

A minimum of 129 credits is required for graduation with the degree of bachelor of science in chemical engineering. There are ten electives in the chemical engineering curriculum. Seven of these are for the general education requirements. The remaining three electives should consist of two chemical engineering electives and one technical elective.

Students are required to obtain a minimum 2.00 grade-point average in Chemical Engineering 501-502 and in overall standing at the end of the sophomore year in order to continue in the major.

Freshman Year	Fall	Spring
ENGL 401, Freshman English	4	—
MATH 425-426, Calculus I and II	4	4
PHYS 407, General Physics I	—	4
CHEM 405, General Chemistry	4	—
CHE 410, Survey of Current Energy and Pollution Control Technology	—	4
Electives (2)	4	4
	16	16

Sophomore Year		
CHEM 683-684, Physical Chemistry I and II	3	3
CHEM 685-686, Physical Chemistry Laboratory	2	2
MATH 527, Differential Equations with Linear Algebra	4	—
CS 403, Introduction to Digital Computer Programming	2	—
PHYS 408, General Physics II	4	—
CHE 501-502, Introduction to Chemical Engineering I and II	3	3
Electives (2)	—	8
	18	16

Junior Year		
CHEM 547-548, Organic Chemistry	3	3
CHEM 549, Organic Chemistry Laboratory	2	—
CHE 601, Fluid Mechanics and Unit Operations	3	—
CHE 602, Heat Transfer and Unit Operations	—	3
CHE 603, Applied Mathematics for Chemical Engineers	4	—
CHE 604, Chemical Engineering Thermodynamics	—	4
CHE 612, Chemical Engineering Laboratory I	—	2
Electives (2)	4	4
	16	16

Senior Year		
CHE 605, Mass Transfer and Stagewise Operations	3	—
CHE 606, Chemical Engineering Kinetics	3	—
CHE 608, Chemical Engineering Design	—	3
CHE 613, Chemical Engineering Laboratory II	2	—
CHE 752, Process Dynamics and Control	—	4
Electives (4)	8	8
	16	15

Energy Option This option covers the major areas of current interest in the energy field. The required courses provide students with a general background knowledge of fossil fuels, nuclear power, solar energy, and other alternative energy resources. The elective courses will permit the student to study topics of special interest in more depth or gain a broader perspective on energy and some closely related subjects. Three courses are required, and a minimum of two additional courses of at least three credits each should be selected from the electives list. Students interested in the energy option should declare their intention during the sophomore year to the department faculty. They may consult with Stephen S. T. Fan.

Required Courses	
CHE 705, Natural and Synthetic Fossil Fuels	4
CHE 712, Introduction to Nuclear Engineering	4
ME 710, Solar Heating Systems	3
	11

Elective Courses	
CHE 695, Chemical Engineering Project	3–4
CHE 696, Independent Study	3–4
CHE 772, Physicochemical Processes for Air and Water Quality Control	4
ME 605, Thermal System Analysis and Design	4
	6–8

Environmental Engineering Option The chemical engineering program, with its substantial requirement in chemistry, fluid dynamics, heat transfer, mass transfer, unit operations, and reaction kinetics, provides students with a unique preparation to deal with many aspects of environmental pollution problems. The option gives students a special focus on the application of chemical engineering principles and processes to the solution of problems relating to air pollution, water pollution, and the disposal of solid and hazardous waste. Three required courses must be selected, plus two electives from the electives list. Each course must carry a minimum of three credits. Students interested in the environmental engineering option should declare their intention during the sophomore year to the department faculty. They may consult with Stephen S. T. Fan.

Required Courses	
CHE 609, Fundamentals of Air Pollution and Its Control	4
CHE 772, Physicochemical Processes for Water and Air Quality Control	4
CIE 748, Solid Waste Management	3
	11

Elective Courses	
CHE 695, Chemical Engineering Project	3–4
CHE 696, Independent Study	3–4
CIE 746, Wastewater Treatment Plant Design	3
CIE 749, Water Chemistry	3
	6–8

Chemistry

(For descriptions of courses, see page 95.)

Students interested in chemistry may major in one of three programs offered in the department, depending upon their plans for a career. Since the required chemistry courses in each degree program are the same in the first year, it is easy to change from one program to another.

In each of the programs, students should register for the following courses in the first year: CHEM 405 (first semester), General Chemistry; CHEM 406 (second semester), Quantitative Analysis; MATH 425 (first semester), Calculus I; and MATH 426 (second semester), Calculus II. Students interested in a chemistry program may consult with the coordinator of undergraduate studies in the department.

Bachelor of Science in Chemistry This curriculum prepares students for careers as professional chemists and provides a strong foundation for graduate study in chemistry or in interdisciplinary areas of science calling for a strong background in chemistry. The curriculum requires a greater depth in chemistry and physics than do the other degree programs.

Requirements

1. Satisfy general education requirements.
2. Language requirement: Much of the chemical literature is in German or Russian and has not been translated. Students must demonstrate a proficiency in one of these languages by completing a year's course in that language. The choice is up to the individual.
3. For specific course requirements, see the accompanying chart.

Bachelor of Arts, Chemistry Major This curriculum offers students the opportunity to combine a chemistry major with other interests. There are fewer required courses in chemistry and physics, and students have more opportunity to elect courses in other areas according to individual interests. The pre-healing arts students interested in chemistry, those preparing for secondary school teaching, or those interested in business can combine these interests with chemistry in this curriculum.

Requirements

1. Satisfy general education requirements.
2. Satisfy the bachelor of arts degree requirements (see page 16).
3. For specific course requirements, see the accompanying chart.

Chemistry Baccalaureate Degree Requirements

Chemistry Courses	B.S.	B.A., Chemistry Major
405*	x	x
406 & 407	x	x
547 & 549	x	x
548 & 550	x	x
683 & 685	x	x
684 & 686	x	x
762 & 763	x	x
697	x	
698	x	
699	x	two other
755 & 756	x	chemistry
774 & 775	x	courses
776	x	chosen from
663		these, except
708		697 and 698,
778		or two approved chemistry-related courses

Other Requirements

All majors: MATH 425 and 426, Calculus I and II.

B.S. degree: PHYS 407-408, General Physics I and II; GERM 401-402 or 403-404 or RUSS 401-402; CS 410, Introduction to Computer Programming; two chemistry-related courses (only one of which may be a chemistry course).†

B.A. degree, chemistry major: PHYS 407, General Physics I, or PHYS 401-402, Introduction to Physics I and II.

**CHEM 403-404 may be substituted for CHEM 405, but this is not recommended.*
†Suggested courses: MATH 527 or 528; PHYS 505; EE 620.

Bachelor of Arts, Chemistry and Physics Teaching This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are more opportunities to teach both subjects on the secondary-school level. Chemistry and physics teaching majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Requirements

1. Satisfy general education requirements.
2. Satisfy the bachelor of arts degree requirements (see page 16).
3. Chemistry requirements: 405, General Chemistry, or 403-404, General Chemistry; 406, 407, Quantitative Analysis; 545, 546 or 547-548 and 549-550, Organic Chemistry; 683-684 and 685-686, Physical Chemistry I and II.
4. Physics requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 605, Experimental Physics I. Physics 406, Introduction to Modern Astronomy, is strongly recommended.
5. Math requirements: 425, Calculus I, and 426, Calculus II.
6. All education courses in the teacher preparation program (see page 25).

General Science Certification See page 27.

Civil Engineering

(For descriptions of courses, see page 96.)

Civil engineers are concerned with the planning, design, and construction of public and private facilities, which must not only provide safe, efficient service to the users but must, in addition, be compatible with the environment (both natural and human) in which they are placed.

The program leads to a bachelor of science degree in civil engineering. The strong analytical basis of the program prepares graduates for many career opportunities. They may enter professional practice or pursue further study in graduate school. Undergraduates study the basic sciences and mathematics, as well as engineering science, analysis, and design.

Freshman Year	Fall	Spring
CIE 400, CIE Lectures	0	—
CIE 505, Surveying	—	4
MATH 425, 426 Calculus I, II	4	4
CHEM 403, 404 General Chemistry	4	4
ENGL 401, Freshman English	4	—
PHYS 407, General Physics I	—	4
Elective (1) general education requirement	4	—
	16	16
Sophomore Year		
CIE 525, 526, Mechanics I, II	3	3
CIE 527, Mechanics III	—	3
PHYS 408, General Physics II	4	—
MATH 527, Differential Equations with Linear Algebra	4	—
MATH 528, 644, or 645	—	4
CS 410 and CS 410F, Introduction to Computer Programming	4	—
CIE 530, Introduction to Civil Engineering Computer Applications	—	3
Electives (2) general education requirements	4	4
	19	17

Junior Year		
CIE 622, Engineering Materials	4	—
CIE 642, Fluid Mechanics	4	—
CIE 643, Engineering Aspects of Environmental Pollution Control	3	—
CIE 681, Classical Structural Analysis	3	—
CIE 633, Systems Analysis	—	3
CIE 644, Water and Wastewater Engineering	—	3
CIE 665, Soil Mechanics	—	4
CIE elective (1)*	—	3
Elective (1) general education requirement	—	4
	14	17
Senior Year		
CIE 682, Project Planning and Design	—	4
Electives (3) general education requirements	8	4
Elective (1) engineering science elective	—	3
CIE electives (5)*	9	6
	17	17

**Minimum of two approved design courses is required, one of which must be CIE 774 or CIE 793.*

The general education and engineering science electives will be chosen to meet requirements of the University, the department, and any option selected.

The engineering science elective is an engineering course taken from an engineering department or program other than civil or environmental engineering. Students must have the proper prerequisites to select such a course. A complete, current list of acceptable engineering science electives is available from the department.

To enter required 600-level CIE courses, a CIE major must have a 2.00 cumulative grade-point average and must have completed the CIE 525, 526, 527 sequence with a 2.00 grade-point average. Exceptions to these requirements will be granted only under extremely unusual circumstances and will require approval of a written petition by the student's adviser and department chair.

A minimum of 133 total credits is required for graduation. To qualify for graduation, the student must have a 2.00 average in all CIE courses.

Computer-Aided Engineering (CAE) Option One of the greatest challenges facing the civil engineering profession is microcomputer (and mainframe computer) integration with standard design procedures. Civil engineers must expand their knowledge of computers in order to use them effectively in analysis, design, project management, project bidding, drafting, and general office automation. A special education in computer-aided engineering is offered to train civil engineers to meet the demands of a modern professional career.

Students select the option during the first semester of the junior year. A student wishing to apply for acceptance into the option must have completed CS 410, CS 410F, and CIE 530 with grades of B or better or with approval of the option adviser. A student must meet all the previously listed graduation requirements. Interested students may consult with the option adviser.

Required Courses (4)	
CIE 630, Civil Engineering CAE Seminar	1
CIE 7xx, approved civil engineering design course	3
CIE 730, Civil Engineering CAE Project	3
CIE 774, Reinforced Concrete Design or CIE 793, Structural Design in Steel	4

Elective Courses (4)

Two civil engineering elective courses in the student's technical concentration (environmental, geotechnical, materials, structures, or systems); two elective computer application courses from the following:

EE 543, Introduction to Digital Systems	4
TECH 564, Fundamentals of CADD/CAE/CIM	3
CS 610, Operating Systems Fundamentals	4
CS 612, Data Structures and Algorithms	4
EE 612, Computer Organization	4
CIE 734, Optimization of Engineering Systems	3
MATH/CS 753, Numerical Methods and Computers I	4
MATH/CS 754, Numerical Methods and Computers II	4
ME 774, Computer-Aided Engineering	3
CIE 784, Civil Engineering Analysis with Numerical Techniques	3

(Minimum of 22 credits)

Constructed Systems Option All structures, regardless of purpose, must be planned, designed, and built to resist the natural forces (gravity, wind, earthquake) and those imposed by people during construction and use of the structure.

Two courses (7 credits) are required. A minimum of five additional courses (15 credits) must be elected from the following list, of which four courses (12 credits) must be in civil engineering. Courses not on the list may be elected upon approval of the option adviser.

Students select the option during the first semester of their junior year and must meet all previously listed graduation requirements. Interested students may consult with the option adviser.

Required Courses (3)	
CIE 783, Matrix Structural Analysis	3
CIE 774, Reinforced Concrete Design	4
or CIE 793, Structural Design in Steel	4
CIE 7xx, approved civil engineering design course	3

Elective Courses (4)

Minimum of 9 credits from the following:

CIE 721, Pavement Design	3
CIE 760, Foundation Engineering	3
CIE 761, Earth Structures	3
CIE 774, Reinforced Concrete Design	4
CIE 782, Timber Design	3
CIE 784, Civil Eng. Analysis with Numerical Techniques	3
CIE 785, Introduction to Structural Vibrations	3
CIE 786, Finite Element Applications for Solid Mechanics	3
CIE 791, Prestressed Concrete	3
CIE 793, Structural Design in Steel	4

Minimum of 3 credits approved elective:

ARTS 455, Introduction to Architecture	4
EE 541, Electrical Circuits	4
ESCI 401 or 402, Principles of Geology I or II	4
MATH or CS (any 600 course or above)	4
ME 441, Engineering Graphics	4
ME 503, Thermodynamics	4
ME 727, Advanced Mechanics of Solids	4

(Minimum of 22 credits)

Environmental Engineering Option Environmental engineering is the application of engineering principles and practices to one or more elements of the environment to protect or improve the quality of life. Environmental engineers use specialized engineering knowledge to manage water, air, and land resources systematically. This option provides fundamental environmental engineering concepts and methods of design and allows specialization in an area of the student's choice.

Five courses (17 credits) are required. At least 6 additional credits must be selected from the following list of elective courses, of which a minimum of 3 credits must be in civil engineering. Courses not on the list may be elected upon approval of the option adviser.

Students select the option during the first semester of their junior year and must meet all the previously listed graduation requirements. Interested students may consult with the option adviser.

Required Courses (5)

CIE 743, Environmental Sampling and Analysis	3
CIE 746, Wastewater Treatment Plant Design	3
CIE 749, Water Chemistry	3
CIE 756, Wastewater Microbiology	4
CIE 774, Reinforced Concrete Design or CIE 793, Structural Design in Steel	4
	17

Elective Courses (2)

Minimum of 3 credits from the following:

CIE 734, Optimization of Engineering Systems	3
CIE 740, Rural Wastewater Engineering	3
CIE 741, Open Channel Flow	3
CIE 742, Hazardous Waste Management	3
CIE 744, Environmental Limnology	4
CIE 745, Engineering Hydrology	3
CIE 747, Introduction to Marine Pollution and Control	3
CIE 748, Solid Waste Management	3
CIE 755, Design of Water Transmission Systems	3

Minimum of 3 credits approved elective:

CHEM 545, Organic Chemistry	3
CHEM 546, Lab (concurrently with Chem 545)	2
CHEM 683, Physical Chemistry I	3
CHE 604, Chemical Engineering Thermodynamics	4
CHE 609, Fundamentals of Air Pollution and Its Control	4
EE 541, Electrical Circuits	4
ESCI 401, Principles of Geology I or 409, Environmental Geology	4
ESCI 710, Groundwater Hydrology	4
ME 441, Engineering Graphics	4
ME 503, Thermodynamics	4

(Minimum of 23 credits)

Computer Science

(For descriptions of courses, see page 102.)

Computer scientists are concerned with all aspects of the design, implementation, and application of computers. They are concerned with problem solving in general, with particular emphasis on the design of computer-efficient solutions. This involves detailed understanding of the nature of algorithms, the software implementation techniques necessary to utilize these algorithms on computers, and a knowledge of how algorithms can be combined in a structured manner to form highly complex software systems.

The program leads to a B.S. in computer science and is designed to prepare students for employment in the computer field or to pursue graduate study in computer science. The program emphasizes the application of computer science theory and principles but also includes a broad background in basic mathematics and an introduction to computer hardware. Most courses require heavy use of the computer, and the laboratories stress hands-on experience with computer equipment.

Demand for the B.S. in computer science far exceeds the department's resources. Therefore, enrollment in the B.S. in computer science program is limited. Transfer into this program is on a space-available basis only and cannot be guaranteed. Selection is based on overall grade-point average and achievement in computer science courses. In addition, many computer science courses are not normally open to nonmajors.

Computer science majors must obtain a grade of C- or better in all CS courses below 695 and an overall grade-point average of 2.00 or better in all computer science courses as a requirement for graduation. If at the end of any semester, including the first, a student's cumulative average in CS courses falls below 2.00, the student may not be allowed to continue as a CS major.

Requirements

1. Satisfy general education requirements. PHYS 407-408, MATH 425, and PHIL 424 are required and may be used to fulfill requirements in the appropriate general education group.

2. One biological or physical science course in addition to the three required for general education.

3. Six required computer science courses: CS 415-416, Introduction to Computer Science I and II; CS 610, Operating System Fundamentals; CS 611, Assembly Language Programming and Machine Organization; CS 671, Programming Language Concepts and Features; and either CS 658, Analysis of Algorithms, or CS 714, Introduction to Programming Semantics.

4. Four required mathematics courses: MATH 426, Calculus II; MATH 531C, Mathematical Proof: Discrete Mathematics Structures; and two courses chosen from MATH 644, Probability and Statistics for Applications (or MATH 735-736); MATH 645, Linear Algebra for Applications (or MATH 761-762); and MATH 651, Combinatorics.

5. Two required electrical engineering courses: EE 543, Introduction to Digital Systems, and EE 612, Computer Organization.

6. Four approved computer science electives chosen from CS courses numbered above 650.

Earth Sciences

(For descriptions of courses, see page 104.)

The courses offered in the Department of Earth Sciences cover the broad spectrum of geology, hydrology, geochemistry, and oceanography. They encompass a group of related studies concerned with an understanding of the size, shape, and constitution of the earth; the processes that are now, or have formerly been, at work upon its surface, in its oceans, and within its interior; its origin; and evolution of life upon it.

The need for people trained in the earth sciences has been emphasized by the search for new and additional energy and mineral resources, by the increased concern with intelligent management of the environment, by the need to develop and manage fresh water resources, and by expansion of research in both oceanography and extraterrestrial geology. In addition, the demand for well-trained secondary teachers of earth sciences has steadily increased over the past few years.

Three undergraduate degree programs are offered through the Department of Earth Sciences. Students interested in an earth sciences program may consult with the department chairperson, Herbert Tischler.

Bachelor of Science in Geology This program represents a strong concentration in the earth and cognate sciences and is especially well suited for students who plan to continue their studies in graduate school. Beyond a central core of courses, there is sufficient flexibility in course selection so that students may, in consultation with their academic advisers, orient the program toward a particular facet of the earth sciences (e.g., mineralogy-petrology, oceanography, hydrogeology, geophysics-structural geology, geomorphology-glacial geology, geochemistry, paleontology-stratigraphy, etc.).

Requirements

1. Satisfy the general education requirements.

2. Satisfactorily complete MATH 425 and 426, CHEM 403-404, and PHYS 407-408 and 505. Some of these courses may also satisfy group 2 and part of group 3 of the general education requirements.

3. Complete a minimum of 12 courses in earth sciences, which should include ESCI 401, Principles of Geology I, or ESCI 409, Environmental Geology; ESCI 402, Principles of Geology II; ESCI 501, Introduction to Oceanography; ESCI 512-513, Principles of Mineralogy I-II; ESCI 530, Field Geology; ESCI 531, Structural Geology; ESCI 561, Geomorphology; ESCI 652, Paleontology and Biostratigraphy; and three approved earth sciences 700-level electives.

4. Complete four approved electives. The following should be considered: one additional 700-level course in the earth sciences, additional courses in mathematics, chemistry, and

physics; as well as courses in computer science, engineering, and the biological sciences.

Bachelor of Science in Hydrology The hydrology major is an interdisciplinary major offered by the departments of earth sciences and civil engineering. Each hydrology major is assigned to an adviser, who helps with course selection and provides general guidance.

University General Education Requirements: Students are required to complete the University general education requirements. Completion of the hydrology core curriculum automatically satisfies the requirement for one course in quantitative reasoning (group 2) and two physical science courses in group 3. To complete the requirements in group 3, hydrology majors must take one of the following biological science courses: BOT 412, ENTO 402, MICR 501-502, PLSC 421, WILD 533, or ZOOL 412.

Core Courses: MATH 425, 426, 527; MATH 644 or RECO 528; PHYS 407, 408; PHYS 505 or CIE 642*; CHEM 403, 404; CS 410, FORS 603; ESCI 401, 402, 561; ESCI 703 or CIE 741; ESCI 705, 710; CIE 743, 745, or 749. (*CIE 642 has two prerequisites, CIE 525 and CIE 527, that do not satisfy major requirements.)

Major Electives: Four approved electives are to be selected with the guidance of the adviser. Qualifying courses may be selected from a list of hydrogeology, biohydrology, water quality, fluid flow, water resources management, and weather and climate courses offered in various departments in the University.

For a list of the elective courses and for further information about the hydrology major, contact the coordinator, S. Lawrence Dingman, Department of Earth Sciences.

Bachelor of Arts, Geology Major This program offers students an opportunity to obtain a broad liberal education and a general background in geology with a greater degree of freedom in choosing electives than in the bachelor of science program. By a careful choice of electives, students can prepare for graduate school, business, or industry.

Requirements

1. Satisfy the general education requirements.
2. Satisfy the bachelor of arts degree requirements (page 16).
3. Complete a minimum of eight courses in the department (with a C- (1.67) or better,) including ESCI 401, Principles of Geology I, or ESCI 409, Environmental Geology; ESCI 402, Principles of Geology II; ESCI 512, Principles of Mineralogy; and five upper-level earth sciences courses, two of which must be 700 or above.
4. Math requirements: 425, Calculus I, and 426, Calculus II.

It is strongly advised that students complete, as early as possible, a year each of college chemistry and physics.

Bachelor of Arts, Earth Science Teaching Major This program is specifically designed to prepare students to teach earth sciences in secondary school. Upon graduation from this program, students receive full teacher certification that is recognized in most states.

Requirements

1. Satisfy the general education requirements.
2. Satisfy the bachelor of arts degree requirements (page 16).
3. Complete the following: ESCI 401, Principles of Geology I, or ESCI 409, Environmental Geology; ESCI 402, Principles of Geology II; ESCI 501, Introduction to Oceanography; GEOG 473, The Weather; CHEM 403-404, General Chemistry; PHYS 401-402, Introduction to Physics I and II; PHYS 406, Introduction to Modern Astronomy; plus 12 approved elective credits from intermediate and/or advanced earth sciences courses.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Satisfy the secondary-school teacher education program. (See p. 25.)

General Science Certification (See page 27.)

Electrical and Computer Engineering

(For descriptions of courses, see page 109.)

Electrical engineers are concerned with the design, development, and production of products and systems that involve electrical signals and power. Thus, broad areas of applications are covered, such as monitoring outer space and the ocean floor, developing robots for factories and biomedical instruments for hospitals, and building microcomputers and power systems. They use such principles and techniques as computer-aided design, optics, acoustics, electronics, automatic control theory, and electromagnetics.

The electrical engineering curriculum prepares students for graduate work in electrical engineering, for productive employment as electrical engineers, and for graduate work in related areas such as physics and business administration. It is compatible with the dual-degree program described on page 46.

At UNH, the cornerstone of the electrical engineering program is the involvement of students in the solution of real-world problems. During the freshman and sophomore years, students take basic courses in mathematics and science, learn how to use the computer, and receive introductory experience in electric circuits, logic design, and electronics. In the junior and senior years, students learn more about the techniques necessary for the analysis and design of electrically based systems.

In addition to general university requirements, the department has a number of grade-point average and credit requirements:

1. For an electrical engineering major to enter the junior year and take any of the first-term junior courses (EE 617, EE 645, EE 651, or EE 612), he or she must have taken, and achieved a cumulative grade-point average of 2.10 in, all of the following freshman and sophomore courses: MATH 425, 426, 527; PHYS 407, 408; and EE 541, 543, 544, and 548.
2. Any electrical engineering major whose cumulative grade-point average in EE courses is less than 2.00 during any three semesters will not be allowed to continue as an electrical engineering major.
3. Electrical engineering majors must achieve a 2.00 grade-point average in EE courses as a requirement for graduation.

To make an exception to any of these departmental requirements based on extenuating circumstances, students must petition the department's undergraduate committee. Mindful of these rules, students, with their advisers' assistance, should plan their programs based on the distribution of courses in the chart below for a total of at least 128 credits.

Basic Curriculum for B.S. in Electrical Engineering
(First two years are common to all options)

Freshman Year	Fall	Spring
Core Courses		
CHEM 405, General Chemistry*	4	—
MATH 425, 426, Calculus I and II	4	4
PHYS 407, 408, General Physics I and II	4	4
Elective, writing skills	4	—
CS 410, Introduction to Computer Programming	—	4

Elective, general education requirement	—	4
Total	16	16
Sophomore Year		
Core Courses		
Math 527, Differential Equations with Linear Algebra	4	—
EE 541, Electrical Circuits	4	—
EE 543, Introduction to Digital Systems	4	—
EE 544, Engineering Analysis	—	3
EE 548, Circuits and Electronics	—	4
ME 523, Introduction to Statics and Dynamics	—	3
Elective, math-science elective**	—	3 or 4
Electives (2), general education requirements	4	4
Total	16	17 or 18
Junior Year		
Core Courses		
EE 617, 618, Junior Laboratory I and II	2	2
EE 612, Computer Organization	4	—
EE 645, Electrical Networks	3	—
EE 651, Advanced Electronics I	3	—
EE 603, Electromagnetic Fields and Waves I	—	3
EE 647, Random Processes in Electrical Engineering	—	2
EE 657, Electromechanical Energy Conversion	—	2
Elective, math-science elective**	3 or 4	—
Elective, general education requirement	—	4
Subtotal	15 or 16	13
Computer Engineering Option		
CS 610, Operating System Fundamentals	—	4
Total	15 or 16	17
Electrical Engineering Systems Option		
EE 652, Advanced Electronics II	—	4
Total	15 or 16	17
Senior Year		
Core Courses		
EE 771, Linear Systems and Control	3	—
Electives (3), general education requirements	4	8
Subtotal	7	8
Computer Engineering Option		
EE 711, Digital Systems	4	—
EE 714, Real Time Computer Applications	—	4
EE 757 or 772, Communication or Control Systems	4	or 4
Elective, approved professional elective	4	or 4
Total	15	16
Electrical Engineering Systems Option		
EE 757, Fundamentals of Communication Systems	4	—
EE 772, Control Systems	—	4
Electives (2) approved professional electives	4	4
Total	15	16

**CHEM 403, 404 may be required for students whose preparation in chemistry is inadequate.*
***Math-science electives are courses chosen from the following list: MATH 645, 646, 647; ME 503, 508; PHYS 505, 506.*

Options and Minors In the junior year, students complete the core courses and begin studying in a chosen option. Students must choose one of the three options and additionally may elect one of the various minors (see page 47). The options, described in the following paragraphs, provide for professional electives so that students may pursue their individual interests. In addition, the senior year features many opportunities for individual or group projects. Each option is made up of five courses and builds upon the background acquired in the core curriculum.

Computer Engineering Option During the past several years, advances in the technology of electronic circuit manufacture have vastly reduced the costs of digital computers. This low cost, coupled with flexibility, has allowed them to be used in a broad variety of applications, from data processing in a small retail store to controlling a machine tool in a manufacturing plant. Since computers are basically electronic devices, it is primarily the job of electrical engineers to design or specify the purchase of the computer and integrate it into larger systems. To do so requires a knowledge of both hardware (circuits) and software (programming) concepts. In this option, students will learn to design, build, and test systems involving digital computers.

The following are required courses: EE 711, EE 714, CS 610. As electives, students take EE 757 or EE 772 and one approved professional elective chosen in consultation with the adviser to meet students' professional objectives.

Electrical Engineering Systems Option The electrical engineering systems option provides students with a background in electrical systems, including communication and control. An effort is made to balance the theory and the applications so that students will appreciate both system development and system implementation. In addition to the required courses, there are two additional professional elective courses that allow students to delve further into areas of interest.

Required courses include EE 652, EE 757, and EE 772. For electives, students choose two courses in consultation with the adviser.

Student-Designed Option This option is for the unusual student whose grade-point average is at least 2.70 and who has well-defined academic goals that cannot be satisfied by either of the regular options. The student and adviser prepare an option proposal that includes a statement of the student's goals and a listing of the option courses that will be taken. The option must include at least one EE course with an engineering design content of fifty percent or greater. Each student's proposal requires approval by the department's undergraduate committee.

Engineering Technology

(For descriptions of courses, see page 111.)

Engineering technology requires the application of engineering and scientific knowledge and methods combined with technical skills in support of engineering activities. Normally engineering technology is not concerned with the development of new principles and methods. The engineering technology program offers only junior- and senior-level work. Students admitted to this program must have an appropriate associate degree from the New Hampshire Technical Institute, the Vermont Technical College, Keene State College, or an equivalent T.A.C.-A.B.E.T.–accredited school. Curricula in electrical engineering technology and mechanical engineering technology are offered. Students may continue study in their fields of specialization, select electives that broaden their educational backgrounds, and participate in project courses where, as part of a technology team, their talents are applied in solving real problems.

Students interested in an engineering technology program may consult with the program chairman, T. A. Parssinen.

Electrical Engineering Technology		
Junior Year	**Fall**	**Spring**
ET 671, Digital Systems	—	4
ET 677, Analog Systems	4	—
ET 637, Heat and Fluid Power I	4	—
ET 674, Control Systems and Components	—	4
ET 680, Communications and Fields	4	—
CS 410, Introduction to Computer Programming	—	4
Electives (2)	4	4
	16	16

Senior Year		
ET 691, Electrical Engineering Technology Project	4	4
ET 633, Business Organization and Law	4	—
ET 634, Economics of Business Activities	—	4
ET 690, Microcomputer Technology	4	—
Electives (3)	4	8
	16	16

All students entering the electrical engineering technology program should have a minimum of 12 semester hours of college-level mathematics, including 2 semesters of calculus. Students without this background will be required to take either MATH 426 or MATH 527 during the first semester of their junior year. The student's adviser will determine which of these courses is most appropriate for the student's program. Electrical engineering technology students must also complete a minimum of 9 credit hours of courses in communication skills.

Mechanical Engineering Technology Junior Year	Fall	Spring
ET 637 and 638, Heat and Fluid Power I and II	4	4
ET 641, Production Systems	4	—
ET 675, Electrical Technology	4	—
ET 644, MET Concepts in Design and Analysis	—	4
CS 410, Introduction to Computer Programming	—	4
Electives (2)	4	4
	16	16

Senior Year		
ET 651, Mechanical Engineering Technology Project	4	4
ET 633, Business Organization and Law	4	—
ET 634, Economics of Business Activities	—	4
ET 645, Instrumentation	4	—
Electives (3)	4	8
	16	16

All students entering the mechanical engineering technology program should have a minimum of 12 semester hours of college-level mathematics, including 2 semesters of calculus. Students without this background will be required to take either MATH 426 or MATH 527 during the first semester of their junior year. The student's adviser will determine which of these courses is most appropriate for the student's program.

All mechanical engineering technology students must satisfactorily complete CHEM 403 or offer evidence of equivalent coursework. Students in this program must also complete a minimum of 9 credit hours of courses in communication skills.

Mathematics

(For descriptions of courses, see page 132.)

Four undergraduate programs are offered through the Department of Mathematics. Normally, students enter one of these specific programs; however, they may change programs within the department at any time. Enrollment in the interdisciplinary B.S. options is limited, and transfer into these programs cannot be guaranteed. Students who take CS 410 and MATH 425 and 426 in the freshman year are on schedule in any of the four programs in the department.

In the sophomore year, MATH 527, 528, and 531 keep a student on schedule in the B.A. program. In two of the three B.S. programs, these three courses plus one other (depending on the program) constitute the recommended sophomore sequence. The B.S. in mathematics education (elementary and middle/junior high options) has a completely different sophomore sequence. However, a student can maintain reasonable flexibility for program change within the department for two years.

In most programs, general courses outside the department should be completed by the end of the sophomore year.

Computer science courses play a special role in mathematics major programs. CS 410 is required in all mathematics programs, and some mathematics electives may be replaced by CS electives (see specific program requirements below).

In addition to the degree programs, the department has an active interest in the actuarial profession and is an examination center for the Society of Actuaries. Recommended courses for those interested in actuarial science can be included in either a bachelor of science or a bachelor of arts program.

Standards for Graduation To qualify for graduation, departmental majors must complete all except two of their mathematics courses with a grade of C- or better. In addition, students must maintain an overall 2.00 grade-point average in courses taken to satisfy major requirements.

Bachelor of Science in Mathematics This program represents the strongest concentration in mathematics of any program offered by the department. Required courses include those necessary for admission to graduate work in mathematics. Through a judicious choice of electives, students may construct a stronger pregraduate program, or they may slant the program toward a career in business or industry.

Requirements

General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)

MATH required courses

MATH 425, 426, Calculus I and II
MATH 527, Differential Equations with Linear Algebra
MATH 528, Multidimensional Calculus
MATH 531, Mathematical Proof
MATH 644, Probability and Statistics for Applications; or MATH 735, Probability, and MATH 736, Statistics
MATH 761, Abstract Algebra
MATH 762, Linear Algebra
MATH 767, One-Dimensional Real Analysis
MATH 784, Topology
MATH 788, Complex Analysis

MATH/CS electives

one approved mathematics elective (chosen from MATH courses numbered 646 or above, excluding 703 and 791)

one approved mathematics or computer science elective (chosen from MATH courses numbered 646 or above, excluding 703 and 791, or from CS courses numbered 610 or above)

other required courses

CS 410, Introduction to Computer Programming Languages (two semesters at the 400 level or one semester at the 500 level of French, Russian, or German; 503 satisfies general education, group 5, foreign culture)
PHYS 407-408, General Physics I and II (satisfies two of the three courses for general education, group 3, physical science)

Bachelor of Arts, Mathematics Major This program offers a broader liberal education than do any of the bachelor of science programs. By a careful choice of electives, however, students can shape this major into a preparation for graduate school, business, or industry.

Requirements

General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)

Foreign language requirement as defined by the University for the B.A. degree.

MATH/CS required courses

CS 410, Introduction to Computer Programming
MATH 425, 426, Calculus I and II
MATH 527, Differential Equations with Linear Algebra
MATH 528, Multidimensional Calculus
MATH 531, Mathematical Proof
MATH 644, Probability and Satistics for Application; or MATH 735, Probability, and MATH 736, Statistics.
MATH 761, Abstract Algebra
MATH 762, Linear Algebra
MATH 767, One-Dimensional Real Analysis
Two approved MATH/CS electives (chosen from CS courses numbered 610 or above

and MATH courses numbered 646 or above, excluding 703 and 791)

Bachelor of Science in Mathematics Education This professional degree program prepares students for mathematics teaching at the elementary, middle/junior high, or secondary level. The program is coordinated with the education department's teacher certification programs. Students may complete the degree requirements for middle/junior high or secondary option with full teacher certification in either four or five years. For the elementary option, full certification requires the five-year program. Students electing the four-year option must plan for one semester of student teaching (EDUC 694) in their senior year, and should consult with the mathematics department program adviser concerning the schedule of mathematics courses. The five-year program involves a required year-long teaching internship in the fifth year. (The internship can be coupled with other graduate work leading to a master's degree.) See Education, page 25.

Elementary Option
Requirements
General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)
CS 410, 410P, Introduction to Computer Programming
MATH 419, Evolution of Mathematics
MATH 425, 426, Calculus I and II
MATH 531, Mathematical Proof
MATH 536, Introductory Statistical Inference, or MATH 644, Probability and Statistics for Applications
MATH 621, Number Systems for Elementary School Teachers
MATH 622, Geometry for Elementary School Teachers
MATH 623, Topics for Elementary School Teachers
MATH 645, Linear Algebra for Applications
MATH 657, Geometry
MATH 703, Mathematics Education, K–6
MATH 791, Mathematics Education

One additional approved elective (usually taken from MATH 651, Combinatorics; MATH 656, Introduction to Number Theory; MATH 658, Topics in Geometry; MATH 698, Senior Seminar; CS 610, Operating System Fundamentals; CS 611, Assembler-Language Programming; and CS 612, Computer Organization)

Other required courses
PHYS 406, Introduction to Modern Astronomy (satisfies physical science requirement)
EDUC 500, Exploring Teaching
EDUC 700, Educational Structure and Change
EDUC 701, Human Development and Learning: Education Psychology
EDUC 705, Alternative Perspectives on the Nature of Education
EDUC 706, Introduction to Reading Instruction in the Elementary Schools

Middle/Junior High School Option
Requirements
General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)
CS 410, 410P, Introduction to Computer Programming
MATH 419, Evolution of Mathematics
MATH 425, 426, Calculus I and II
MATH 531, Mathematical Proof
MATH 621, Number Systems for Elementary School Teachers
MATH 622, Geometry for Elementary School Teachers
MATH 644, Probability and Statistics; or MATH 735, Probability, and MATH 736, Statistics
MATH 645, Linear Algebra for Applications; or MATH 762, Linear Algebra
MATH 657, Geometry I
MATH 698, Senior Seminar
MATH 761, Abstract Algebra
MATH 791, Mathematics Education

One additional approved MATH/CS elective (usually taken from MATH 527, Differential Equations; MATH 651, Combinatorics; MATH 656, Intro. to Number Theory; MATH 658, Topics in Geometry; MATH 736, Statistics; MATH 767, One-Dimensional Real Analysis; MATH 784, Topology; CS 610, Operating System Fundamentals; CS 611, Assembly-Language Programming; and CS 612, Data Structures and Algorithms)

Other required courses
EDUC 500, Exploring Teaching
EDUC 700, Educational Structure and Change
EDUC 701, Human Development and Learning: Educational Psychology
EDUC 705, Alternative Perspectives on the Nature of Education

Secondary Option
Requirements
General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)
CS 410, 410P, Introduction to Computer Programming
MATH 425, 426, Calculus I and II
MATH 527, Differential Equations with Linear Algebra
MATH 528, Multidimensional Calculus
MATH 531, Mathematical Proof
MATH 644, Probability and Statistics for Applications; or MATH 735, Probability, and MATH 736, Statistics
MATH 645, Linear Algebra for Applications; or MATH 762, Linear Algebra
MATH 657, Geometry
MATH 698, Senior Seminar
MATH 761, Abstract Algebra
MATH 791, Mathematics Education

Two additional approved mathematics or computer science electives (usually taken from MATH 651, Combinatorics; MATH 656, Introduction to Number Theory; MATH 658, Topics in Geometry; MATH 767, One-Dimensional Real Analysis; MATH 784, Topology; CS 610, Operating System Fundamentals; CS 611, Assembly-Language Programming; CS 612, Computer Organization.

Other required courses
EDUC 500, Exploring Teaching
EDUC 700, Educational Structure and Change
EDUC 701, Human Development and Learning: Educational Psychology
EDUC 705, Alternative Perspectives on the Nature of Education

Bachelor of Science: Interdisciplinary Programs in Mathematics and Its Applications These programs prepare students for employment in various areas of applied mathematics. Certain of them also lead to graduate work in appropriate fields (e.g., physics, computer science, economics). The major may consist of mathematics combined with chemistry, computer science, economics, electrical science, fluid dynamics, mechanics, physics, statistics, or thermodynamics.

Each interdisciplinary major consists of ten mathematics courses plus at least five courses in the other discipline. Specific requirements follow. If more than five courses outside of mathematics are required or elected, the excess may be used to satisfy appropriate general education requirements.

Requirements
General education requirements (MATH 425 may be used to satisfy the requirement in quantitative reasoning, group 2.)

Core courses
MATH 425, 426, Calculus I and II
MATH 527, Differential Equations with Linear Algebra
MATH 528, Multidimensional Calculus (not required in math-computer science option)
MATH 531, Mathematical Proof (in math-computer science option this must be MATH 531C, Discrete Mathematical Structures)
MATH 645, Linear Algebra for Applications; or MATH 761, Abstract Algebra, and MATH 762, Linear Algebra

Approved mathematics electives
(must be chosen from MATH courses numbered 646 or above, excluding 703, 791; in the math-statistics option these may include CS courses numbered 503 or above)
In the math-computer science option: MATH 644, Probability and Statistics for Applications (or MATH 735, Probability, and MATH 736, Statistics); MATH 651, Combinatorics; and three approved math electives.

In the math-economics option: MATH 735, Probability; MATH 736, Statistics; and two approved math electives.
In all other options except statistics: MATH 644, Probability and Statistics for Applications (or MATH 735, Probability, and MATH 736, Statistics); MATH 646, Analysis for Applications; MATH 647, Complex Analysis for Applications; and one approved math elective.

One required course (in all options except math-computer science)
CS 410 and 410C or 410F, Introduction to Computer Programming

Additional Courses
mathematics-chemistry option
CHEM 405, General Chemistry (taken no later than sophomore year); CHEM 683 and 685, Physical Chemistry I, and Physical Chemistry Laboratory (these two courses regarded as a single unit); CHEM 684 and 686, Physical Chemistry II, and Physical Chemistry Laboratory (these two courses regarded as a single unit); CHEM 776, Physical Chemistry III; PHYS 701, Introduction to Quantum Mechanics I, or CHEM 774, Inorganic Chemistry
one free elective (note: CHEM 547-548, Organic Chemistry, suggested as elective for those planning to do graduate work in chemical physics)

mathematics-computer science option
CS 415 and 416, Introduction to Computer Science I and II
CS 610, Operating System Fundamentals
CS 658, Analysis of Algorithms
two more approved CS courses (chosen from CS courses numbered 671 or above)
two additional courses (EE 543, Introduction to Digital Systems; and either EE 612, Computer Organization, or CS 611, Assembler-Language Programming

mathematics-economics option
ECON 401, Principles of Economics (Macro)
ECON 402, Principles of Economics (Micro)
ECON 605, Intermediate Microeconomic Analysis
ECON 611, Intermediate Macroeconomic Analysis
ADMN 605, Operations Research
one approved economics course (chosen from the following: ECON 626, Applied Regression Analysis; ECON 727, Advanced Econometrics; ADMN 606, Advanced Operations Research).

mathematics-electrical science option
EE 541, Electrical Circuits
EE 548, Circuits and Electronics
EE 645, Electrical Networks
EE 603, Electromagnetic Fields and Waves I
EE 757, Fundamentals of Communication Systems
EE 771, Linear Systems and Control
(note: EE 541 and 548 should be taken no later than the sophomore year)

mathematics-fluid dynamics option
ME 503, Thermodynamics
ME 508, Fluid Dynamics
ME 525, Mechanics I
ME 707, Analytical Fluid Dynamics
ME 708, Gas Dynamics

mathematics-mechanics option
ME 503, Thermodynamics
ME 525, Mechanics I
ME 526, Mechanics II
ME 527, Mechanics III
two additional courses (ME 723, Advanced Dynamics; ME 724, Vibration Theory and Applications; or ME 727, Advanced Mechanics of Solids)

mathematics-physics option
PHYS 407, 408, 505, and 506, General Physics I-IV
two additional courses (chosen from PHYS 602, Thermal Physics; PHYS 607, Optics; PHYS 616, Physical Mechanics; PHYS 701, Introduction to Quantum Mechanics I; PHYS 702, Introduction to Quantum Mechanics II; PHYS 703, Electricity and Magnetism I; and PHYS 704, Electricity and Magnetism II)

mathematics-statistics option
one course from the following: MATH 767, One-Dimensional Real Analysis; MATH 753, Numerical Methods and Computers I, or MATH 754, Numerical Methods and Computers II
five statistics courses: MATH 735, Probability, and MATH 736, Statistics; MATH 739, Linear Statistical Models; MATH 742, Applied Statistical Methods; and MATH 740, Experimental Design

mathematics-thermodynamics option
ME 503, Thermodynamics
ME 508, Fluid Dynamics
ME 525, Mechanics I
two additional courses (chosen from ME 701, Macroscopic Thermodynamics; ME 702, Statistical Thermodynamics; and ME 603, Heat Transfer)

Mechanical Engineering

(For descriptions of courses, see page 134.)

Mechanical engineering is a challenging profession encompassing research, design, development, and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and consumer and industrial products in general. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The mechanical engineering program develops the student's creative potential to meet the increasingly complex needs of industry, government, and education while giving an appreciation of the role of technology in a modern society.

The curriculum prepares prospective graduates either for more advanced studies or for beginning professional engineering careers. It provides a foundation of knowledge in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Students develop abilities in analysis, experimentation, and design. Elective courses allow students to gain additional competence in any of these specific areas. Other elective courses in the arts, humanities, and the social sciences are included to provide a liberal education.

Students, with their advisers' assistance, should plan a program based on the following distribution of courses that averages 16 credits per semester and totals not less than 128 credits. The outline that follows is to be considered as being typical only in format. Within the constraints of satisfying all of the requirements and having all the necessary prerequisites, schedules may vary because of scheduling needs or student preference. Some mechanical engineering elective courses may not be offered every year.

The curriculum has ten elective courses. These should be selected in consultation with a departmental adviser to lead to a balanced program that addresses chosen areas of interest. Six of the elective courses are selected from groups four through eight of the University's general education requirements, providing the mechanical engineer with a broad background in the social sciences and humanities. To ensure depth, at least one of the courses in group seven must be numbered 500 or above. One of the elective courses must be selected from the biological science listing of group three of the general education requirements.

To enter the junior-year courses in the mechanical engineering major, students must have a 2.00 grade-point average or higher in the following courses: PHYS 407, PHYS 408, ME 503, ME 525, and ME 526.

Freshman Year	Fall	Spring
ENGL 401, Freshman English	4	—
CHEM 405*, General Chemistry	—	4†
MATH 425, 426, Calculus I and II	4	4
PHYS 407-408, General Physics I and II	4	4
ME 441, Engineering Graphics	4†	—
ME 525, Mechanics I	—	3
ME 543, Microcomputer Lab	—	1
	16	16

Sophomore Year		
MATH 527, Differential Equations with Linear Algebra	4	—
MATH 528, Multidimensional Calculus	—	4
ME 526, 527, Mechanics II and III	3	3
ME 561, Introduction to Materials Science	3	—
ME 564, Materials II	—	3
ME 503, Thermodynamics	—	3
ME 545, Materials Laboratory	1†	—
ME 546, Mechanics Laboratory	—	1†
CS 410, Introductory Programming	2	—
CS 410F, Scientific Programming with FORTRAN	2	—
Elective	—	3–4
	15	17–18
Junior Year		
ME 508, Fluid Dynamics	3	—
ME 547, Thermal Science Laboratory	2	—
ME 603, Heat Transfer	—	3
ME 629, Kinematics and Dynamics of Machines	3	—
ME 643, Elements of Design	—	3
ME 648, Systems Modeling and Experimentation I	—	3
EE 535, Circuits and Signals	4	—
EE 536, Electronics and Electromagnetics	—	4
Electives (2)	3–4	3–4
	15–16	16–17
Senior Year		
ME 605, Thermal System Analysis and Design	3	—
ME 655, Design Process	2	—
ME 656, Senior Design Experience	3	—
ME 749, Systems Modeling and Experimentation II	3	—
Electives (7)	6–8	15–18
	17–19	15–18

*CHEM 403-404 may be required for students whose preparation in chemistry is inadequate.
†May be required in alternate semester to facilitate scheduling.*

Energy Option Many mechanical engineering graduates traditionally pursue professional careers in areas that are related to energy generation, conversion, or use. Increased emphasis on energy conservation and the development of alternative energy sources has created challenging and rewarding opportunities for graduates having a strong interest and capability in these fields. The Department of Mechanical Engineering offers a formal energy option intended to promote the development of well-planned student programs with special emphasis on courses applicable to career goals in energy-related industries. This program of four courses, open to mechanical engineering majors, emphasizes those subjects necessary for an understanding of the engineering aspects of energy systems and related problem areas. Students electing the energy option should do so during the first semester of the junior year and have their program approved by a department faculty member involved in the option. To have the energy option shown on transcripts, students should file appropriate forms with the dean's office during the first semester of the junior year.

Required Courses
ME 708, Gas Dynamics
ME 710, Solar Heating Systems
CHE 705, Natural and Synthetic Fossil Fuel
CHE 712, Introduction to Nuclear Engineering

Physics

(For descriptions of courses, see page 148.)

Physics is concerned with the properties of matter and the laws that describe its behavior. It is an exact science based on precise measurement, and its objective is the kind of understanding that leads to the formulation of mathematical relationships between measured quantities. As a fundamental science, its discoveries and laws are basic to understanding in nearly all areas of science and technology. Advances in such diverse fields as medical instrumentation, solid state electronics, and space research have relied heavily on the application of basic physical laws and principles.

Students interested in the study of physics at the University of New Hampshire will find a strong interaction between research and academic programs. Undergraduates have participated in research studies ranging from nuclear scattering experiments at major particle accelerators to astrophysical studies of the solar system using space probes. These experiences have proven beneficial to engineering and physics students alike. The department has its own library, which provides a comfortable, inviting atmosphere for study and relaxed reading.

The suggested programs that follow are indicative of the flexibility available to students, whether they are preparing for graduate work in physics, industrial opportunities, governmental research, secondary-level teaching, or a general education that might utilize the fundamental knowledge of physics.

The following undergraduate degree programs are offered through the Department of Physics. Interested students may consult with the department chairperson.

Bachelor of Science in Physics This degree is the professional program offered by the department. The required courses are those necessary for admission to graduate work or a career in industry. Additional courses may be beneficial for graduate preparation or may be desirable for more depth in certain areas of physics.

Requirements

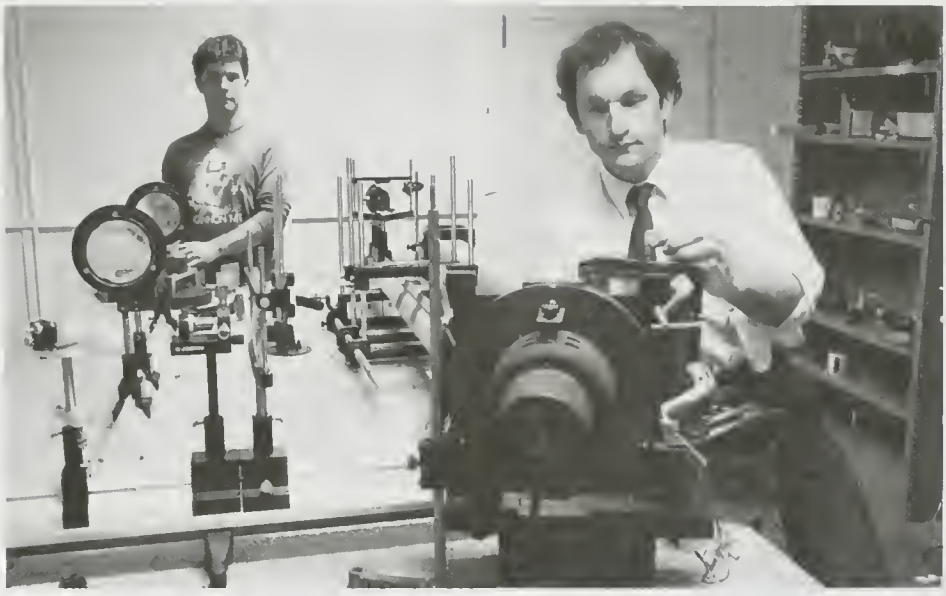
1. Satisfy general education requirements.
2. Satisfy bachelor of science requirements (page 46).
3. One course in English (chosen from group 8) is required in addition to the University requirement.
4. Minimum physics requirements: 407-408, 505-506, 615-616, 701, 703; 2 courses selected from 605, 606, 705, 706; and 2 courses selected from 602, 605, 606, 607, 702, 704, 705, and 706 (with not both from 605, 606, 705, 706).
5. Chemistry: 403-404 or 405.
6. Math: 425-426; 527; 528; 646; CS 410.
7. By the end of the spring semester of the sophomore year, a student must have a minimum grade of C in each 400- or 500-level course specifically required for the B.S. degree and an overall average of 2.33 in these courses in order to continue in the B.S. program.

Physics electives

Additional physics courses may be selected from the following: 791, Special Topics; 718, Introduction to Solid State Physics; 795, Independent Study; 710, Introduction to Modern Astrophysics.

Suggested Curriculum for B.S. in Physics Freshman Year	Fall	Spring
PHYS 407-408, General Physics I and II	4	4
MATH 425, 426, Calculus I and II (group 2)	4	4
CHEM 403-404, General Chemistry (group 3)	4	4
ENGL 401, Freshman English (group 1)	4	—
Elective (general education requirement)	—	4
	16	16
Sophomore Year		
PHYS 505-506, General Physics III and IV	4	4
MATH 527-528, Differential Equations with Multidimensional Calculus	4	4
CS 410, Introduction to Computer Programming	4	—
English (from group 8)	—	4
Elective (general education requirement)	4	4
	16	16

Junior Year		
PHYS 605-606, Experimental Physics I and II	4	4
PHYS 615, Intro. Mathematical Physics	3	—
PHYS 616, Physical Mechanics	—	3
PHYS 602, Thermal Physics	3	—
PHYS 701, Introduction to Quantum Mechanics I	—	4
MATH 646, Analysis for Applications	—	4
Elective (general education requirement)	4	—
Elective (free)	4	—
	18	15
Senior Year		
PHYS 703, Electricity and Magnetism I	4	—
PHYS 607, Optics	—	4
PHYS 705, Experimental Physics III	3	—
Physics elective	—	4
Electives (general education requirements)	4	4
Elective (free)	4	4
	15	16



Bachelor of Arts, Physics Major This degree provides an opportunity for a broad and liberal education, which in some cases may be sufficient for graduate work. A judicious choice of electives may also prepare students for interdisciplinary programs that require proficiency in a restricted area of physics.

Requirements

1. Satisfy general education requirements.
2. Satisfy bachelor of arts degree requirements (page 16).
3. PHYS 407-408, 505-506. Note that MATH 425, 426 and MATH 527-528 are prerequisites for some of the courses.
4. At least four additional courses in physics approved by the department (excluding PHYS 401-402 and PHYS 412). Three of these courses must be at the 600 level or above. A total of 32 credits is required.

Bachelor of Arts, Chemistry and Physics Teaching For information, see page 50.

School of Health Studies

Roger A. Ritvo, Dean
Phyllis A. Hoff, Associate Dean
Carole A. Pierce, Advising Coordinator

Department of Communication Disorders
Department of Family Studies
Department of Health Management and Policy
Department of Leisure Management and Tourism
Department of Medical Technology
Department of Nursing
Department of Occupational Therapy
Department of Physical Education

Bachelor of Science
Communication Disorders
Family and Consumer Studies
  Child and Family Studies
  Consumer Studies
Health Management and Policy
Leisure Management and Tourism
  Program Administration
  Therapeutic Recreation
  Tourism and Park Management
Medical Technology
Nursing
Occupational Therapy
Physical Education
  Athletic Training
  Exercise Specialist in Health Maintenance
  Outdoor Education
  Sports Communication
  Teacher Certification

The School of Health Studies, established in 1968, is one of the newest academic components of the University. It was created in response to the growing need for programs in higher education that prepare young men and women for health and health-related careers. Currently, the school offers undergraduate instruction leading to the bachelor of science degree in communication disorders, family and consumer studies, health management and policy, leisure management and tourism, medical technology, nursing, occupational therapy, physical education. Each program has been designed to enable students to acquire the basic knowledge and skills needed to practice their chosen professions and at the same time to obtain a broad cultural background in the humanities and social sciences.

Degree Requirements

Candidates for the B.S. degree must satisfy all general education requirements for graduation (page 14), earn at least 128 credits, successfully complete the courses required in one of the curricula described in this section, and achieve the required minimum grade-point average in the chosen curriculum. Generally, courses are to be completed in the sequence in which they are arranged.

Minors: See page 17; see also p. 19.
Dual-Degree Programs: See page 16.
Student-Designed Majors: See page 72.
Second Majors: See page 17.

Undeclared Major

A limited number of well-qualified freshmen who have expressed an interest in a health-related career but who are undecided about a specific major, may enter the School of Health Studies as undeclared students. Undeclared students should explore possible majors by taking courses listed below.

Required Courses
ENGL 401, Freshman English
PSYC 401, Introduction to Psychology
ZOOL 507-508, Human Anatomy and Physiology

Recommended Courses
CHEM 403-404, General Chemistry
COMM 520, Survey of Communication Disorders
FS 525, Human Development
HMP 401, U.S. Health Care Systems
LMT 455, Introduction to Recreation and Park Services
LMT 501, Leisure Services for the Handicapped
MEDT 401, Introduction to Medical Technology
NURS 405, Exploring Nursing
NUTR 475, Nutrition in Health and Disease
OT 510, Occupational Therapy Theory I
PHED 500, Perspectives in Physical Education
PHED 501, Adv. First Aid and Emergency Care
PHED 502, Basic Athletic Training
SOC 400, Introductory Sociology

Undeclared students should be prepared to declare a major by April when they preregister for the fall semester of the sophomore year.

Student Liability Insurance

All students whose programs require participation in clinical learning experiences must purchase and maintain liability insurance for the entire clinical experience. Proof of such insurance coverage must be furnished to the department before the clinical experience begins. The University has arranged for appropriate insurance coverage at a modest cost to students. Further information may be obtained at major department offices.

Programs of Study

Communication Disorders

(For descriptions of courses, see page 100.)

Communication disorders is the profession devoted to helping people overcome disabilities of speech, language, or hearing. The study of communication disorders may begin in the freshman or sophomore year. Students learn about speech, language, and hearing disorders in the classroom and then become involved in clinical practice, in the on-campus clinic. Students are encouraged to take elective courses in human development, learning theory, early childhood, health administration, special education, or various aspects of rehabilitation.

Students' professional education should be continued at colleges or universities offering graduate programs leading to a master's degree and to subsequent certification by the American Speech and Hearing Association. Certified clinicians find employment opportunities in hospitals, schools, community speech and hearing clinics, or private practice.

The required courses in communication disorders, which all students in the program must successfully complete, are 520, Survey of Communication Disorders; 521, Anatomy and Physiology of the Speech and Hearing Mechanism; 522, The Acquisition of Language; 523, Clinic Observation; 524, Applied Phonetics; 530, Technical Skills in Speech Pathology; 631, Speech Pathology I; 632, Speech Pathology II; 634, Intro. to Clinical Procedures; 635, Clinical Practicum in Speech Pathology; 704, Basic Audiology; 705, Introduction to Auditory Perception and Aural Rehabilitation; and 777, Speech and Hearing Science. Students must also complete a course in statistics. Other elective courses are available.

Students interested in this program should consult with the chairperson, Frederick C. Lewis.

Family Studies

(For descriptions of courses, see page 117.)

The Department of Family Studies offers specialized programs of study for students desiring professional careers emphasizing family advocacy. Students may choose from five program concentrations (described below) under two broad options (child and family studies, consumer studies). Each concentration and option has entry-level criteria and unique course requirements. All require close consultation with a faculty adviser.

Family Studies Students desiring to work in settings providing services to children and/or families construct an

individual plan of studies in this concentration congruent with their specific professional goals.

Consumer Studies Students desiring careers as consumer affairs professionals in business or governmental agencies consult with their adviser to design an individualized plan of studies in this option to meet their career objectives.

Child Studies This concentration has been approved by the New Hampshire State Board of Education to prepare students for certification as nursery/kindergarten teachers. Students must apply to the department for this program by spring semester of their junior year.

Family Internship This concentration allows senior majors an opportunity to work in a community agency providing direct services to families. Interns will apply knowledge gained from their academic studies in a supervised environment. Students who have completed appropriate background courses must apply for internships during fall semester of their senior year.

The child studies and family internship concentrations are highly structured and have limited enrollments. Acceptance to these programs is restricted to students demonstrating exceptional potential for working with children and families.

Home Economics Education Students interested in certification for teaching home economics at the secondary level are encouraged to apply through the Department of Education for the fifth-year program. (See page 25.)

All FS students must complete University and college requirements for a bachelor of science degree. Departmental requirements include a minimum of nine FS courses (36 credits). In addition, students are required to take a minimum of seven approved courses (28 credits) in related fields, selected in consultation with their advisers. These courses and electives help students fulfill specific career objectives in their areas of professional specialization.

The department offers a minor to interested students in related majors. Students desiring further information are advised to consult with the departmental administrative assistant as early as possible.

Health Management and Policy

(For descriptions of courses, see page 123.)

Students in the health management and policy program are prepared to embark upon management careers in hospitals and health care agencies. Graduates work in various settings, such as medical centers, hospitals, long-term care facilities, health maintenance organizations, community mental health centers, insurance companies, home health agencies, and regulatory agencies.

The academic program is interdisciplinary, with undergraduates taking courses in many academic units of the University. Students gain a broad view of health and develop analytical skills in health care management. The department's computer laboratory is integrated with the curriculum.

The department is an approved full member of the Association of University Programs in Health Administration (AUPHA).

Premedical and Predental Education Students interested in careers in medicine and dentistry can complete required courses (see page 73) as electives while completing this major. Students selecting this approach must devote the summer between their junior and senior years to a full-time field practicum.

Academic Program Competencies are achieved through three components of the curriculum: University general education requirements, core area, and collateral studies. Students must work closely with their assigned advisers to develop a plan of study for each of these components.

General University Requirements: Advisers can assist students in selecting courses that will satisfy certain program expectations and simultaneously meet University general education requirements.

Core Area: Students will enroll in (1) introductory courses: HMP 401, U.S. Health Care Systems and HMP 501, Epidemiology and Community Medicine; and (2) upper-division courses: HMP 721, Hospital and Health Services Administration; HMP 723, Health Planning; HMP 740, Management Accounting for Health Care Organizations; HMP 741, Quantitative Methods for Health Care Organizations; HMP 742, Strategic Management for Health Care Organizations; HMP 744, Ethical Issues in Health Management and Medicine; and HMP 746, Health Policy.

Practicum: The sixteen-week field practicum, an essential part of the academic program, integrates classwork with a supervised work experience and allows students to explore an area of special interest in depth. Courses include HMP 621, Prepracticum Seminar; and HMP 622, Field Practicum. Field practicum sites are selected by faculty and are concentrated in central and northern New England.

Collateral Area: A basic understanding is expected in the following areas: economics, mathematics, organizational behavior, accounting, and statistics. Advisers will work with students to select appropriate courses.

Program Review: The faculty reviews student performances during the semester before the practicum to determine each student's readiness.

Academic Minor in Health Management and Policy An integrated minor is available to students majoring in communication disorders, nursing, medical technology, occupational therapy, therapeutic recreation, and social work.

Leisure Management and Tourism

(For descriptions of courses, see page 131.)

The effective use of leisure opportunities and individual resources is one of the most challenging opportunities and responsibilities for an individual and society in the coming decade.

Tourism is rated the first or second industry in many states; one in every fifteen Americans works in a job related to leisure. Both population and economic projections suggest that tourism and leisure service industries will continue to expand and thereby provide numerous professional career opportunities.

The professional preparation of students centers on three options of study: program administration, therapeutic recreation, and tourism and park management. Depending on the option selected, students focus on the organization, planning, development, and management of leisure services and resources within a variety of settings.

Internal transfer students must have a minimum 2.33 cumulative grade-point average for admission to the major. Students within the major are required to maintain a minimum 2.33 cumulative grade-point average. In addition, to graduate, students must obtain a minimum grade of C (2.00) in all courses specifically required by the department.

The department has been awarded national NRPA/AALR accreditation as a professional preparation program.

Core Courses All majors must complete a core curriculum of six courses: LMT 455,

Introduction to Recreation and Park Services; LMT 501, Leisure Services for the Handicapped; LMT 557, Leisure Service Program Design; LMT 663, Recreation and Park Administration; LMT 772, Law of Recreation Resources and Leisure Services; LMT 794, Measurement and Evaluation in Recreation.

The internship (LMT 664), required of all majors, is an eight-credit module completed during the summer between the student's junior and senior year. It is designed to bridge the gap between theory and practical application. Students working with their advisers and the internship coordinator select an appropriate setting, based on their professional and career interests. They must complete a minimum of 480 hours of supervised field study within twelve weeks. Specific requirements are identified in the Internship Manual available from the leisure management and tourism office.

Cognate Area Students are required to work with their advisers to identify five courses that will support an area of professional interest.

Program Administration Option This option prepares students for supervisory positions and emphasizes program planning, marketing, implementation competencies, and administrative concepts. Community recreation departments, YM/YWCAs, youth-serving agencies, health clubs, senior citizen centers, outdoor recreation centers, and resorts are examples of settings in which students may expect to find employment.

In addition to the required core courses, students complete the following departmental requirements: LMT 554, Recreation Business Management; LMT 558, Program Supervision and Leadership; LMT 665, Information Retrieval and Communication in Leisure Services; LMT 664A, Internship in Program Administration.

The required University courses are ENGL 401, Freshman English, or ENGL 501, Introduction to Prose Writing; CMN 500, Public Speaking; INCO 491, Computer Literacy or approved equivalent; SOC 502, Statistics; PSYC 401, Introduction to Psychology; FS 525, Human Development; ADMN 580, Introduction to Organizational Behavior; PHED 501, Advanced First Aid and Emergency Care.

Therapeutic Recreation Option This option prepares students to work primarily in clinical facilities such as hospitals, rehabilitation centers, state institutions, mental health centers, and extended care facilities to focus on therapeutic recreation services while achieving overall treatment goals. The program of study is designed to help students meet requirements for the National Council for Therapeutic Recreation Certification.

In addition to the required core courses, students complete the following departmental requirements: LMT 502, Introduction to Therapeutic Recreation; LMT 603, Principles of Therapeutic Recreation; LMT 604, Clinical Aspects & Techniques in Therapeutic Recreation; LMT 664B, Internship in Therapeutic Recreation.

The required University courses are ENGL 401, Freshman English or ENGL 501, Introduction to Prose Writing; CMN 500, Public Speaking; INCO 491, Computer Literacy or approved equivalent; PSYC 401, Introduction to Psychology; PSYC 402, Statistics in Psychology; ZOOL 507-508, Human Anatomy and Physiology; PHED 652, Clinical Kinesiology.

Tourism and Park Management Option This option stresses the business, natural, and human resource elements of private and public recreation planning and management. Within the option, a student may emphasize specific aspects of park resources (such as planning, interpretive services, and wilderness management) or concentrate in a particular area of tourism business management (such as marketing, attraction management, operations, and tourism planning).

In addition to the required core courses, students complete the following departmental requirements: LMT 554, Recreation Business Management; LMT 661, Introduction to Tourism Management; LMT 667, Tourism and Park Planning; LMT 766, Impacts of Tourism; LMT 664C, Internship in Tourism and Park Management; LMT 711, Recreation Resource Management.

The required University courses are ENGL 401, Freshman English or ENGL 501, Introduction to Prose Writing; CMN 500, Public Speaking; SOC 502, Statistics; RECO 411, Resource Economics Perspectives; ADMN 550, Survey of Marketing; ADMN 580, Introduction to Organizational Behavior.

Leisure and Recreation Study in Scotland A ten-week program sponsored by the American Universities International Program is held each year during the spring semester at the University of Edinburgh, Scotland. Registration is limited. Approval by the curriculum director is required one year before departure. Eleven credits can be granted.

Medical Technology

(For descriptions of courses, see page 136.)

Medical technology is a challenging and rewarding profession for students interested in laboratory medicine. Medical technologists are vital members of the health team who perform various medical laboratory tests and provide the diagnostic assistance required in modern patient care. Medical technologists are employed in hospitals, research, industry, education, and a variety of other health care settings.

Students entering the program spend their freshman, sophomore, and junior years on campus. During the spring semester of the senior year, students spend twenty-six weeks at Mary Hitchcock Memorial Hospital in Hanover, New Hampshire, where they complete clinical courses MEDT 751–754. Upon successful completion of the program, students are awarded a B.S. degree and are eligible to take a national certification examination.

Academic requirements are as follows: students must obtain a grade of C- or better in MICR 503, CHEM 545-546, BCHM 656, CHEM 517-518, MICR 705, and MICR 602. A minimum grade of C is required in all medical technology courses.

Evaluation of a student's academic performance and personal interviews with the clinical faculty are required. These interviews evaluate a student's understanding of the profession, communication skills, supervisory potential, maturity, and self-confidence. Students must demonstrate these attributes to participate in the clinical courses.

Students interested in this program should consult the chairperson, Karol LaCroix.

Career Mobility Option This option is designed to make the B.S. degree in medical technology available to certified laboratory assistants, medical laboratory technicians, military trained laboratory personnel, and other individuals with at least two years of full-time recent experience in the clinical laboratory. This may be done on a full- or part-time basis by taking prerequisite courses at UNH or other accredited institutions throughout the state. Students have the opportunity to challenge clinical course requirements through credit by examination. Written and practical examinations are available in the areas of chemistry, hematology, urinalysis, microbiology, immunohematology, and immunology. Students interested in the option should contact the chairperson of the medical technology program.

Freshman Year	Fall	Spring
MEDT 401, Introduction to Medical Technology	—	0
ZOOL 507-508, Human Anatomy and Physiology	4	4
CHEM 403-404, General Chemistry	4	4
ENGL 401, Freshman English	4	—
Electives (3)	4	8
	16	16
Sophomore Year		
CHEM 545-546, Organic Chemistry	5	—
MICR 503, General Microbiology	5	—
MICR 602, Pathogenic Microbiology	—	5
BCHM 656, Physiological Chemistry and Nutrition	—	4
MATH 536, Intro. Stat. Inference	4	—
Electives (2–3)	4	4–8
	18	13
Junior Year		
MEDT 652, Clinical Hematology	4	or 4
MEDT 654, Clinical Chemistry	—	4
MICR 705, Immunology	4	—
MEDT 720, Clinical Mycology/Parasitology	4	or 4
Electives (3)	4–8	4–8
DCE 491, Intro. to Computer Information Studies I	—	2
	16	18
Senior Year*		
MEDT 653, Clinical Immunohematology	4	—
CHEM 517-518, Quantitative Analysis	5	—
MEDT 600, Pathophysiology	4	—
MEDT 610, Lab Management	4	—
MEDT 751, Advanced Clinical Microbiology	—	4
MEDT 752, Advanced Hematology	—	4
MEDT 753, Advanced Immunohematology	—	4
MEDT 754, Advanced Clinical Chemistry	—	4
	17	16

**Students will spend the spring semester at Mary Hitchcock School of Medical Technology in Hanover, New Hampshire.*

Nursing

(For descriptions of courses, see page 140.)

The nursing curriculum is accredited by the National League for Nursing. The philosophy of the program emphasizes the uniqueness of each individual.

The goal of the nursing curriculum is to assist students in the development of knowledge and skills essential to the practice of nursing today and in the future. Graduates of the program are prepared to provide care to individuals and groups, to help clients identify and meet their health care needs, to be effective colleagues on the health care team, and to shape the future of health care.

The curriculum is divided into two major areas. The first focuses on liberal arts, humanities, and biological and social sciences as a foundation for courses in the major. The second, nursing courses, emphasizes critical thinking, problem solving, decision making, technical skills development, and caring. Clinical experiences are offered in area hospitals and community health agencies. The senior year culminates in the senior practicum. This unique course allows the student to select, with faculty approval, a clinical practice of special interest in the health care setting of the student's choice.

The faculty of the nursing program believe learning is a creative process wherein students are active participants in their education, growth, and development as professional nurses. Faculty members are facilitators and mentors to students within a supportive yet scholarly environment.

Students must successfully complete the following prerequisite courses before entering the second nursing course in spring semester, sophomore year: ENGL 401, ZOOL 507-508, PSYC 401, SOC 400, and NURS 405. Before entering junior year, students must successfully complete BCHM 501, MICR 501, FS 525, NUTR 475, and statistics. Most of the prerequisite courses also meet general education requirements. All students are required to achieve a minimum grade of C in each prerequisite course. Prerequisite courses may be repeated only once. A cumulative grade-point average of 2.33 must be attained before entering junior year and must be maintained throughout junior and senior years. Students must achieve a minimum grade of C in all major courses in order to complete the program.

Students are responsible for their own transportation to clinical agencies, for the purchase of uniforms and professional equipment, for liability and health insurance coverage, and for selected immunizations. Additional costs associated with the program include laboratory fees each semester beginning in sophomore year and fees associated with attendance at professional meetings. Students must be certified in cardiopulmonary resuscitation before second semester, sophomore year.

R.N. Baccalaureate Program Registered nurses with a valid New Hampshire license may pursue a bachelor of science degree with a major in nursing. Students may enroll on a full- or part-time basis.

All students must successfully complete prerequisite courses before entering the nursing component. Curriculum requirements may be met through transfer credits, course enrollments, and challenge examinations.

The nursing component is based on the belief that R.N. students enter the program with knowledge and competence gained through previous educational and work experiences. This knowledge and competence can be demonstrated through successful completion of baccalaureate-level nursing theory and clinical examinations. Individualized plans of study are developed to enable successful completion of nursing content.

The R.N. student must earn a minimum of 128 credits and a minimum UNH grade-point average of 2.33 for completion of the program.

Students interested in this program should consult with the chairperson, Karen R. Johnson.

Freshman Year	Fall	Spring
ENGL 401, Freshman English	4	—
PSYC 401, Intro. to Psychology	—	4
ZOOL 507-508, Human Anatomy & Physiology	4	4
SOC 400, Introd. Sociology	—	4
NUTR 475, Nutrition in Health & Disease	4	—
Electives (2)	4	4
	16	16
Sophomore Year		
BCHM 501, Biological Chemistry	4	—
MICR 501, Public Health Microbiology	4	—
NURS 405, Exploring Nursing	4	—
FS 525, Human Development	—	4
NURS 510, Foundations of Nursing Practice	—	4
Statistics	—	4
Electives (2)	4	4
	16	16
Junior Year		
Core courses		
NURS 601, Nursing I	4	—
NURS 610, Nursing II	—	4
Modular courses*	8	8
NURS 601C, Nursing of Adults I		
NURS 601D, Nursing of Children		
NURS 601E, Nursing of the Childbearing Family		
NURS 610C+, Nursing of Adults II		
NURS 610D+, Nursing in the Community		
NURS 610E+, Nursing in Mental Health		
Electives (2)	4	4
	16	16

Senior Year		
Core courses		
NURS 621, Nursing III	4	—
NURS 629, Nursing Research	—	2
NURS 630, Nursing Leadership	—	2
Modular courses*	8	8
NURS 610C, Nursing of Adults II		
NURS 610D, Nursing in the Community		
NURS 610E, Nursing in Mental Health		
NURS 621C, Nursing of Adults III		
NURS 630C, Senior Practicum		
Electives (2)	4	4
	16	16

Each student will be assigned two 4-credit modules per semester.
†All NURS 610 modules not completed in the junior year must be taken in the senior year.

Occupational Therapy

(For descriptions of courses, see page 142.)

The curriculum is accredited by the Committee on Allied Health Education and Accreditation/American Medical Association in cooperation with the Accreditation Committee of the American Occupational Therapy Association. The program includes three major areas: liberal arts, sciences, and humanities; biological, behavioral, and health sciences; and occupational therapy theory and practice—human performance, activity processes, and the application of occupational therapy theory to practice. Occupational therapy practice is directed toward enabling or restoring individual capacity for functional independence and adaptation in the context of clients' environments. Observation and guided practice in local clinical sites are an integral part of some courses.

Following completion of the four-year academic program, students are placed in three, three-month full-time fieldwork experiences. Successful completion of these three placements qualifies students to sit for the Occupational Therapy Certification Examination administered by the American Occupational Therapy Certification Board.

To continue in the major, students must meet the following criteria:

1. By the end of spring semester, freshman year, the student must have
   a) a 2.33 cumulative grade-point average in required courses (ENGL 401, PSYC 401, OT 500, ZOOL 507-508, and sociology choice);
   b) a minimum grade of C in ZOOL 507, ZOOL 508, and OT 510;
   c) completed one Level I Fieldwork experience before the sophomore year.

2. By the end of fall semester, sophomore year, the student must have a minimum of C (2.00) in OT 511, OT 581, and OT 600.

3. By the end of spring semester, sophomore year, the student must have
   a) a 2.33 cumulative grade-point average in courses required for the major;
   b) a minimum grade of C (2.00) in OT 514 and PHED 652.

4. By the end of spring semester, junior year, the student must have a 2.33 cumulative grade-point average in courses required for the major and have completed two OT 588-Level I Fieldwork experiences.

5. To qualify for graduation, the student must have
   a) a 2.33 cumulative grade-point average in courses required by the major, with the exception of the course in statistics;
   b) a minimum grade of C (2.00) in PHED 706, OT 582, 583, 624, 633, 634, and 693 (these may be repeated only once).

Courses required for the major are those specified in the following list with the exception of electives. Curriculum review and revision is undertaken annually; students are expected to check with their departmental advisers in September for updated policies and requirements. Students are responsible for transportation to off-campus clinical and other learning experiences and must purchase personal liability insurance for coverage for the clinical components of the curriculum.

Freshman Year	Fall	Spring
ENGL 401, Freshman English	4	—
PSYC 401, Intro. to Psychology	4	—
OT 500, The Behavior and Development of Children	—	4
ZOOL 507-508, Human Anatomy and Physiology	4	4
OT 510, Occupational Therapy Theory I	—	4
OT 588, Level I Fieldwork: One-Week Experience	—	0
Elective	4	—
Any sociology course except SOC 502	—	4
	16	16
Sophomore Year		
OT 511, Intro. to Professional Literature and Communication	4	—
OT 514, Meaning of Human Occupation	—	4
OT 600, Developmental Tasks of Adulthood	4	—
Any psychology course except PSYC 401 or 402	4	—
PHED 652, Clinical Kinesiology	—	4
OT 581, Medical Concepts for Occupational Therapists	4	—
Electives (2)	—	8
	16	16
Junior Year		
PHED 706, Neurology	4	—
OT 582, Occupational Therapy Theory II: Rehabilitation Techniques	—	4
OT 583, Occupational Therapy: Psychiatric Foundations	4	—
OT 693, Neurodevelopmental Evaluation and Treatment	—	4
One statistics course (SOC 502, PSYC 402, PHED 668, MATH 536, RECO 701, RECO 528, or EDUC 785)	4	—
Electives	4	8
OT 588, Level I Fieldwork: One-Week Experience	—	1
	16	17
Senior Year		
OT 624, Occupational Therapy Treatment of Psychosocial Dysfunction	4	—
OT 633, Treatment in Adult Neurodysfunction	4	—
OT 634, Systems of Therapeutic Intervention in Physical Disabilities	—	4
OT 623, Group Process	2	—
OT 697, Transitions: Student to Professional	—	4
Electives	6	8
	16	16

Level II Fieldwork Experiences
OT 711 or Psychosocial Dysfunction Fieldwork
OT 712 or Physical Dysfunction Fieldwork
OT 713, Special Area Field Work

Upon completion of the prerequisite courses, students are scheduled for a minimum of nine months' supervised clinical fieldwork placements. These Level II Fieldwork experiences are scheduled in centers that have established educational programs and are approved by the department. The fieldwork experiences are divided into three-month periods as follows: OT 711, Psychosocial Dysfunction; OT 712, Physical Dysfunction; OT 713, Special Area. A physical examination including a tuberculin test is required before fieldwork experiences. Proof of poliomyelitis immunization is also required. Students are required to purchase liability insurance and health insurance for their off-campus Level II Fieldwork experiences. Level II Fieldwork is the fifth year of preparation for entry to the field. A fee is charged for the coordination of Fieldwork.

Eligible graduates apply for the July or January national certification examina-

tion through the department. A $150 fee is currently charged for the Occupational Therapy Certification Examination.

Students must be aware that curriculum revisions are continually considered; information will be available during new-student summer orientation and during the first week of classes.

Students interested in this program should consult the chairperson, Barbara Sussenberger.

Physical Education

(For descriptions of courses, see page 145.)

Physical education is a dynamic profession, keeping pace with society's burgeoning passion for physical activity. The mission of the Department of Physical Education is to generate, transmit, and apply knowledge about the role of physical activity (including exercise, movement, outdoor adventure, and sport) in the advancement of health in society. The department has several teaching, research, and service functions that support this mission, including the preparation of professionals in the five options described below. While options vary in emphasis, each curriculum offers students fundamental knowledge in the following areas: the biological, psychological, and sociocultural foundations and consequences of physical activity; the pedagogy and rehabilitative aspects of physical activity; the management and marketing of delivery systems in the field. Each option makes extensive use of field experiences and internships that blend theory with practice.

The department offers five areas of study for majors: (1) athletic training; (2) exercise specialist in health maintenance; (3) outdoor education; (4) sports communication; and (5) teacher certification. Openings in options 1, 2, 3, and 4 are limited. The department is reviewing the curriculum in the following options: athletic training and teacher certification. There may be substantive course changes in effect by September, 1989. All students should check with the Department of Physical Education office in New Hampshire Hall for such changes.

Students who wish to minor in physical education must complete 20 credits of coursework that have been approved by a department minor adviser. No more than 6 of the 20 credits may be earned through activity or coaching courses.

Students interested in majoring or minoring in physical education should consult with the chairperson, Stephen Hardy, or the assistant chairperson, Katherine Amsden.

Athletic Training Option This option prepares individuals for careers as athletic trainers. In addition to the courses listed below, work as a student trainer will be available to the student. Eligibility for the national certification examination requires 1,800 hours of practical work. (This will change to 1,500 hours in 1989.) PHED 703 provides 600 hours. Students must earn a grade of B (3.00) or better in PHED 502 and PHED 503, and a grade of C (2.00) or better in all other required PHED courses. Students may elect to complete both the athletic training and the teacher certification options, which will normally require four and one-half to five years. Interested students may consult with the option adviser, Daniel Sedory.

Physical Education Required Courses	
PHED 501, Advanced First Aid and Emergency Care	2
PHED 502, Basic Athletic Training	4
PHED 503, Athletic Training Applied Techniques	2
PHED 610, Adapted Physical Education	4
PHED 620, Physiology of Exercise	4
PHED 652, Clinical Kinesiology	4
PHED 702, Advanced Athletic Training	4
PHED 703, Laboratory Practice in Athletic Training	8
PHED 706, Neurology	4
PHED 780, Psychological Factors in Sport	4
PHED activity courses PHED 470 (1 cr.); PHED 475 (1 cr.); an individual sport (0.5 cr.); a team sport (0.5 cr.); a coaching course (2 cr.)	5
University Required Courses	
NUTR 475, Nutrition in Health and Disease	4
PSYC 401, Introduction to Psychology	4
ZOOL 507-508, Human Anatomy and Physiology	8
Recommended Courses	
CHEM 401-402, Introduction to Chemistry	8
PHYS 401, Introduction to Physics I	4
OT 581, Medical Concepts for Occupational Therapists	4

Exercise Specialist in Health Maintenance Option This curriculum prepares individuals for career opportunities in adult fitness programs in communities, health agencies, and industry. Exercise specialists work in physical activity programs of prevention, intervention, and cardiac rehabilitation. Students with a particular interest in corporate health and fitness may wish to elect one or more of the following: ADMN 517, Survey of Basic Accounting; ADMN 580, Introduction to Organizational Behavior; ECON 402, Principles of Economics (Micro). Students must earn a grade of C (2.00) or better in every required course. All required courses must be completed before enrolling in PHED 650. Interested students may consult with the option adviser, Robert Kertzer.

Physical Education Required Courses	
PHED activities (475 and either 447 or 520)	6
PHED 501, Advanced First Aid and Emergency Care	2
PHED 502, Basic Athletic Training	4
PHED 620, Physiology of Exercise	4
PHED 621, Exercise Laboratory Techniques	3
PHED 650, Exercise Specialist Internship	8
PHED 652, Clinical Kinesiology	4
PHED 668, Measurement Procedures in Physical Education	4
PHED 722, Graded Exercise Testing and Exercise Prescription	4
PHED 732, Electrocardiography	4
University Required Courses	
ADMN 550, Survey of Marketing	4
BCHM 501, Biological Chemistry	4
CHEM 403-404, General Chemistry	8
CS 406, Introduction to Computing, or	4
INCO 491, Computer Literacy	2
NUTR 475, Nutrition in Health and Disease	4
PSYC 401, Introduction to Psychology	4
ZOOL 507-508, Human Anatomy and Physiology	8

Outdoor Education Option The outdoor education option prepares individuals for careers working with diverse populations in public and private schools, organizations, and agencies. The techniques and approaches of adventure education represent the underlying philosophy of the curriculum. The option is interdisciplinary in scope, uses the various natural resources in the seacoast and mountain area, and gives students ample opportunity for practical application and field experience. Students must earn a grade of C (2.00) or better in every required course. Students seeking teacher certification should enroll in the teacher certification option and select additional appropriate courses in outdoor education. Interested students may consult with the option adviser, Michael Gass.

Physical Education Required Courses	
PHED activities (400–499, 533) Six outdoor education activities from recommended list (credits depend upon choices elected)	4–9
PHED 550, Outdoor Education Philosophy and Methods	4
PHED 681, Theory of Adventure Education	4
PHED 682, Outdoor Leadership (2 credits taken twice)	4

PHED 683, Organization & Administration of Outdoor Education	4
PHED 685, Emergency Medical Care: Principles and Practices	4
PHED 693C, Teaching Assistantship in Outdoor Education	2
PHED 694A, Internship in Outdoor Education	2–4
University Required Courses	
EDUC 703, Alternative Teaching Models	2–4
ENGL 501, Introduction to Prose Writing	4
PSYC 401, Introduction to Psychology	4
Other: Core of courses emphasizing the particular area or population in outdoor education of interest to student —e.g., business, education, psychology—selected with assistance of an adviser.	16

Sports Communication Option The sports communication option combines substantive knowledge in sports with skills in mass communication, including sportswriting and sportscasting. A grade of B (3.00) or better is required in ENGL 501 to continue in this option, and students must earn a grade of C (2.00) or better in each required PHED course. An internship experience is required for all students. Interested students may consult with the option adviser, Joyce Mills.

Physical Education Required Courses	
PHED activities	4
PHED coaching courses	6
PHED 561, History of American Sport & Physical Culture	4
PHED 635, Sport in Literature	4
PHED 636, Introduction to Sports Information	2
PHED 668, Measurement Procedures in Physical Education	4
PHED 741, Sport in Society	4
PHED 780, Psychological Factors in Sport	4
University Required Courses	
ENGL 501, Introduction to Prose Writing	4
ENGL 621, Newswriting	4
PSYC 401, Introduction to Psychology	4
SOC 400, Introductory Sociology	4
CMN 402, Communication and Social Order	4
CMN 500, Public Speaking	4
INCO 491, Computer Literacy	2
One of the Following Groups of Courses	
1) (three courses)	
ENGL 711, Editing	4
CMN Electives (2 communication courses)	8
2) (three courses)	
CMN 455, Introduction to Mass Communication	4
ENGL Elective (a writing course)	4
one of the following:	
CMN 556, Introduction to Television Production	4
CMN 580, Broadcast News Preparation/Delivery	4
THEA 549, Voice and Diction I	2
ARTS 551, Photography	4
One of the Following Courses	
ENGL 720, Newspaper Internship	4–16
THEA 691, Laboratory or Field Experience	4
PHED 694C, Internship	2–4

Teacher Certification Option The teacher certification option provides a specialized professional background and a broad general education. Students may pursue coursework to prepare as generalists (all grade levels) or as either elementary or secondary specialists in physical education. In addition to the above, students may elect to complete a second option in athletic training. Students interested in outdoor education within the teaching field should elect appropriate outdoor education courses. A cumulative grade-point average of 2.20 and a grade-point average of 2.50 in all physical education courses is required to be eligible for student teaching. If a student's cumulative grade-point average in physical education theory courses is less than 2.50 during any three semesters, the department will recommend to the dean of the School of Health Studies that the student be excluded from continuing in the teacher certification option.

Interested students may consult with the option adviser, Sally White.

Physical Education Required Courses	**Credits**
PHED 470–479; 484–492, Physical Education Activities (for men and women)	9.5
and one of the following: PHED 447, 520, 533	1–2
PHED 482, Physical Education Activity (for men)	0.5
PHED 486, Physical Education Activity (for women)	0.5
One from the following: PHED 415, 416, 427, 433, 434, 435, 437, 438, 439, 453, 533	0.5–1.0
One course from the following: PHED 411, 412, 414, 417, 420, 421, 422, 423, 424, 432	0.5
PHED 500, Perspectives in Physical Education	4
PHED 501, Advanced First Aid & Emergency Care	2
PHED 610, Adapted Physical Education	4
PHED 620, Physiology of Exercise	4
PHED 625, Dynamics of Human Movement	4
PHED 668, Measurement Procedures in Physical Education	4
PHED 775, Perceptual Motor Learning	4
One of the following:	
PHED 563, The Theory of Teaching Physical Education in the Secondary School	4
PHED 692, Theories of Teaching Physical Education in the Elementary School	4
Education Required Courses	
EDUC 500, Exploring Teaching	4
EDUC 700, Educational Structure and Change	2
EDUC 701, Human Development and Learning: Educational Psychology	4
EDUC 705, Alternative Perspectives on the Nature of Education	4
EDUC 707, Teaching Reading through the Content Areas	2
EDUC 694, Supervised Teaching of Physical Education	8
University Required Courses	
PSYC 401, Introduction to Psychology	4
ZOOL 507-508, Human Anatomy and Physiology	8

Whittemore School of Business and Economics

Kenneth J. Rothwell, Interim Dean
Robin D. Willits, Associate Dean
George T. Abraham, Associate Dean for Graduate Program Services
Wayne M. Burton, Assistant Dean for Administration
Jo-Ann Kelly, Director of Advising
Cari Moorhead, Academic Counselor

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

The Whittemore School of Business and Economics was established July 1, 1962, through the efforts of the late Laurence F. Whittemore, noted industrialist and long-time trustee and chairman (1955–60) of the UNH Board of Trustees. Since 1969, the school has been housed in McConnell Hall, named for Dr. John W. McConnell, the fourteenth president of the University (1963–71).

The basic intent of the Whittemore School's undergraduate curricula is to combine a breadth of liberal education with specifics of professional training in administration, economics, and hotel administration. Undergraduates enrolled in the Whittemore School programs must take a substantial part of their coursework in other colleges in the University in order to fulfill the general education requirements. Beyond those requirements, students are encouraged to elect additional courses in the arts, the behavioral and social sciences, the humanities, mathematics, and the natural sciences. Thus, students who complete the Whittemore School programs in administration, economics, and hotel administration are prepared for employment and graduate study in both these and adjacent fields.

A minor is offered in economics. Within the limits of its resources, the Whittemore School also intends to serve the needs of undergraduates elsewhere in the University for whom selected courses in administration, economics, or hotel administration are desirable complements to their primary course of study. To the extent that space is available after majors have enrolled, some Whittemore School courses are open to nonmajors who have the prerequisite preparation.

Degree Requirements

The Whittemore School offers a bachelor of arts degree program in economics and bachelor of science degree programs in administration and hotel administration. Candidates for a degree must satisfy all of the University general education requirements for graduation as well as the particular requirements of their individual major programs. In addition, candidates must meet a computer literacy requirement and show proficiency in writing. Economics majors must also satisfy specific requirements associated with the bachelor of arts degree. (See page 16.) No Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

Modifications tend to occur in major programs during the four-year period of a student's undergraduate career. Students are expected to conform to these changes insofar as they do not represent substantive alterations in their courses of study.

For information concerning advanced degrees, see the Graduate School catalog.

Advising System

Undergraduate advising in the Whittemore School is carried out jointly by academic counselors and the faculty. The academic counselors are based in the Whittemore School Advising Center, where student academic records are kept. The counselors assist students in program planning, preregistration, understanding and meeting general academic requirements, and general academic and career decision making. The faculty draw on their own experience, expertise, and interests in helping students with course, program, and career selection.

Undergraduates are encouraged to develop an advisory relationship with one or more faculty members with whom they have mutual interests. All students are urged to seek as much assistance as they need, from whatever source, but are reminded that theirs is the ultimate responsibility for knowing and meeting the various academic requirements for a degree.

Independent Study/Internship

Juniors or seniors in the Whittemore School may elect the internship or independent study options for variable credit. For either option, the student must secure a faculty sponsor in the area of interest and submit a written proposal prior to the start of the semester in which the project is to be undertaken. Independent study normally involves research, while internships are usually undertaken with cooperation of an off-campus organization and involve a nonroutine but practical application of skills and concepts acquired in a student's program.

Independent studies and internships require considerable self-direction and self-monitoring on the part of the student, who must be in high academic standing. Careful prior review of requirements with the undergraduate adviser is necessary.

The Washington internship, a semester of supervised work experience in Washington, D.C., is open to any major. See page 157.

International and Exchange Programs

The Whittemore School encourages qualified students to participate in programs of international work and study. Most recently, the Whittemore School began a new international marketing program with the University of Grenoble in the French Alps. Students may also elect to take a dual major in international affairs, offered in conjunction with the program for international perspectives (see page 72).

In addition, the University offers a wide selection of foreign study programs in such countries as England, France, Italy, Spain, Germany, and the Soviet Union, to mention a few. Exchange programs with San Diego State University and the University of California at Santa Cruz are also available.

Information on the Grenoble program is available in the advising center, Room 120, McConnell Hall. Information on all other programs can be obtained from the sponsoring department or the Center for International Perspectives.

Five-Year Programs: B.A.-M.B.A., B.S.-M.B.A.

The Whittemore School and the College of Engineering and Physical Sciences offer a joint program leading to a bachelor of science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a master of business administration (M.B.A.) in five years rather than the normal six. Similarly, with the College of Liberal Arts, the Whittemore School offers a joint program leading to a B.A. in French, history, philosophy, or psychology and an M.B.A. The College of Life Sciences and Agriculture and the Whittemore School offer a joint program leading to a B.S. in plant science and an M.B.A. See the individual college descriptions for details.

Programs of Study

Administration

(For descriptions of courses, see page 82.)

The administration program provides training for individuals interested in managerial or administrative careers in business or in public or private institutions.

Since most graduates of the program embark upon business careers, the program emphasis is in that direction. However, as demand has grown in recent years for people able to apply businesslike methods to the problems of nonprofit institutions such as hospitals, school systems, government departments, and other socially oriented organizations, the program's objectives have been broadened to include all types of administration.

The curriculum offers professional education in the basic theories, principles, concepts, and analytical tools used by successful modern administrators, combining them with an introduction to some of the important functional areas of management. At the same time, typical students achieve a well-rounded education by selecting courses in the liberal arts and the sciences from other colleges and schools in the University.

The administration program consists of eleven required courses in three groupings, plus two required WSBE electives. In addition, the program requires computer proficiency, which can be satisfied through coursework or acceptable equivalency. Group A includes the core courses taken in the freshman and sophomore years. These focus on basic concepts, tools, and skills. Group B consists of four courses in the functional areas of organizational behavior, production, marketing, and finance, normally taken in the junior and senior years. Group C consists of the final capstone courses in administration. These are taken in the senior year.

Students must successfully complete all Group A courses (achieving a minimum grade-point average of 2.00 in them) and obtain junior standing before any Group B courses may be taken; and all Group B courses must be completed before taking required Group C courses. In order to graduate, students must achieve a grade-point average of at least 2.30 in the thirteen major courses and a minimum grade of C- in each major course. Transfer credit can be applied only to Group A courses.

Students are encouraged to take advanced electives in areas of their interest and in relation to career goals. Faculty and the undergraduate counselors can provide useful information and guidance for choices of electives.

The Whittemore School also offers courses for nonmajors. Students interested in these courses should contact the Advising Office.

The recommended plan of study is given below:

Freshman and Sophomore Years (Group A)

ECON 401, Principles of Economics (Macro); ECON 402, Principles of Economics (Micro); ADMN 424, Business Statistics; ADMN 502, Financial Accounting; ADMN 503, Managerial Accounting; INCO 491, Computer Literacy (or equivalent)

Junior and Senior Years (Group B)

ADMN 611, Behavior in Organizations; ADMN 650, Operations Management; ADMN 651, Marketing; ADMN 653, Financial Management

Senior Year (Group C)

ADMN 701, Strategic Management: Environmental Issues; ADMN 703, Strategic Management: Decision Making; two WSBE electives

Economics

(For descriptions of courses, see page 106.)

Economics is the study of the allocation of scarce resources among competing uses, either through use of conscious public policy or through impersonal market forces. The analytical skills of economists are useful in evaluating alternative methods of achieving these goals and in the formulation of new approaches to problems in these areas.

The economics program is designed to introduce students to the tools of economic analysis and to an understanding of the areas to which they may be usefully applied.

While undergraduate training in economics may not qualify students as professional economists (those intending such a career should plan on graduate study), it is regarded by employers as a highly desirable background for business or government. In recent years, economics graduates have competed on a favorable basis for business and government jobs with graduates in other areas, including administration. Undergraduate economics training is an excellent background for graduate work in law, business administration, and international relations, as well as economics. Graduate study in economics usually requires a course in linear algebra and at least one year of calculus.

Students planning to pursue graduate study in economics should consult with their advisers or faculty members early in the academic program to assist in their selection of an appropriate graduate school and to aid in gaining admission.

Courses in economics, including a minor program, are open to nonmajors. Students majoring in other programs may find certain economics courses useful supplements to their own majors and a help in future employment. Political science majors may be interested in courses in economic development, comparative economic systems, public finance, and government regulation of business; engineering and science students may be interested in courses in introduction to econometrics, and intermediate microeconomic analysis. Noneconomics majors with questions about the nature of various courses should feel free to question the economics faculty.

Economics majors must complete nine full courses in economics with a grade of at least C- (1.67) in each course and achieve at least a 2.00 grade-point average. These must include both intermediate theory courses, ECON 605 and 611, and ADMN 424, Business Statistics. (Students may petition to substitute one 600- or higher-level administration or resource economics course for an economics elective.) Major credit toward ECON 605 and/or 611 will be awarded transfer students only if such courses have been taken at the junior level or above. Transfer students must take five of their nine economics courses at UNH. All economics majors must satisfy the bachelor of arts degree requirements (page 16). In addition, the program requires computer proficiency, which can be satisfied through coursework or acceptable equivalency.

A suggested plan for economics majors is given below:

Freshman and Sophomore Years

ECON 401, 402, Principles of Economics (Macro and Micro); ADMN 424, Business Statistics; INCO 491, Computer Literacy (or equivalent)

Junior Year

ECON 605, Intermediate Microeconomic Analysis; ECON 611, Intermediate Macroeconomic Analysis

Junior and Senior Years

Economics electives (4)

Minor A minor consists of five economics courses. A complete list of minor requirements is available in the Whittemore School Advising Center, Room 120, McConnell Hall.

Hotel Administration

(For descriptions of courses, see page 127.)

The hotel administration program objective is to prepare students for management positions in the service sector and specifically in the hospitality industry. Graduates have accepted positions in lodging, food service, tourism, travel and recreation industries, and institutions such as hospitals, nursing homes, colleges, and schools.

In order to have a well-rounded university education, students take courses in liberal arts as well as foundation courses in business administration and economics. The hotel administration curriculum builds upon this foundation and provides experience and in-depth education in the lodging and food service industries.

The program includes a mix of practical experience along with classroom activities. These practical experiences are provided by major consulting projects to industry (as part of classroom projects); lecture series; seminars and field trips; a minimum of 400 hours approved work experience (practicum); and by the operation of a campus food service facility, catering services, and gourmet dinners.

The hotel administration program encompasses fourteen required courses in three groupings. Group A consists of six core courses taken in the freshman and sophomore years. Group B includes most of the functional areas required to develop successful management skills. These are generally taken in the junior and senior years. Group C includes Hotel and Restaurant Development, Hospitality Marketing Management, and a final capstone course, Strategic Management in the Hospitality Industry, which is usually taken in the senior year. A wide range of elective independent studies and internships can complement the required curriculum. In addition, the program requires computer proficiency, which can be satisfied through coursework or acceptable equivalency.

Students must successfully complete Group A courses, achieving a minimum grade-point average of at least 2.00, before Group B courses may be taken. With the exception of Advanced Food and Beverage Management, Group B courses must be completed before taking any Group C courses.

In order to graduate, students must obtain a 2.30 grade-point average in all major required courses and a minimum grade of C- in each major course. Graduates of this program who are qualified for and interested in further allied studies are well prepared for advanced degree programs in business or institutional administration.

A suggested plan of study is given below:

Freshman and Sophomore Years (Group A)

ECON 401, Principles of Economics (Macro); ECON 402, Principles of Economics (Micro); HOTL 401, Distinguished Lecture Series in Hotel Administration; HOTL 403, Introduction to Food and Beverage Management; HOTL 518, Managerial Accounting for the Hospitality Industry; ADMN 424, Business Statistics; ADMN 502, Financial Accounting; INCO 491, Computer Literacy (or equivalent)

Junior and Senior Years (Group B)

HOTL 654, The Management of Rooms Division and Hospitality Properties; HOTL 667, Advanced Food and Beverage Management; ADMN 611, Behavior in Organizations; ADMN 651, Marketing; ADMN 653, Financial Management

Senior Year (Group C)

HOTL 655, Hotel and Restaurant Development; HOTL 700, Hospitality Marketing Management; HOTL 703, Strategic Management in the Hospitality Industry

This section describes interdisciplinary study opportunities, preprofessional programs (prelaw, premed/predental), off-campus programs, and other special academic programs at UNH. Other ways of combining studies are mentioned in the program information of the various colleges and schools. Some of the more specific opportunities are

Interdisciplinary Programs

Earth, Oceans, and Space

The Institute for the Study of Earth, Oceans, and Space (EOS) is devoted to obtaining a scientific understanding of the entire Earth system and its environment in space. EOS research analyzes on global and finer scales the interactions and processes controlling the Earth system's components: the atmosphere, magnetosphere, biosphere (including anthrosphere), hydrosphere, cyrosphere, lithosphere, the Sun, and the space environment.

The institute brings together under a common theme several established research groups on campus: the Space Science Center, the Geochemical Systems Laboratory, the Complex Systems Research Center, the Ocean Processes Analysis Laboratory, and the Marine Systems Engineering Laboratory. Although the primary educational theme of the institute is to expand upon existing graduate degree programs to train future scientists with a global view, undergraduate courses to stimulate and excite students with the Earth system perspectives are planned.

Gerontology

The gerontology interdisciplinary minor provides students with the opportunity to examine and evaluate the aging process as it affects the individual and society. Through in-depth inquiry, personal encounters, and classroom discussion, students develop an understanding of aging from a variety of perspectives. Students are encouraged to analyze the historical and philosophical foundations from which policies, programs, and professional activities affecting the aged are developed, implemented, and evaluated.

Gerontology minors are required to take a minimum of 20 credits (five courses). The courses must include three core gerontology courses plus two electives from a list of courses approved by the Interdisciplinary Minor Advisory Committee.

Required Core Courses
GERO 600, Introduction to Gerontology
NURS 670, Issues in Health Care of the Aged
GERO 795, Independent Study (a practicum arranged by the coordinator of the minor, or by the appropriate designee)

Approved Electives
SW 525, Introduction to Social Welfare Policy: Provisions
SW 550, Human Behavior and Social Environment I
SW 700, Social Gerontology
SW 701, Women and Aging
FS 525, Human Development
FS 797, Special Topics: Older Adult Consumer
HMP 755, Long-Term Care
NURS 535, Death and Dying
OT 600, Developmental Tasks of Adulthood
SOC 797A and 697A, Special Topics: Sociology of Aging
PHED 607, Biology of Aging

Other courses on special topics may complete the electives if approval is obtained from the advisory committee.

Students who wish to minor in gerontology should consult with the coordinator, Raelene Shippee-Rice, Department of Nursing, Hewitt Hall, 862-2260.

Intercollege Courses

Intercollege courses are listed on page 129. The Independent Work-Study courses are continuous offerings. Other INCO courses include INCO 401, Nuclear War; INCO 404, Honors: Freshman Seminar; INCO 480, Art in Society; INCO 491, Computer Literacy; INCO 495, Computer Applications; INCO 604-605, Honors: Senior Thesis; INCO 655-656, London Program; INCO 685, 686, Study Abroad; and INCO 698, Summer Research Project.

Marine Sciences

Undergraduate programs in marine science and ocean engineering at the University of New Hampshire reflect the diversity of the ocean itself and are enriched by easy access to a variety of natural laboratories, ranging from freshwater lakes to the open ocean.

Studies in marine science and ocean engineering draw upon faculty from departments throughout the University. Students identify the discipline (ranging from mechanical engineering to zoology) they like best and pursue marine specializations related to that area of study.

Institute of Marine Science and Ocean Engineering The Institute of Marine Science and Ocean Engineering (IMSOE) provides a focus for marine activities on campus, with specialized laboratory facilities located in individual departments and organized research units. IMSOE gives special emphasis to interdisciplinary programs that enhance the strengths of academic units of the University.

The Freshwater Biology Group administers the Lakes Lay Monitoring Program, an interdepartmental effort that monitors the quality of the water in fifty New Hampshire lakes and includes research, education, and service components. Estuarine research is pursued at the Jackson Estuarine Laboratory on Great Bay, which was recently designated as a National Estuarine Research Reserve. The Coastal Marine Laboratory, a major running-seawater facility, is located in nearby New Castle. Research on salmonids and other marine animals is conducted at the Anadromous Fish and Aquatic Invertebrate Research Laboratory located near the Durham reservoir. The 45-foot research vessel *Jere A. Chase* has docking facilities at the Jackson Lab and at the State Fish Pier in Portsmouth Harbor. Summer finds many students living and studying at the Shoals Marine Laboratory on Appledore Island, one of the Isles of Shoals, where UNH and Cornell University cooperatively run a seasonal laboratory focusing

on marine science, engineering, and related subjects. Each facility contains up-to-date specialized equipment, including navigational and sampling aids aboard the R/V *Jere A. Chase.*

Curricula in the Marine Sciences There is no separate undergraduate major in the marine sciences. However, faculty in every school and college contribute to marine education. Students should declare a major in the established science discipline most closely allied to their principal area of interest and complete a minor in marine biology, ocean engineering, or oceanography. Students may declare only one marine minor.

Marine Biology The minor in marine biology, available to all students in the University, consists of 20 semester hours with grades of C (2.00) or better and no pass/fail courses. No more than 8 major requirement credits may be used. All courses in the program are selected in consultation with the marine biology minor adviser, Larry Harris, in the Department of Zoology.

Students who want to minor in marine biology must take one introductory course (ESCI 501, Introduction to Oceanography; ZOOL 503, Introduction to Marine Biology; or ZOOL 674, Field Marine Science) and four courses concentrating on an area of interest. For example, a student interested in marine mammals might take Mammalogy (ZOOL 712), Animal Behavior (ZOOL 713), Marine Ecology (ZOOL 791A), and Fisheries Biology (ZOOL 772). Courses commonly taken as part of the minor include BOT 625, 722, 723; CIE 747; MICR 707, 708; ZOOL 503, 528, 674, 711, 717, 719, 728, 751, 753, 772, 775. In addition, students are encouraged to become involved in a research project, either by working in a professor's laboratory or by participating in the Undergraduate Ocean Research Program (TECH 697).

Students should declare their intention to minor in marine biology before the end of the junior year. During the final term, students should apply to the dean to have the minor shown on their transcripts.

Ocean Engineering The ocean engineering minor allows undergraduate engineering students to acquire a nucleus of knowledge about engineering pertaining to the ocean and the coastal zone.

In addition to meeting the University minor requirement of 18 semester hours, students must complete satisfactorily a minimum of five courses from the following list: ESCI 501, Introduction to Oceanography; ESCI 752, Chemical Oceanography; ESCI 758, Introductory Physical Oceanography; ESCI 759, Geological Oceanography; OE 710, Ocean Measurements Laboratory; OE 753, Ocean Hydrodynamics; OE 754, Ocean Waves and Tides; OE 761, Materials in the Ocean; OE 781, Physical Instrumentation; OE 785, Underwater Acoustics; OE 795, Special Topics in Ocean Engineering; OE 751, Naval Architecture in Ocean Engineering; OE 752, Submersible Vehicle Systems Design; OE 757, Coastal Engineering and Processes; and TECH 697, Undergraduate Ocean Research Program. Ordinarily, students must take ESCI 501, TECH 697, and additional courses from the above list for a total of 18 semester hours. Two of these courses must be engineering courses.

Students wishing to take the ocean engineering minor should indicate their interest to the ocean engineering minor adviser, Kenneth C. Baldwin, Department of Mechanical Engineering, no later than the beginning of the junior year. During the final semester, students must apply to the dean to have the minor shown on their transcript.

Oceanography The minor in oceanography, available to all students in the University, consists of a minimum of five courses totaling at least 18 credits with grades of C (2.00) or better and no pass/fail courses. No more than eight major requirement credits may be used. All courses in the program are selected in consultation with the oceanography minor adviser, T. C. Loder, in the Department of Earth Sciences.

Required courses include (1) ESCI 501, Introduction to Oceanography; (2) two of the following courses: ESCI 752, Chemical Oceanography; ESCI 758, Introductory Physical Oceanography; ESCI 759, Geological Oceanography; (3) any two of the following courses, or a suitable substitute approved by the minor adviser (at least one of these courses should be in the biological sciences): BOT 625, 722, 723; CIE 747, 757; EE 785; ESCI 754, 756; EC 611; ME 695, 751, 752, 757; MICR 707, 708; OE 753, 754; POLT 511; TECH 697; ZOOL 560, 674, 715, 720, 751, 753, 772, 775.

Students are encouraged to declare their intention to minor in oceanography before the end of the junior year. During the final semester, students should apply to the dean to have the minor shown on their transcript.

Shoals Marine Laboratory The University of New Hampshire, in cooperation with Cornell University, offers a summer field program in marine sciences on Appledore Island at the Isles of Shoals. Courses introduce undergraduates to a broad array of marine sciences, including oceanography, marine biology, fisheries, and marine resources. Introduction to Field Marine Biology (ZOOL 474), a three-week, four-credit course, is offered each summer at the Shoals Marine Lab. It has no prerequisites and satisfies the general education requirement in the biological sciences. The four-week, six-credit general course, Field Marine Science (ZOOL 674), is offered in June and August of each summer. It draws upon the backgrounds of more than fifteen faculty and many others, including captains, fishermen, and others whose living is associated with the sea. At least one full year of college biology or the equivalent is a prerequisite. Daily lectures and work in laboratory and field are offered; the course is graded on a letter grade basis. Other credit courses are offered in marine pollution, marine botany, adaptations of marine organisms, underwater research, and other areas. For further information, contact the Institute of Marine Science and Ocean Engineering, Marine Programs Building, University of New Hampshire.

Diving Program The UNH diving program offers instruction in SCUBA diving and research diving techniques. It provides professional diving support for underwater research. The Shoals Marine Laboratory offers courses in marine archaeology and underwater research during the summer, under the guidelines of UNH diving regulations. For further information, contact Paul Lavoie (safety officer and director of the Hyperbaric Center) at the Institute of Marine Science and Ocean Engineering.

Research There are many opportunities for undergraduates to become involved in the more than $3.0 million worth of funded marine research involving UNH faculty.

The University of New Hampshire and the University of Maine at Orono have a joint Sea Grant College Program that supports research, teaching, and service projects through funding from the National Oceanic and Atmospheric Administration of the Department of Commerce. Marine projects also receive support through the National Science Foundation, the Department of the Interior, the Office of Naval Research, and other foundations and private donors.

Extensive research, interdisciplinary academic programs, and the extraordinary variety of marine environments and facilities allow students to observe and learn about the frontiers of science and

technology being explored in the ocean. For further information about marine opportunities, contact the Institute of Marine Science and Ocean Engineering, Marine Programs Building.

Program for International Perspectives

(For course descriptions, see page 153.)

The Program for International Perspectives offers undergraduate students the opportunity to take a dual major in international affairs. The dual major requires completion of the interdisciplinary international affairs program and any other major. The dual major is not to be confused with a "second" or "double" major, which combines two independent majors.

The purpose of the program is to expand the students' global horizons, enhance their other major, and expand their career opportunities into the international arena. The requirements for international affairs are listed below.

Required Core Courses
PIP 401, International Perspectives: Science, Business, and Politics
PIP 501, North-South Issues in International Affairs
PIP 701, Seminar in International Affairs

Four Electives (one from each of the program's four elective groups)
foreign areas
science, technology, and the private sector
public policy
theory in international affairs

Competency in a Foreign Language (functional reading, writing, and speaking ability equivalent to the third-year, second-semester level)

Foreign Experience (a minimum of two months in a non–English-speaking country)

The courses in the dual major program are multidisciplinary, taught by faculty from many different departments in the University. They are designed to help students appreciate the complex interrelationships and interdependencies among nations and peoples and to equip students with the analytical skills and broad perspectives necessary for both public- and private-sector international careers.

PIP 401, a prerequisite for PIP 501, should be taken during the fall of the freshman year, and PIP 501 no later than spring of the sophomore year.

The foreign experience (usually completed during the junior year) and the foreign language requirement are completed before taking PIP 701 in the spring of the senior year. To acquire the knowledge, skills, and experience that come from residence in a foreign culture, students may spend an academic year, semester, or summer in an academic institution, in an internship with a private or public organization, or in purposeful travel.

For information, contact the Center for International Perspectives, Hood House, 862-2398.

Student-Designed Majors

Under special circumstances, students may design their own majors. This option is offered for highly motivated and self-disciplined students who seek a course of study that is not available through existing programs at the University. It allows students, with the close supervision of faculty members, to cross department and college lines and to create educational experiences on and off campus as part of individual programs of study.

Student-designed majors are administered by a committee of elected faculty that operates through the Office of the Vice President for Academic Affairs. Students who want to design their own majors are expected to give the committee evidence of careful thought and planning in a detailed proposal submitted before the middle of their junior year. Proposal guidelines are available in the Office of the Vice President for Academic Affairs.

Technology, Society, and Values

The technology, society, and values (TSV) minor integrates studies of the nature of technology, its social and environmental impact, and its ethical implications. It allows students in technological majors to understand their disciplines in a broader context, and those in nontechnological majors to become better informed about technology and its effects.

The student minoring in TSV must complete a minimum of 20 credits of TSV courses. All students in the minor must take PHIL 424 (Science, Technology, and Society). TECH 583 (Technology Systems) is required of all non-engineering students. Other students, particularly those in the College of Engineering and Physical Sciences, may petition out of the TECH 583 requirement with the approval of the TSV adviser.

The remaining courses to constitute the minor must be selected, with the advice and approval of the TSV adviser, from the following list:

CHE 410, Survey of Current Energy and Pollution Control Technology
CIE 520, Environmental Pollution and Protection—A Global Context
CMN 455, Introduction to Mass Communication
EC 501, Environmental Philosophy
EC 635, Contemporary Conservation Issues
EC 702, Natural Resources Policy
ECON 698, The International Transfer of Technology
ECON 752, Technology, Information, and Public Policy
HMP 401, U.S. Health Care Systems
HIST 521, History of Science: Space, Time, and Motion
HIST 522, History of Science: Biology and Medicine
INCO 401, Nuclear War
NURS 670, Issues in Health Care of the Aged
PHIL 424, Science, Technology, and Society
PHIL 447, Computer Power and Human Reason
PHIL 630, Philosophy of the Natural Sciences
PHIL 660, Law, Medicine, and Morals
TECH 583, Technology Systems

The student may apply at most four credits within his/her major toward the TSV minor.

Students interested in minoring in TSV should contact the TSV adviser, Val Dusek, 45 Hamilton Smith Hall, 862-3076.

Preprofessional Programs

Prelaw

The Prelaw Committee of the University of New Hampshire recommends consideration of the following description of prelegal education excerpted from the *Prelaw Handbook* of the Association of American Law Schools.

Law schools are vitally concerned with the quality of preparation that students bring from their undergraduate experiences. For unless that preparation has been of high quality, the law schools cannot equip them for satisfactory performance within the legal profession and the democratic community.

The association's responsibility in matters of prelegal education cannot best be met by prescribing certain courses and extracurricular activities for students planning to study law. The wide range of a lawyer's tasks opens a correspondingly wide range for choice of relevant prelaw preparation. So-called "law" courses in undergraduate instruction should not be taken for the purpose of learning the "law." They are not likely to be effective as education for lawyers, although they can be very useful for teaching students

"about law" and for helping them estimate whether they might be interested in law study.

But while it considers the prescription of particular courses unwise, the association can call attention to the quality of undergraduate instruction it believes fundamental to the later attainment of legal competence. That quality of education is concerned with the development in prelaw students of the following basic skills and insights.

Comprehension and Expression in Words Language is the lawyer's working tool. He or she must be able, in the drafting of legal instruments, to convey meaning clearly and effectively. In oral and written advocacy he or she must be capable of communicating ideas convincingly and concisely. In reception no less than in expression, language is fundamental as the lawyer's medium of communication. For the lawyer must be able to grasp the exact meaning of factual statements and legal instruments, to catch the fine points of legal reasoning and argument, and to comprehend the technical materials that constitute the body of the law. To acquire sufficient capacity for communication calls for extensive practice in all phases of the art. Truly, the legally trained man or woman must be precise in the use of the English language.

Critical Understanding of Human Institutions and Values The purpose is to develop insight into, rather than merely information about, institutions and values: human nature and the physical world; the economic systems of societies; the democratic processes in western societies; the social structures of societies; the cultural heritage of western societies, including philosophy and ethics.

Creative Power in Thinking The purpose is to develop power to think clearly, carefully, and independently. A large part of the work legally trained people are called upon to do calls for problem solving and sound judgment. Creative power in thinking requires the development of skills in research, fact-completeness, marshaling and differentiation of facts, deductive and inductive reasoning, reasoning by analogy, critical analysis, constructive synthesis, and power of decision.

For additional information, please contact a member of the Prelaw Committee: Professor Richard Desrosiers, Department of Spanish and Classics, Murkland Hall, (603)862-3132; Professor William Jones, Department of History, Horton Social Science Center, (603)862-3025; Professor John Kayser, Department of Political Science, Horton Social Science Center, (603)862-1699; or Professor Ann Morgan, Department of Leisure Management and Tourism, Hewitt Hall, (603)862-2391.

Premedical/Predental Study

Students preparing for careers in medicine, dentistry, optometry, osteopathy, podiatry, pharmacy, and physician assistant programs should become familiar with the minimum course requirements in their respective fields of interest as early as possible in order to incorporate the required courses into their college programs. There is no preprofessional major with a rigidly prescribed curriculum. Students are encouraged to major in subjects of their choice, either in sciences or nonsciences. In the past few years there has been a trend, particularly in premedicine and predentistry, away from exclusive concentration in a single area of science. Successful applicants from UNH have majored not only in sciences such as zoology, microbiology, biochemistry, and chemistry but also English, history, languages, psychology, and political science.

Students are assigned an appropriate faculty adviser from the department or school of their chosen major. The Preprofessional Health Advisory Committee offers information about specific admissions requirements and procedures to the professional schools desired and provides recommendations at the time of application.

All medical and dental schools expect applicants to have demonstrated ability in basic natural and physical sciences. Although the specific requirements for admission vary considerably, the following courses constitute a minimum for students to be considered for admission: biological sciences, physics, general chemistry, and organic chemistry—all two semesters each with laboratory. A year of English, preferably composition, is required, as are one–two semesters of calculus. An appropriate group of courses from among the offerings at the University of New Hampshire would be the following: BIOL 411-412; ZOOL 412, 507-508, 518; PHYS 401-402; CHEM 403-404, 651-652, 653-654; and MATH 425-426. One semester of general psychology is also required by some dental schools.

Courses that qualify individuals for consideration as premedical, predental, or other preprofessional students should be completed by the time application to a professional school is submitted, usually by the end of the junior year. Inasmuch as performance in these courses is weighted heavily by the admissions committees, it is strongly recommended that students not register for them under the pass/fail grading alternative.

The following schedule is suggested for timing applications to medical and dental schools:

1. Students should apply to schools of their choice in the summer after their junior year if they wish acceptance following graduation. However, a delay of a year or more to complete courses or to work is neither detrimental nor unusual for acceptance into medical or dental school. Though the application services accept applications from June through December, early applications are often advantageous.

2. The Medical College Admissions Test (MCAT) or the Dental Admission Test (DAT) must be taken before or at the time of application to medical or dental schools. The MCAT and DAT exams are preferably taken in the spring of the student's junior year (if the student is applying as a senior).

3. Interested students should contact the Preprofessional Health Advisory Office early in their college careers and meet members of the advisory committee before they apply to professional schools, since the letter of recommendation provided by the committee is an integral part of the admissions process. Visit the office or call 862-3625 for an appointment.

Among students from UNH who were accepted into medical and dental schools over the past five years, the competitive overall grade-point average was approximately 3.50 for medical school and 3.40 for dental school.

Off-Campus Programs

Consortium (NHCUC) Student Exchange Program

Under the Student Exchange Program of the New Hampshire College and University Council (NHCUC), UNH students may be eligible to enroll for one or two courses, one semester of courses, or a full year of coursework at a member school, on a space-available basis. The purpose of the consortium exchange is to allow matriculated undergraduates to use educational resources that are not available at the home campus and are considered appropriate for their degree programs. The consortium exchange will be used only when academic reasons or other special circumstances warrant it. Approval of the UNH adviser and college dean is required. Schools in the NHCUC consortium include Colby-Sawyer College, Daniel Web-

ster College, Franklin Pierce College, Nathaniel Hawthorne College, New England College and its Arundel Branch in England (limited enrollment), New Hampshire College, Notre Dame College, Rivier College, St. Anselm College, UNH, Keene State College, and Plymouth State College. Students will remain as degree candidates and continue to pay normal UNH tuition and fees but must make their own room and board arrangements if they plan to spend a full semester at another consortium school. For more information and application forms, students should contact Carolyn Tacy, exchange coordinator, Dean of Students Office, Huddleston Hall.

UNH/UNHM Cross Registration

Matriculated students at the University of New Hampshire and the University of New Hampshire at Manchester may take UNH courses at either location. Students must have permission of their academic advisers and must register for the courses on a space-available basis. For more information and special registration forms, students should contact James Wolf, associate registrar, Stoke Hall, or Peter Haebler, assistant dean for academic services, UNHM. See page 167 for UNHM course listings.

Foreign Study Programs

The University offers opportunities for students to study in many foreign institutions. The Cambridge Summer Program, the London Program, and the New England/Quebec Student Exchange Program are described below. University departments also sponsor programs in Dijon and Grenoble, France; Granada, Spain; and Leningrad, USSR. Students may also study abroad in these and other locations through the intercollege option (INCO). For information on study abroad programs, students should contact Sonny Davis at the Center for International Perspectives (Hood House) or one of the foreign language departments in Murkland Hall.

Cambridge Summer Program For six weeks each summer, students from across the United States have the opportunity to participate in the Cambridge Summer Program held at Cambridge University in England. Program participants take courses in English, history, or the humanities, taught by faculty from Cambridge University and UNH. Students live, dine, and study together at Gonville and Caius College, one of the oldest colleges at Cambridge. The program is open to students who have successfully completed at least one year of college. For more information, contact Janet Aikins, Department of English, Hamilton Smith Hall.

London Program At Regent's College in the heart of London, the University of New Hampshire sponsors courses in British studies, the arts, humanities, and a wide range of other basic subjects, offered during the fall and spring semesters. Taught by British and American faculty, many of the courses are specifically concerned with British studies or have a special British emphasis. The program allows students to spend a semester or year in London while still making normal progress toward their U.S. degrees. To be eligible, students must have successfully completed at least one year of college and must have an overall grade-point average of at least 2.50. Interested students should contact the program coordinator, London Program Office, 52 Hamilton Smith Hall.

New England/Quebec Student Exchange Program Students may spend their sophomore or junior year at one of several French- or English-speaking universities in the province of Quebec, including McGill University and the Université de Montréal. Eligibility requirements include a command of the language of the host campus, U.S. citizenship, sophomore or junior standing, and excellent academic record. Contact Sonny Davis, Center for International Perspectives.

Exchange Programs within the U.S.

The University offers many possibilities for exchange study with other American institutions. Exchange programs provide an educational experience in a different environment within the United States, with the intent that the students receive the fullest experience of the new university that is possible. It is hoped that students will develop new ways of viewing the world and expand their conception of our complex society.

One-semester or full-year exchange programs are available with San Diego State University and the University of California, Santa Cruz. In addition, through the National Student Exchange, UNH students can study at more than eighty colleges and universities throughout the country (including North Carolina, New Mexico, Utah, Colorado, and the U.S. Virgin Islands and Puerto Rico).

To qualify for exchange study, students must be full-time degree candidates with at least a 2.50 grade-point average, be at least first-semester sophomores but no more than first-semester seniors, have declared a major, receive permission from their college dean and adviser, and receive permission from the exchange coordinator.

Students in exchange programs are expected to return to UNH to continue or complete their studies. Participation in an exchange program does not disrupt the continuity of a student's educational process. Exchange program participants continue to maintain their status as UNH students, even while temporarily located at another university. Students thus do not have to withdraw from school and later be readmitted. Maintaining UNH student status also facilitates reentry into classes, dormitories, and many other dimensions of University life upon students' return.

Interested students should contact Carolyn Tacy in the Dean of Students Office, Huddleston Hall.

New England Subdegree Exchange Program In order to provide students at the New England land-grant universities with expanded access to unique programs and faculty expertise, the institutions have agreed to encourage student exchanges of one but not more than two semesters. To qualify, students must identify a course or combination of courses related to their area of academic interest and not available on their home campus, be degree candidates in good standing with at least a 2.50 grade-point average, be at least first-semester sophomores, and receive permission from the appropriate university exchange authorities at both the sending and receiving institutions. Interested students should contact Carolyn Tacy in the Dean of Students Office, Huddleston Hall.

Other Programs

Field Experience Program

The field experience program integrates theoretical classroom study with planned and supervised practical experience. The program operates in three different patterns: full-time employment during half of the academic year, alternating a semester in class with a semester of work; part-time employment and part-time classwork during the whole academic year; and full-time employment during the summer.

Participating students are placed in off-campus positions that are both related to their curricula and of sufficient quality to

provide worthwhile learning experiences. The students not only strengthen their academic knowledge through practical experience but also gain greater career awareness and understanding of the work environment.

Students from the following colleges, departments, and programs may participate: College of Engineering and Physical Sciences, Whittemore School of Business and Economics, College of Liberal Arts (art history, communication, French, geography, German and Russian, history, humanities, political science, psychology, sociology and anthropology, Spanish and classics, theater and dance), College of Life Sciences and Agriculture (animal and nutritional sciences, biochemistry, biology, botany and plant pathology, entomology, forest resources, microbiology, plant science, resource economics and community development, and zoology); School of Health Studies (family studies); career concentration minors; and associate in arts degree.

Students may earn elective credits toward graduation by registering for the appropriate DCE field experience course. In some cases, students participating full time in a field experience project may retain their full-time enrollment status. Interested students should contact the Field Experience Program, Division of Continuing Education, Brook House, (603) 862-1184.

Reserve Officer Training Corps Programs

The Army and Air Force offer Reserve Officer Training Corps (ROTC) programs leading to a commission as a second lieutenant in their respective services. Both programs are open to men and women. Students in either ROTC program may pursue any University curriculum that leads to a baccalaureate or higher degree.

Two- and four-year programs are available. The four-year program is open to freshmen and to transfer students who began ROTC at another institution. In addition to on-campus ROTC course requirements, students must attend an officer preparatory training session for a part of one summer.

ROTC is open to all students pursuing a baccalaureate degree who have a minimum of two academic years or more remaining within their degree program. Entering freshmen may preregister for Military Science 413 (AROTC) or Aerospace Studies 415 (AFROTC). Sophomores desiring to enter ROTC should check with either the Army or Air Force enrollment advisers located in Zais Hall.

Two-year ROTC programs are open to students who have two academic years of study remaining at the University. Applicants for the two-year program must attend a six-week training session during the summer immediately before their entry into ROTC.

ROTC scholarships are offered on a competitive basis by both the Army and Air Force. Entering freshmen may compete for four-year scholarships during the last year of high school. Students in a four-year ROTC program and two-year program applicants compete for scholarships covering their remaining academic years. Scholarships pay for full tuition, all mandatory University fees, and required textbooks for all courses. In addition, all scholarship recipients receive a tax-free $100-per-month subsistence allowance. Nonscholarship students in the last two years of an ROTC program also receive the tax-free $100-per-month subsistence allowance.

Students in Air Force ROTC are required to take a math reasoning course from a list approved by the professor of aerospace studies as part of their curriculum.

Students in Army ROTC are required to complete three professional military education courses from a list approved by the professor of military science as part of the professional education requirements that must be met before commissioning. Exceptions must be in accordance with Cadet Command Regulation 145-3.

More specific information about ROTC programs may be obtained by contacting the professor of military science (Army ROTC) or the professor of aerospace studies (Air Force ROTC).

Undergraduate Research Opportunities Program (UROP)

Undergraduates can enhance their education through collaborative research projects with faculty members. The Undergraduate Research Opportunities Program offers participants the chance to improve research skills and to acquire an understanding of the nature of research in an academic field. Participation in the program can also aid students in making choices and developing plans concerning careers and graduate schools. For information please contact Donna Brown, coordinator, UROP Office, Hood House.

Thompson School of Applied Science

Brian A. Giles, Director
John A. Leahy, Jr., Assistant to the Director

The mission of the Thompson School of Applied Science (TSAS) is to offer two-year programs leading to an associate in applied science degree. A combination of science-based education, professional preparation, and practical experience qualifies graduates for employment as technicians, professional assistants, and supervisors in business and public organizations.

The primary goal of most Thompson School students is to acquire the necessary knowledge, skills, and experience to enter employment in their field at the end of two years. Some graduates elect to continue their education at the baccalaureate level.

Associate Degree Programs

The Thompson School of Applied Science offers the following professional programs:

Applied Animal Science Applied animal science prepares students for animal-related occupations in the production and management of dairy herds, livestock, horses, small animals, and field crops.

Applied Business Management Applied business management combines practical skills in sales, personnel management, communications, and data processing with classroom study of accounting, economics, management, business law, and human relations for a thorough and realistic understanding of the business world.

Civil Technology Civil technology encompasses three distinct yet interrelated areas of study: construction, energy management, and surveying. These concentrations prepare students for technician or management positions in one of this country's largest industries—construction and its related aspects.

Food Services Management Food services management prepares students for employment as restaurant managers; hospital, school, or institutional food service managers; food and beverage buyers and controllers; and food service equipment salespersons. Courses in cooking prepare students to become chefs and to work in food production jobs.

Forest Technology Forest technology prepares students to enter the forestry/natural resources field with the technical skills necessary for successful careers. Effective forest management includes producing continuous crops of trees to supply wood-product needs while simultaneously keeping the forest aesthetically pleasing to people and beneficial to wildlife.

Horticultural Technology Horticultural technology students gain knowledge and skills in the art and science of technical horticulture. The curriculum includes foundation courses such as plant structure and function, soils, woody plant materials, plant protection, and plant propagation and specialized courses in such areas as landscaping, nursery, interior plantscaping, fruits, vegetables, floriculture, floral design, and bedding plants. The program gives a student a general horticultural background while also providing the opportunity to specialize.

Admission Requirements

Applicants to the Thompson School of Applied Science are considered on the basis of secondary school course selections, academic achievement, class rank, and school recommendations. The secondary school program need not be college preparatory. Emphasis is placed on applicants' motivation and demonstrated interest in their career fields.

All candidates graduating from high school must submit the results of the College Entrance Examination Board Scholastic Aptitude Test. Applicants to the forest and civil technology programs must also have completed two years of satisfactory work in college preparatory mathematics.

Financial Aid

Associate in applied science degree candidates are eligible for the full range of financial aid offered by the University. See the Financial Aid section of the Thompson School catalog.

Advising

Program planning and other advising services are provided by the faculty and professional staff of the Thompson School. Academic advisers are available during office hours or on an appointment basis.

Housing

Thompson School students are eligible for on-campus housing.

Transfer Policy

The University of New Hampshire awards partial credit transfer for TSAS coursework. Students who seek to continue their education in the University's baccalaureate degree programs are advised that transfer consideration is based on an applicant's level of achievement and on the availability of spaces in the baccalaureate programs. Students with an academic average of 2.80 or higher at the end of the freshman year, or 2.50 or higher at the end of the senior year, may be eligible for transfer. Other colleges and universities offer similar credit transfer arrangements.

For More Information

For a Thompson School Catalog and/or more specific information, write or call the Thompson School of Applied Science, Barton Hall, Durham, N.H. 03824 (603) 862-1025.

University of New Hampshire at Manchester

Lewis Roberts, Jr., Dean
John P. Resch, Associate Dean
Peter Haebler, Assistant Dean
Deborah Sady, Director of Continuing Education

The University of New Hampshire at Manchester (formerly Merrimack Valley College) was established in 1985 to increase access to a university education for people who live and work in central New Hampshire. The newest college of the University offers associate and selected bachelor's degrees, access to other UNH degree programs, special courses, workshops, seminars, and cultural events for the region.

Degree Programs

Students can pursue UNH associate in arts or associate in science degree programs full or part time with a choice of concentrations. Those students who complete requirements for an associate degree in Manchester with a minimum grade-point average of 2.50 and who are recommended by their academic advisers are guaranteed admission to the University in Durham. The University does not, however, guarantee admission to a specific college or program.

Selected UNH bachelor of arts degree programs, designed to serve adult part-time students in the Merrimack Valley, as well as selected degrees from other colleges of the University System of New Hampshire are also available through the University of New Hampshire at Manchester.

For More Information

UNHM courses are listed on p. 167 of this catalog. To receive a UNHM Bulletin and more specific information on UNHM courses and programs, contact the University of New Hampshire at Manchester, 220 Hackett Hill Road, Manchester, N.H. 03102 (603) 668-0700.

Division of Continuing Education

William F. Murphy, Dean

The Division of Continuing Education provides access to higher education for New Hampshire residents under conditions that permit individuals to participate in University programs appropriate to their changing educational needs. These needs may at times be best satisfied through participation in workshops, seminars, short courses, or certificate programs—at other times by enrollment in credit courses and degree programs.

The Division of Continuing Education faculty is drawn from the teaching staffs of the University, from the faculties of neighboring colleges and universities, and from business, professional, and community leaders.

In addition to the programs listed below, it is possible to complete many of the degree requirements in other areas of study offered by the University through enrollment in credit courses scheduled by the Division of Continuing Education each semester. For descriptions of courses, see page 103.

Associate in Arts Degree

The associate in arts degree gives students an opportunity to obtain a general, two-year college education, elect coursework in several career-related fields, and in some instances earn college credits in supervised work experience with cooperating employers. The program is particularly suited to adults who are returning to the University after an interruption in their studies, who wish to be either full- or part-time degree students, and who need some time to establish their academic goals.

A wide range of University credit courses is available both during the late afternoon and early evening hours and during the daytime. Special procedures have been designed to simplify admission and registration for part-time evening students.

Within the associate in arts degree program, students may elect to concentrate their studies in one of the career concentrations described under diploma programs (see below) or in other approved areas.

The degree can be complete in itself or it can be a halfway mark toward a bachelor's degree. Credits earned as an A.A. degree candidate are transferable into related bachelor's degree programs at UNH and other colleges and universities.

Admission Requirements For the associate in arts degree program, candidates must have a high school diploma or an equivalency certificate and should have demonstrated ability and motivation through secondary school achievement, work experience, and/or military service. Because of the present limited residence hall capacity of the University, this program is available only to commuting students.

Graduates of associate in arts programs are awarded a minimum of 64 credit hours upon entry into a UNH bachelor's degree program. Degree candidates wishing to continue their studies should consult with their advisers to ensure that their planned programs meet the specific requirements for the selected major at the institution awarding the bachelor's degree.

The associate in arts degree program is offered on a full-time and a part-time basis. Students interested in the part-time evening A.A. degree option should obtain an application form from the Division of Continuing Education. Students interested in a full-time or daytime A.A. degree program should obtain the application form from the UNH Admissions Office.

Degree Requirements For degree requirements, see page 16.

Academic Regulations and Pass/Fail Associate in arts degree candidates are subject to the academic requirements established by the University for all students.

Associate in arts degree candidates, after completion of a minimum of 16 credits at the University of New Hampshire on a regular graded basis of A to F, may use the pass/fail grading alternative in a maximum of two elective four-credit courses. The pass/fail grading alternative may be used for a maximum of four credits per semester. No pass/fail grading alternative may be used in fulfillment of University general education requirements or for courses in students' declared career concentrations. The minimum passing grade for credit is a D- (0.67).

Advising Program planning and other advising services are provided by the professional staff of the Division of Continuing Education. Academic advisers are available from 8 A.M. to 4:30 P.M. daily and during evening hours on an appointment basis.

Financial Aid Associate in arts degree candidates are eligible for the full range of financial aid offered by the University. See the Financial Aid section of this catalog.

Special Student Status

Special students—those who are not formally admitted into a degree program at the University of New Hampshire—may enroll in University credit courses each semester through the Division of Continuing Education.

All special undergraduate students are limited to 11 credits per term unless they obtain written permission from the dean of admissions, Grant House. Special graduate students are also subject to enrollment limitations. Contact the Division of Continuing Education for details.

Undergraduate Courses Special students must have a high school diploma or its equivalent or be at least 18 years of age.

Graduate Courses Special students must hold a bachelor's degree or equivalent from an approved college or university.

Prerequisites All students are responsible for satisfying course prerequisites, if any. Instructors may require students to withdraw from a course if they are not adequately prepared for the level of work.

Academic Standards A cumulative grade-point average of 2.00 (C grade) is the minimum acceptable level for undergraduate work in the University. The records of special undergraduate students are examined periodically; academically deficient or potentially deficient students may be warned, excluded, or suspended.

Diploma Programs

Computer Information Studies A career in computer information offers excellent opportunities for advancement and professional growth for individuals with appropriate training. Because computer information specialists are essential in today's technological, information-oriented society, qualified men and women will be in constant demand. Long-range employment forecasts predict solid, continuing growth well into the next decade.

This career concentration trains individuals for such entry-level positions as data analyst, applications technician, programmer, and computer operations supervisor. Graduates should be qualified to work on projects that involve equipment ranging from personal computers to large-scale hardware.

Required computer information studies courses: CS 410 and 410P or CS 406; DCE 491, 492, 590, 591, and 592; MATH 420.

Criminal Justice Careers in criminal justice are among the most challenging occupations. Careers in criminal justice extend beyond the "police beat" and include, for example, positions in various agencies of law enforcement at the municipal, county, state, and federal levels of government, and in private industry. Required criminal justice courses: DCE 550, 551, and 552, and a choice of one from DCE 554, POLT 507, or SOC 515.

Pre-Engineering and Physical Sciences Adults who desire a University degree in engineering or the physical sciences may enroll on a full-time or part-time basis through the associate in arts degree program.

This program satisfies first-year course requirements of most bachelor of science programs in engineering and physical sciences. For further information, see separate Pre-Engineering Bulletin.

Required courses: MATH 425-426; PHYS 407-408; CHEM 403-404.

Noncredit Courses

Throughout the year, the Division of Continuing Education offers noncredit courses to the community. These courses provide opportunities for individual growth or continuing education for groups and individuals in business, labor, education, government, or the professions.

Professional and career development noncredit courses typically meet one evening a week for about ten weeks, depending on course objectives. Examples include paralegal studies, business writing, information systems, graphic arts, interior design, skills for teaching, and labor-management relations.

Personal enrichment courses are offered during the day and evening, during the week, and on weekends. Examples include physical fitness and recreation, parent-child communication, arts and crafts, local history, current events, personal financial planning, creative writing, and photography.

Noncredit Certificate Programs

Certificate programs consist of specifically developed sequences of courses that provide a sound balance of theory, fundamentals, and specialized training. Certificates of achievement awarded by the Division of Continuing Education have earned professional acceptance as evidence of increased knowledge in basic principles and techniques.

Noncredit certificate programs include interior design, graphic arts, gerontology, applied farm technology, calligraphy, illustration, and paralegal studies.

Conferences and Workshops

The Division of Continuing Education also conducts institutes, workshops, and seminars, which range from half-day briefings on specific topics to residential institutes lasting several days or weeks. Such programs are offered on topics of community interest and for the continuing education of business, industry, government, and the professions.

The Division of Continuing Education uses the facilities of the entire University campus for its programs, as well as the New England Center (adjacent to the UNH campus) and nearby commercial establishments.

Course Charges

Students who enroll in credit courses through the Division of Continuing Education pay on a per-credit basis, depending on course level. These course charges are listed in the Division of Continuing Education Bulletin published before each semester. The course charges for noncredit courses and for conferences, workshops, and institutes vary according to the scope of the individual programs.

Class Schedule

While students may enroll in morning and afternoon classes through the Division of Continuing Education, many courses offered each semester are scheduled in the late afternoon and early evening to accommodate evening students.

All courses offered by the University each semester are open to special students on a space-available basis.

For More Information

For further information about programs or services, course offerings, registration procedures, and academic requirements, call or write the Division of Continuing Education, Verrette House, UNH, Durham, N.H. 03824 (603) 862-2015.

Summer Session

William F. Murphy, Dean

The University of New Hampshire offers students the opportunity to continue their studies on a year-round basis through multiple sessions during the summer months. The summer courses are of the same high quality as those during the regular academic year and require the same level of academic performance.

Summer Session offerings include a full range of undergraduate and graduate credit courses in most of the major academic disciplines. Throughout the summer, classes are scheduled in the morning, afternoon, and evening.

Enrollment in Summer Session classes does not imply admission to degree candidacy.

Undergraduate Courses

Undergraduate courses are open to undergraduates from UNH and other colleges, to interested members of the community who have a high school diploma or its equivalent or who are at least 18 years of age, and to high school students completing their junior or senior year (by permission of the dean).

Graduate Courses

Graduate courses are open to graduate students and other individuals with a bachelor's degree or its equivalent from an approved college or university.

Other Offerings

Other Summer Session offerings include noncredit courses and certificate programs; workshops and seminars for business, industry, and the professions; and residential conferences and institutes.

For More Information

A separate summer bulletin is published each year in March and is available from Summer Session, Verrette House, University of New Hampshire, Durham, N.H. 03824 (603) 862-2015.

Graduate School

Raymond L. Erickson, Dean
Harry J. Richards, Associate Dean

Master of Arts
Counseling
Economics
English
  Literature
  Language and Linguistics
  Writing
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Science
Animal and Nutritional Sciences
Biochemistry
Biology
Botany
Chemical Engineering
Chemistry
Civil Engineering
Communication Disorders
Computer Science
Earth Sciences
  Geology
  Oceanography
Electrical Engineering
Entomology
Family and Consumer Studies
Forest Resources
Genetics
Hydrology
Mathematics
Mechanical Engineering
Microbiology
Music Education
Nursing
Ocean Engineering
Physical Education
Physics
Plant Science
Resource Administration and Management
Resource Economics
Soil Science
Wildlife
Zoology

Master of Arts in Teaching
Elementary Education
Secondary Education

Master of Science for Teachers
Chemistry
English
Mathematics
Physics

Master of Education
Administration and Supervision
Counseling
Developmental Disabilities
Early Childhood Education
  Special Needs
Elementary Education
Reading
Secondary Education
Special Education

Master of Occupational Education

Master of Business Administration

Master of Public Administration

Certificate of Advanced Graduate Study
Counseling
Educational Administration and Supervision

Doctor of Philosophy
Animal and Nutritional Sciences
Biochemistry
Botany
Chemistry
Earth Sciences
  Geology
  Oceanography
Economics
  Organizational Behavior/Labor
Engineering
English
Genetics
History
Mathematics
Mathematics Education
Microbiology
Physics
Plant Science
Psychology
Reading/Writing Instruction
Sociology
Zoology

The Graduate School offers a wide range of programs leading to the master's degree, two programs leading to the C.A.G.S., and a number of programs leading to the Ph.D. degree. Graduate programs have been developed systematically to achieve academic excellence by careful utilization of institutional resources and regional opportunities. A highly qualified graduate faculty supervises programs and establishes the requirements for admission and degrees, which are administered by the dean of the Graduate School.

Most graduate programs are relatively small and permit students to work closely with faculty members in the area of specialization. The aim of graduate programs is to offer high-level professional training in their respective disciplines and to provide opportunities for students to learn and practice sound research methods. Graduate students are expected to use fully the available opportunities and to demonstrate the maturity and self-discipline necessary for sound scholarship.

Admission Graduate School admission may be granted to graduates of colleges and universities of approved standing, provided that applicants' undergraduate records are satisfactory.

Applications for admission and the Graduate Catalog containing detailed descriptions of graduate programs may be obtained from the Graduate School, Horton Social Science Center, UNH, Durham, New Hampshire 03824.

Early Admission—University of New Hampshire Seniors Qualified senior students at the University of New Hampshire may be admitted to the Graduate School provided they have followed normal application procedures; they must have been admitted for the semester in which they wish to enroll in courses for graduate credit. A 3.20 cumulative grade-point average is normally required to be considered for early admission. Such seniors are normally admitted prior to the start of their last undergraduate semester. Seniors who have been admitted under early admission may register for a maximum of two courses for graduate credit.

Dual Credit—UNH Seniors University of New Hampshire seniors who have been admitted to the Graduate School under early admission may, upon recommendation of the department and approval of the Graduate School, be allowed to count up to eight credits of graduate-level coursework toward both a bachelor's and master's degree. Dual credit forms must be completed and approved by the dean of the Graduate School at the beginning of the semester for which dual credit is sought. Dual credit forms are available at the Graduate School.

Financial Assistance Graduate assistantships are available in most departments. These involve part-time work in connection with the University's instructional or research activities. University awards, such as tuition scholarships, are also available to qualified students. Assistantships and scholarships are awarded on the basis of academic qualifications.

Financial assistance in the form of College Work-Study and loans may be available through the Financial Aid Office.

Explanation of Arrangement

The title and arabic number designate the particular course. When two course numbers are connected by a hyphen, the first semester of the course, or its equivalent, is a prerequisite to the second. If the course numbers are separated by a comma, qualified students may take the second semester without having had the first.

In courses that are not designated by title as laboratory courses, the notation "Lab" indicates that laboratory sessions are a part of the course.

Prerequisites and Corequisites

Each prerequisite for a course is separated from the other prerequisites by a semicolon; e.g., Prereq: EDUC 601; PSYC 635. If permission (of the instructor, department, adviser, or committee) is a prerequisite for all students, it is listed among the prerequisites; e.g., Prereq: EDUC 601; PSYC 635; permission. If, on the other hand, permission may be substituted for one or more of the listed prerequisites, it follows the other prerequisites and is separated from them by a slash mark; e.g., Prereq: EDUC 601; PSYC 635;/or permission. If permission may be substituted for only one of the prerequisite courses, it is listed with the course for which it may be substituted; e.g., Prereq: EDUC 601 or permission; PSYC 635.

Corequisites are courses that must be taken in the same semester.

Credits

The number of credits listed is the number of semester credits each course number will count toward graduation (except in the case of variable credit courses). Students must register for the number of credits shown or, if the course is variable credit, within the range of credits shown.

Cr/F following the description indicates that no letter grade is given but that the course is graded Credit or Fail.

For up-to-date information about when a course is offered; who teaches the course; the number of recitations, lectures, labs, and such, students are referred to each semester's *Time and Room Schedule*.

The system of numeric designation is as follows:

200–299 Courses in Thompson School of Applied Science.* Full credit only to TSAS degree candidates, who may transfer partial credit toward other asssociate and baccalaureate degrees.

400–499 Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.

500–599 Intermediate-level courses for undergraduate credit only.

600–699 Advanced-level undergraduate courses.
Entrance to courses numbered 600 and above normally requires junior standing.

700–799† Advanced-level undergraduate courses.
Ordinarily not open to freshmen and sophomores.

800–999 Courses that carry graduate credit only and therefore are open only to admitted or special graduate students.

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*See TSAS bulletin. UNH baccalaureate or associate in arts degree candidates may take 200-level courses for audit only, as the courses carry no graduation credits.

†At the time this catalog went to press, 700- and 800-level courses were being renumbered. As a result, some 700-level course numbers may change. Students should consult the *Time and Room Schedule* for up-to-date information.

Administration (ADMN)

(For program description, see page 68.)

Program Director: Stephen L. Fink
Professors: Stephen L. Fink, Charles W. Gross, Jonathan Gutman, James O. Horrigan, Manley R. Irwin, Fred R. Kaen, Marvin J. Karson, Barry Shore, Linda G. Sprague, William E. Wetzel, Jr., Robin D. Willits, Dwayne E. Wrightsman
Adjunct Professor: R. Stephen Jenks
Associate Professors: John H. Barnett, Joseph F. Durocher, Jr., Ahmad Etebari, John Freear, Raymond J. Goodman, Jr., Francine S. Hall, Jinoos A. Hosseini, Michael J. Merenda, Richard L. Mills, Melvin Sandler, Starr F. Schlobohm, Allen R. Thompson, Rita Weathersby
Visiting Professor: Gunapala Nanayakkara
Assistant Professors: Gene Bocialetti, Susan H. Herhold, Allen M. Kaufman, R. Daniel Reid, Jeffrey E. Sohl, T. J. Wharton
Adjunct Assistant Professors: Richard D. Lamb, John H. Overton
Instructors: Judith N. Bouley, Ruth Clarke, Celeste DiMambro, Peter W. Royce
Lecturers: Jacalyn Cilley, Ann L. Cunliffe, Nancy L. Hansen, Naida Kaen, Joseph E. Michael, Jr.
Director of Executive Programs: Michael J. Merenda

424. Business Statistics
Introductory coverage of statistical methods for managerial decision making: probability, descriptive and inferential statistics, and regression. Quantitative techniques common to many introductory statistics courses are covered, but the emphasis is on understanding concepts such as uncertainty, inferences from sample data, and model formulation, and on utilizing these techniques as aids in decision making. No credit for students who have had MATH 536, MATH 644, PSYC 402, RECO 528, or SOC 502. 4 cr.

447. Personal Taxation
Summary of federal income taxation from the viewpoint of the individual. No credit toward an ADMN major. 4 cr.

502. Financial Accounting
Concepts, procedures, and tools of analysis in selection, quantification, and communication of economic events affecting financial condition, income, and cash flows of organizations. No credit for students who have had ADMN 517 or DCE 462-463. 4 cr.

503. Managerial Accounting
Planning, budgeting, and control within an organization. Emphasis on cost analysis in decision making. Prereq: ADMN 502. 4 cr.

517. Survey of Basic Accounting
Concepts, conventions, and processes in financial and managerial accounting. Usefulness and limitations of accounting data in decision making and in analyses of past results. (For non-ADMN majors and minors. No credit for students who have had ADMN 502.) 4 cr.

523. Advanced Business Statistics
Sample survey design and analysis, experimental design, analysis of variance, nonparametric methods. Prereq: ADMN 424. 4 cr.

526. Introduction to Business Data Processing
Fundamentals of data processing with applications to the functional areas of management. Topics include system design, software, hardware, and applications. Prereq: ADMN 424. 4 cr.

550. Survey of Marketing
Focuses on marketing as the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives. For non-ADMN majors and minors. No credit for students who have had ADMN 651. 4 cr.

580. Introductinn to Organizational Behavior
Application of behavioral science concepts to work settings in profit and nonprofit organizations. Individual behavior, interpersonal relations, work groups, relations among groups—studied in the context of organizational goals and structure. Experiential focus. For non-ADMN majors and minors. No credit for students who have had ADMN 611. 4 cr.

602. Values in a Managerial Society
The role and influence of values on management decision making. The conflict between

traditional values such as material progress, private property, self-interest, etc., and emerging notions about environmentalism, consumerism, worker and product safety, etc. is examined through case discussions and readings. 4 cr.

605. Operations Research
Synthesis and analysis of basic principles and methods of operations research applied to managerial decisions. Mathematical programming, networks, inventory, queuing, sequencing, scheduling, and Markovian models. Prereq: permission. 4 cr.

606. Advanced Operations Research
Analysis and synthesis of complex operations research models. Project is undertaken by all students. Advanced mathematical programming (nonlinear, parametric linear, stochastic, and dynamic), stochastic inventory models, advanced queuing models, and heuristic programs. Prereq: ADMN 605 or permission. 4 cr.

611. Behavior in Organizations
Application of behavioral science concepts to work settings and management. Focus on analyzing work situations and developing action recommendations based on understanding behavior. Major topics include individual behavior, interpersonal relations and communication, work groups, relations among groups—studied in the context of organizational goals and structure. Open to WSBE majors only. No credit for students who have had ADMN 580. Prereq: all Group A courses and junior standing. 4 cr.

614. Organizational Analysis
Provides a framework and concepts for understanding the nature and functioning of organizations of various types: business, educational, health, social service. Enhances students' skills as organizational members and managers. Case discussions, class exercises, field work. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

626. Advanced Computer Systems Analysis and Design
Analysis and design of computer systems in administration. Applications in finance, accounting, marketing, and manufacturing. Case studies and projects. Prereq: ADMN 526. 4 cr.

630. Applied Regression Analysis
Introduction to regression techniques as used in economics and management; estimation and statistical inference in the context of the general linear model; discussion of problems encountered and their solutions; extensions of the general linear model. Prereq: ADMN 424. (Also offered as ECON 626.) 4 cr.

635. Statistical Decision Making
Introduction to decision-making theory, including alternatives, criteria, loss functions, and risks. A probabilistic, including Bayesian, approach to decision making under uncertainty. Applications from statistics and management science. Prereq: ADMN 424. 4 cr.

643. Time Series Forecasting
Introduction to modern methods of forecasting from time series data. Exponential smoothing, time series analysis and stationarity, Box-Jenkins analysis, state space model fundamentals, dynamic regression models. Each model methodology includes model identification, estimation, and diagnostic checking. Emphasis on use of the models as forecasting tools. Prereq: ADMN 424 or equivalent. 4 cr.

647-648. Business Law I, II
Law of contracts, agency, sales, negotiable instruments, real and personal property, partnership and corporations, with application of the Uniform Commercial Code. Prereq: at least junior status; permission. 4 cr.

650. Operations Management
Analysis of operational problems in the manufacturing product and service sectors; standards, capacity, inventory, scheduling, and control. Open to WSBE majors only. Prereq: all Group A courses and junior standing. 4 cr.

651. Marketing
Covers marketing as the process of planning and developing goods and services to satisfy the needs of target customers: consumers, other businesses, and institutions. Focus on how marketing contributes to the firm's goals through product planning, pricing, promotion, and distribution policies. Open to WSBE majors only. No credit for students who have had ADMN 550. Prereq: all Group A courses and junior standing. 4 cr.

653. Financial Management
Acquisition, management, and financing of a firm's resources by means of money. Capital market theory, capital budgeting, cost of capital, capital structure theory, dividend policy, and working capital management. Open to WSBE majors only. Prereq: all Group A courses and junior standing. 4 cr.

685-686. Study Abroad
Open to students studying abroad in the discipline as approved by the administration program director. 1–16 cr. Cr/F.

695. Independent Study
Individual research projects that are student designed. Initial sponsorship of a business administration faculty member must be obtained, and approval of WSBE adviser and dean. For juniors and seniors in high standing. 1–12 cr.

696. Supervised Student Teaching Experience
Participants are expected to perform such functions as leading discussion groups, assisting faculty in undergraduate courses that they have successfully completed, or working as peer advisers in the Advising Center. Enrollment is limited to juniors and seniors who have above average G.P.A.s. Reflective final paper is required. Prereq: permission of instructor, program director, and director of advising. 1–4 cr. May be repeated to a maximum of 4 cr. Cr/F.

698. Topics in Administration
Special topics; may be repeated. Prereq: permission. 4 cr.

701. Strategic Management: Environmental Issues
Managerial problem solving relative to the ethical, economic, social, political, and technical aspects of an organization's environment. Open to WSBE majors only. Prereq: all Group A and B courses. 4 cr.

703. Strategic Management: Decision Making
Capstone course, interrelating and applying specialized courses; cases of companies, firms, and industries. Special emphasis on the role of the strategic manager in the decision-making process. Open to WSBE majors only. Prereq: all Group A and B courses. 4 cr.

712. Managing Organizational Change
Presents conceptual and technical tools to manage the challenge of change, both unpredictable and predictable. Topics include the process of change; change strategies; change agent roles—internal and external; bases of resistance to change; coping with resistance. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

713. Interpersonal Skills for Managers
Focuses on student awareness of interpersonal style and its effectiveness in gaining personal and organizational rewards. Also considered is the process by which groups develop and the management of that development. Prereq: permission. 4 cr.

714. Managing Organizational Conflict
Conflict among individuals, small groups, and organizations. Analysis of cases, readings, simulations, and roleplays (often using video tape) develops useful concepts and skills for dealing with conflict. Students examine their own behavior in coping with conflicts within the class. Field project required. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

717-739. Advanced Financial Accounting I, II
Theory and practice in regard to income measurement and asset valuation. Special topics including consolidations, partnerships, leases, pensions, price-level reporting, foreign currencies, and fund accounting. Prereq: All Group A courses and ADMN 653. 4 cr.

718. Cost and Management
Effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital budgeting analysis. Emphasis on decision making. Prereq: ADMN 503. 4 cr.

720. Auditing
The attest function and the responsibility and professional ethics of the independent auditor in our society. Audit concepts, procedures,

objectives, and reports. Operational audits, social audits, and management services. Prereq: ADMN 717 or permission. 4 cr.

722. Topics in Accounting
Special topics. Prereq: ADMN 717 or 718, depending on topics; permission. 4 cr.

723. Topics in Finance
Prereq: ADMN 653. 4 cr.

724, 725. Advanced Production Planning and Control I, II
Analysis and development of production planning and control systems. Topics include inventory management, material requirements planning, capacity management, and production activity control. Prereq: permission. 4 cr.

726. Decision-Support Systems
Exploration of computer usage in support of the problem-solving and decision-making process. Topics include conceptual foundations of decision-support systems, design of decision-support systems, spreadsheets, data base, and expert systems. Use of main frame and microcomputers, cases, projects; guest speakers. Prereq: all Group B courses; ADMN 526; and permission. 4 cr.

730. Investments Analysis
Security valuation, efficient markets, portfolio management, options, and alternative investments. Computer research topics. Prereq: ADMN 653; permission. 4 cr.

732. Exploration in Entrepreneurial Management
Examination of the management of change and innovation with particular attention to the role of the entrepreneur in the management of new ventures. Characteristic behavioral, organizational, financial, and marketing problems of entrepreneurs and new enterprises. Prereq: permission. 4 cr.

742. Management Information Systems
Concepts, design, and implementation of systems to provide information and support for managerial decision making. Use of computers, models, and behavioral factors from the manager's perspective. Prereq: juniors and seniors only. 4 cr.

745. International Business
Issues and problems confronting managers in the international economy. Emphasis on problems of working across national borders rather than on those encountered within the framework of different national economies, cultures, and institutions. For managers working in a multinational enterprise. Prereq: permission. 4 cr.

746. International Financial Management
Financial management problems facing multinational firms. Primary focus on effects of currency denominations on financial decisions. Prereq: ADMN 653. 4 cr.

747. Business Taxation
Taxation factors relevant to business decisions. Emphasis upon federal income taxation from the viewpoint of the firm. Prereq: ADMN 502. 4 cr.

750. Marketing Management
Practical application of theories taught in ADMN 651. Planning, organization, and control of marketing activities in large corporations and small businesses; new-product development; pricing policies; selection of channels of distribution; interrelationships between marketing, production, and finance. Sound policy formulation and decision making established through analysis of cases. Prereq: a basic marketing course. 4 cr.

751. Advertising and Promotion
Covers advertising and other promotional tools that assist the firm in communicating with its customers. Advertising planning and strategy development in relation to marketing goals; creating and executing advertisements; advertising from a cultural perspective domestically and internationally. Prereq: ADMN 651 or permission. 4 cr.

752. Marketing Research
Formulating research objectives to solve marketing problems: techniques for surveys and marketing experimentation; analysis of data to aid marketers in decision making; strengths and limitations of marketing research in the marketing process. Prereq: ADMN 651 or equivalent. 4 cr.

755. Advanced Business Finance
Development of analytical tools and practical skills for recognizing and solving complex problems of business finance. Working-capital management, capital budgeting, cost of capital, capital structure, and dividend policy. Prereq: ADMN 653. 4 cr.

760. International Marketing
Environmental factors affecting international trade: culture and business customs, political and legal factors and constraints, economic and technological development, and the international monetary system. Integration of these with the marketing management functions of market research and segmentation; product, promotion, distribution, and pricing decisions. Prereq: ADMN 651 or permission. 4 cr.

761. Sales Management
Principles and methods of successful personal selling and management of the sales function. Exposure to selling experience in field of student interest; case studies, sales presentations; oral and written analyses of sales management issues. Prereq: ADMN 651 or equivalent. 4 cr.

762. Marketing Workshop
Integrative study of a real marketing situation in a business, nonprofit institution, or government agency. Student teams identify problem, research or collect data, suggest alternative solutions, and submit a recommended course of action. Prereq: ADMN 651; one additional advanced marketing course; permission. 4 cr.

770. Personnel Administration
Role of personnel administration and human resource management in achieving goals in "for-profit" and "not-for-profit" organizations. Functions of management; scope, technique, and current issues of personnel administration; organization of personnel activities and staff. How managers relate to personnel administration and interact with personnel administration staff and services. Prereq: permission. 4 cr.

775. Labor-Management Relations
Study of the legal, economic, and institutional environment within which labor-management relations occur and of the processes and goals that determine the rules governing labor-management relations. Focus on relations in the U.S., covering union and non-union and private and public enterprises. Issues considered include employee discipline, seniority and performance appraisal, and job rights versus management rights. Grievance administration, arbitration, and contract negotiations also examined. Prereq: senior standing or permission. 4 cr.

780. Issues for Men and Women as Managers
With changing work patterns and family roles, male and female managers need new skills and sensitivities to work together effectively. Course seeks to heighten awareness of gender-related attitudes and behaviors as they affect work interactions. Topics include implications of gender expectations for leadership, communication, and career success; impact of stereotypical attitudes and behaviors; issue of sexual attraction and harassment at work; and considerations for balancing career and family. Prereq: senior standing; permission. 4 cr.

785. Career Management
Develops individual career management skills. Topics include concepts of career development; issues pertaining to career management in organizations. Helpful for students interested in human resource management. Prereq: juniors and seniors only; permission. 4 cr.

795. Internship
On-the-job skill development through fieldwork in an organization (business, industry, health, public service, etc.). Normally, supervision is provided by a qualified individual in the organization, with frequent consultation by a faculty sponsor. Written report required. Internships may be part or full time, with course credits assigned accordingly. 1–16 cr. Cr/F.

798. Topics in Administration
Special topics; may be repeated. Prereq: consent of adviser and instructor. 1–4 cr.

799. Honors Thesis/Project
Supervised research leading to the completion of an honors thesis or project; required for graduation from the honors program in administration. 4–8 cr.

Aerospace Studies (AERO), Reserve Officer Training Corps

(For program description, see page 75.)

Professor: Col. Arthur J. Heaphy, Jr.
Assistant Professors: Major David Stoh, Capt. Gloria A. L. Copeland, Capt. Gregory S. Meserve

Leadership Laboratory is required each semester of all Air Force ROTC students seeking commissions as second lieutenants in the U.S. Air Force upon graduation. Students taking Air Force ROTC courses for credit, but not seeking commissions, need not register for this lab.

301. Leadership Laboratory
Taken by all AFROTC cadets throughout enrollment in AFROTC. Command and staff leadership experiences in cadet corps. Air Force customs and courtesies, drill and ceremonies, career opportunities, and life and work of the junior officer. Student leadership potential developed in a practical, supervised laboratory. Field trips to Air Force installations. 0 cr.

415. The Air Force Today I
Development, mission, and organization of the Air Force as an instrument of the U.S. national defense policy. 1 cr.

416. The Air Force Today II
Major Air Force commands; roles of separate operating agencies; organization, systems, and operations of strategic defense; general-purpose aerospace support forces. 1 cr.

541. The Development of Air Power I
The nature of warfare; development of air power from balloons and dirigibles through World War II. 1 cr.

542. The Development of Air Power II
Development of air power from post–World War II through the peaceful use of air power in Berlin; the Cuban crisis; air war in Southeast Asia; and research and development of present and future aerospace vehicles. 1 cr.

671. Air Force Management and Leadership I
An integrated management course emphasizing the individual as a manager in the Air Force. Motivation and behavior, leadership, communication, group dynamics, and decision making in a changing environment. Air Force cases studied. 4 cr.

672. Air Force Management and Leadership II
Organizational and personal values; management of forces in change; organizational power, politics, managerial strategy, and tactics; Air Force cases studied. 4 cr.

681. National Security Forces in Contemporary American Society
Focus on the armed forces as part of American society, emphasizing civil-military relations in context of U.S. policy formulation and implementation. Requirements for adequate national security forces; political, economic, and social constraints on the national defense structure; impact of technological and international developments on strategic preparedness; the variables involved in the formulation and implementation of national security policy. 3 cr.

682-683. The Military Profession
Focus on attitudes toward the military, socialization processes, role of the professional military leader-manager, and military justice and administrative law. 1 cr. each sem.

Animal and Nutritional Sciences (ANSC)

(For program description, see page 36.)

Chairperson: William A. Condon
Professors: William A. Condon, Thomas P. Fairchild, James B. Holter, Samuel C. Smith, Richard G. Strout, Willard E. Urban, Jr.
Associate Professors: William E. Berndtson, Roger A. Cady, Colette H. Janson-Sand, Alan H. Parsons, Charles G. Schwab, Anthony R. Tagliaferro, Roger E. Wells
Assistant Professors: Patricia Dugan-Bedker, Janet C. Briggs, Joanne Curran-Celentano, Nancy R. Deuel, Thomas L. Foxall, Richard S. Kingston, Robert L. Taylor, Jr.
Instructor: Richard J. Hurley
Lecturer: Elizabeth C. Smith
Teacher/Trainer: Amy S. Dickens
Extension Educator: F. Carlton Ernst, Jr.

400. Food and People
Nutrition and food science; biological, social, political, economic, and historical significance of food. Animal food products. (Also offered as NUTR 400.) Special fee. 4 cr.

401. Introduction to the Animal Sciences
Overview of dairy, livestock, light horse, and poultry industries; animal physiology, nutrition, genetics, and diseases; animal products and human health; animal science research. Special fee. Lab. 4 cr.

402. Horsemanship
For beginning, intermediate, and advanced riders. Basics of balance seat, specializing in basic dressage and combined training. Limited number of students may stable their horses at the University. Special fee. May be repeated for a maximum of 12 credits. 2 cr.

404. Introductory Equine Science
Study of the horse industry encompassing nutrition, genetics, breeds, selection procedures, and health maintenance. Lab. 4 cr.

405. Food and Society
Consideration of the cultural significance of food, emphasizing historical, psychological, social, political, and economic aspects. (Also offered as NUTR 405.) 4 cr.

406. Careers in Animal Science
A survey of various areas of animal and veterinary science and opportunities available. Required of all ANSC freshmen; open to others by permission. 1 cr. Cr/F.

502. Fundamentals of Animal Health
Principles of disease mechanisms: causes, body reactions, and immunology. Prerequisite for other ANSC disease courses. 2 cr.

503. Abattoir Management
Licensing requirements, sanitation, inspection facilities, and use of the slaughterhouse; field trips. Prereq: permission. Lab. 2 cr.

504. Meat and Its Products
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry; field trips. Lab. 3 cr.

507. The Scientific Approach to Equine Discipline
Physiological development, control, and education; bitting, longeing, driving, and equine gymnastics. Prereq: ANSC 402; permission. Lab. 2 cr.

508. Dairy Husbandry Clinic
Practical experience in dairy husbandry techniques. Only for students with no previous experience in dairy husbandry. Prereq: permission. 2 cr. Cr/F.

550. Livestock Management
Economic principles and management factors involved in the production of beef, sheep, and swine. Lab. 4 cr.

552. Introductory Dairy Herd Management
Economic principles and management factors involved in successful dairy herd management. Criteria for success, record keeping, applied genetics, housing, materials handling, feeding, and health care are topics covered. 3 cr. (Not offered every year).

554. Introductory Dairy Herd Management Lab
Practical study of various aspects of dairy herd management. Farm visits and case studies will be involved. Should be taken concurrently with ANSC 552. 1 cr. (Not offered every year).

556. Poultry Management
Economic principles and management factors involved in poultry production. Lab. 4 cr. (Not offered every year).

601. Livestock Selection
Principles of selecting beef, sheep, and swine based on performance, pedigree analysis, progeny testing, and type evaluation. Lab. 2 cr.

603. Dairy Cattle Selection
Principles of selecting dairy cattle based on performance, pedigree analysis, progeny testing, and type evaluation. Lab. 2 cr.

604. Light Horse Selection
Principles of selecting light horses based on performance, pedigree, progeny records, and type evaluation. Lab. 2 cr.

605. Principles of Nutrition
Principles underlying nutrition of animals; digestion, absorption, and intermediary metabolism; function of nutrients in maintenance,

growth, and production; metabolic disorders resulting from inappropriate intake of nutrients. Prereq: 1 year of chemistry; 1 semester of physiology. (Also offered as NUTR 605.) Special fee. Lab. 4 cr.

607. Small Animal Diseases
Common diseases in companion animals; emphasis on canine and feline medicine. Prereq: ANSC 502. 2 cr.

610. Feeds and Feeding
Classification, identification, and characteristics of animal feedstuffs; feed processing and palatability; feeding methods; balancing rations; specific application to dairy, beef, sheep, goats, swine, poultry, horses, rabbits, mink, and fish. Prereq: ANSC 605. Lab. 4 cr.

612. Genetics of Domestic Animals
Application of Mendelian principles to traits of domestic animals with particular emphasis on economically important traits of farm animals. Principles of population and quantitative genetics will be introduced. Topics will include sex linkage, Hardy-Weinberg Law, meiosis, elementary statistics, genetic relationships, and heritability. Lab. 4 cr.

614. Diseases and Parasites of Wildlife
An ecological approach to some of the more common diseases and parasites of fishes, birds, game, and fur-bearing mammals. Influence of environment and management practices on the incidence and severity of diseases; relationship of wildlife diseases to human health. Prereq: permission. 3 cr. (Not offered every year.)

616. Wildlife Disease Laboratory
Demonstrates necropsy techniques and examination of wildlife specimens for common parasitic and other diseases. Restricted to wildlife management majors only. Prereq or coreq: ANSC 614. 1 cr. Cr/F.

617. Livestock Diseases
Common veterinary problems of dairy and beef cattle, sheep, goats, and swine. Prereq: ANSC 502 or equivalent. 2 cr.

619. Livestock Disease Clinic
Disease principles applied to clinical cases in the University herds and flocks; practical treatments and methods. Should be taken concurrently with ANSC 617. Prereq: ANSC 502 and permission. 2 cr.

620. Equine Diseases and Parasites
Common veterinary problems of horses, including infectious diseases, colic, parasites, and lameness. Prereq: ANSC 502 or equivalent. 2 cr.

622. Equine Disease Clinic
Disease principles applied to clinical cases in the University herd. Should be taken concurrently with ANSC 620. Prereq: ANSC 502 and permission. 2 cr.

623. Comparative Histology
Introduction to microscopic anatomy of domestic animal tissues and body systems with reference to human, avian, fish, and marine mammals. Structure and function briefly correlated. Prereq: ZOOL 507-508 or permission. 4 cr. (Not offered every year.)

653-654. Principles of Teaching Equitation
Teaching techniques and procedures, with emphasis on dressage; opportunity to teach riding theory and techniques to other students under supervision of instructor. Teaching certificate awarded to students successfully completing course. Prereq: ANSC 402, 507, and 652; permission. Special fee. Lab. A year-long course; 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

656. Research Laboratory Methods I
Laboratory safety, calculations, quality control, overview of instrumentation, and trouble shooting as applied to introductory research techniques. Prereq: CHEM 403-404. (Also offered as MEDT 656.) 4 cr.

695-696. Supervised Teaching Experience
Participants are expected to perform such functions as leading discussion sections, directing and assisting in laboratories, and assisting students with their problems in courses that participants have completed successfully. Enrollment is limited to juniors and seniors who have a minimum 3.00 cumulative average. Prereq: permission of instructor and department chairperson. 1–2 credits. May be repeated up to a maximum of 4 credits. Cr/F.

697. Equine Seminar
Current equine industry issues, recent literature and research, and professional preparation. May be repeated to a maximum of 4 credits. 1 cr. Cr/F.

701. Physiology of Reproduction
Comparative aspects of embryology, anatomy, endocrinology, and physiology of reproduction. Special fee. Lab. 4 cr.

702. Experimental Endocrinology of Reproduction
Discussions of current research literature plus application of laboratory techniques to the study of hormone relationships in the reproductive system. Prereq: ANSC 701 and permission. Special fee. Lab. 4 cr.

704. Principles of Pathobiology
Principles of disease processes; reactivity of the diseased cell, tissue, and organ. Prereq: ANSC 501; 502; a 600-level disease course; /or permission. 3 cr.

706. Physical Performance Enhancement
Improvement of physical performance of athletic humans and animals through the integrated application of principles of sports nutrition, exercise physiology, and biomechanics. Prereq: one sem. of nutrition; one sem. of exercise physiology; /or permission. 4 cr.

712. Animal Breeding and Improvement
Principles of genetic evaluation; selection and breeding systems as they apply to the genetic improvement of farm animals. Prereq: ANSC 612 or permission. Lab. 4 cr. (Not offered every year.)

716. Avian Diseases
Diagnosis, treatment, and control of major bacterial, viral, and fungal diseases; parasite infestations; and nutritional deficiencies of birds. Diseases of commercial poultry are emphasized, but those occurring in pet and wild birds are also included. Labs will cover avian pathology and immunology. Permission. 4 cr.

717. Mammalian Physiology I
A systems-level course with emphasis on basic physiologic concepts and the functional principles of the nervous, muscular, skeletal, and cardiovascular systems. Prereq: one year of introductory animal anatomy and physiology and one semester of biochemistry or permission. 4 cr.

718. Mammalian Physiology II
A systems-level course with emphasis on the respiratory, gastrointestinal, excretory, reproductive, and endocrine systems. Prereq: one year of introductory animal anatomy and physiology and one semester of biochemistry or permission. 4 cr.

720. Community Nutrition
Focus on managerial processes of planning, leading, and evaluating community nutrition programs and the skills and tools needed to develop and present such programs. (Also offered as NUTR 720.) 4 cr. (Not offered every year.)

722. Immunobiology
Study of the molecules, cells, and tissues of the immune system. Experimental foundations of immune ontogeny and phylogeny, cellular interactions, regulatory mechanisms, and immunogenetics. Analysis of the immune response using cellular and humoral techniques. Prereq: MICR 705 or permission. Lab. 4 cr.

724. Reproductive Management and Artificial Insemination
Focus on goals and fundamentals of reproductive management of horses, dairy and livestock animals, and, through hands-on experience, development of competency in performing modern breeding techniques for equine and bovine reproduction. Prereq: ANSC 701 and permission. Special fee. Lab. 4 cr.

750. Human Nutrition
Detailed analysis of the nutrient requirements throughout the life cycle. Nutrient needs are evaluated in the context of their physiological and biochemical functions. Prereq: basic nutrition. Coreq: ANSC 751. (Also offered as NUTR 750.) 4 cr. (Spring semester only.)

760. Geriatric Nutrition
Emphasis on the nutritional requirements and status of the elderly in view of psychologic and physiologic changes in aging. Approaches for nutrition intervention and support will be

addressed. Prereq: NUTR 475 or permission. (Also offered as NUTR 760.) 3 cr. Cr/F.

773. Clinical Nutrition
Application of principles of normal nutrition and physiology to clinical problems; altered nutrient requirements in human disease. Prereq: basic nutrition and biochemistry or permission. Coreq: ANSC 775. (Also offered as NUTR 773.) 4 cr. (Spring semester only.)

775. Practical Applications in Therapeutic Nutrition
Supervised practical experience in therapeutic dietetics in one of several cooperating New Hampshire hospitals. Emphasis on nutritional counseling, assessment and instruction of patients with nutrition-related disorders. Coreq: ANSC 773. (Also offered as NUTR 775.) 3 cr. (Fall semester only.)

780. Critical Issues in Nutrition
Critical reviews and analysis of controversial topics in nutrition; emphasis on developing analytical reasoning skills. Prereq: permission of instructor. (Also offered as NUTR 780.) 4 cr. (Spring semester only.)

796. Investigations in the Animal Sciences
Problems in A) Genetics; B) Nutrition; C) Management; D) Diseases; E) Histology; F) Light Horsemanship; G) Physiology; H) Cell Biology; I) Microbiology. Prereq: permission. May be repeated. 1–4 cr.

798. Contemporary Topics in Biomedical Science and Nutrition
Lecture-discussion series on topics in animal biology, nutrition, and medicine including production and applications of monoclonal antibodies; oncogenesis; sports nutrition; nutrition and cancer; toxicology; atherogenesis. 2 cr. Cr/F.

Anthropology (ANTH)

Department of Sociology and Anthropology
(For program description, see page 23.)

Associate Professors: Charles Bolian, Richard Downs, Barbara Larson, Stephen Reyna, Deborah Winslow

411. Cultural and Social Anthropology
Cultural and social aspects of human behavior, particularly in relation to nonindustrial societies. Analysis of selected societies, institutions, and forms of social structure. 4 cr.

412. Physical Anthropology and Prehistoric Archaeology
Human physical evolution and cultural prehistory; evolutionary theory and archaeological techniques. 4 cr.

500. Peoples and Cultures of the World
A) North America; B) South America; C) Middle East and North Africa; D) Sub-Saharan Africa; E) South Asia; F) Southeast Asia; G) Oceania; H) Other. Characteristic ecological, historical, and socio-cultural factors in the major ethnographic regions of the globe. Analysis of selected societies and institutions. Offered in the following sections as staff is available and student needs dictate. North America: Study of the economy, society, religion, art, and ideas of North American Indians from precolonial times to the present. South America: A survey of the indigenous cultures and selected studies of the relationship between environment and culture. Changes in culture and social organization since the 16th century will be considered where historical data permit. Middle East and North Africa: The role of ecological, social, cultural, and historical factors in shaping Middle Eastern and North African culture today. Special attention will be paid to family, values, and religion; to nomadic, village, and urban ways of life; and to issues of unity, diversity, colonialism, and culture change. Sub-Saharan Africa: Study of Sub-Saharan economy, society, and culture from precolonial times to the present. South Asia: Emphasis on India, Sri Lanka, and Nepal. Traditional and changing South Asian cultures, including caste, family, economy, and religious traditions of Hinduism and Buddhism. Southeast Asia: Geographical, historical, ethnic, and sociocultural factors characteristic of the region. Impact of Indian, Chinese, Islamic, and European civilizations. Analysis of selected indigenous social, political, economic, and religious institutions. Oceania: Study of the economy, society, religion, art, and ideology of Pacific Island cultures from precolonial times to the present. 4 cr.

501. World Prehistory
A) North America; B) Mesoamerica; C) South America; D) Near East; E) Other. The development of prehistoric culture in various areas of the world. Offered in the following sections as staff is available and student needs dictate. North America: Archaeology of the Indians north of Mexico from earliest evidence of settlement to European contact. Diversity of cultures from ecological and evolutionary perspectives. Emphasis on the Eastern Woodlands, the Plains, and the Southwest. Mesoamerica: Cultural development from earliest cultures through the Spanish conquest. Emphasis on origins of agriculture and rise of Olmec, Teotihuacan, Maya, Toltec, and Aztec civilizations. Stress on factors critical to the development of complex societies. South America: Cultural development from earliest migrations through Inca Empire. Focus on major regions of South America. Consideration of Intermediate Area, Amazon Basin, and Central Andes as core regions for foundations of civilization. Near East: From earliest cultures to the development of agriculture and settled village life. Examines the processes that gave rise to the world's first civilizations. 4 cr.

512. Introduction to World Ethnography
Primarily for majors and minors, but open to all students. Historical and geographic factors, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Analysis of selected peoples in the major ethnographic areas. 4 cr.

514. Method and Theory in Archaeology
Basic method and theory; techniques in recovering and interpreting data; laboratory exercises in ceramic and lithic analysis. Critical evaluation of archaeological literature. Prereq: ANTH 412 or permission. 4 cr.

515. Anthropology and Contemporary Issues
Anthropological approaches to current world issues such as racism, poverty, religious movements, revolution, and environmental stress. Selected topics examined in the context of both western and nonwestern societies. 4 cr.

516. Kinship and Social Organization
The significance of kin and nonkin relations in human societies. Topics include the origins and evolution of human society, variations in the form and functions of marriage, family, and kin-based groups and selected nonkin relationships. Primary focus will be on nonindustrial societies. Prereq: ANTH 411 or permission. 4 cr.

517. Introduction to Anthropological Analysis
Basic skills of reading, writing, and analysis essential to the study of anthropology. Focus on learning to recognize, compare, and evaluate critically the central arguments of several major books drawn from different subfields and orientations in anthropology. Small class size for extensive discussion and feedback. Prereq: ANTH 411 or 412;/or permission. 4 cr.

518. History of Anthropological Theory
Reading and discussion of the works of major theoreticians of American, British, and French schools. Selections from the works of Spencer, Morgan, Tylor, Boas, Kroeber, Lowie, Steward, White, Durkheim, Mauss, Levi-Strauss, Malinowski, Radcliffe-Brown, Evans-Pritchard, and others are treated in terms of their contributions to the historical development of anthropology and their relevance to contemporary debates in anthropological theory. 4 cr.

519. Social Change and Development: An Anthropological Perspective
Extraordinary growth of European and American economic and political power since 1450. Major social, cultural, and economic changes resulting from this growth, described from the anthropological literature for the developing world. Existing theories reviewed in terms of their ability to explain these changes. 4 cr.

600. Issues in Contemporary Anthropological Theory
Explores such recent directions in the discipline as cognitive/symbolic anthropology, cultural materialism, evolutionary theory, gender studies, interpretive anthropology, political economy, practice theory, and structuralism. Prereq: ANTH 518 or permission. 4 cr.

614. Economic Anthropology
Economics of nonindustrial societies; definition of economics; production, distribution, and consumption in selected societies; development. Prereq: ANTH 411 or permission. 4 cr.

616. Anthropology of Religion
Major anthropological theories of religion; analysis of religious beliefs as symbolic systems and their interrelations with ritual and other social institutions. Detailed study of specific religions. Prereq: ANTH 411 or permission. 4 cr.

618. Political Anthropology
Political processes and structures in nonindustrial societies. Major topics: centralization of power and authority, legal systems, and warfare. Prereq: ANTH 411 or permission. 4 cr.

625. Female, Male, and Society
Critical, cross-cultural study of sex-related behavior in historical as well as contemporary perspective. Draws on anthropological, social-psychological, and sociological literature. (Also offered as SOC 625.) 4 cr.

630. Anthropological Field Research
Explores in theory and practice a range of approaches to doing field studies in anthropology. Techniques such as life histories, questionnaires, projective tests, participant observation, and field diaries will be explored in class and through active participation in a class research project. Prereq: ANTH 411; one 500-level or higher anthropology course;/or permission. 4 cr.

650. Field School in Archaeology
Field and laboratory methods in archaeology. Emphasis on excavation techniques and data analysis as related to project research design. Includes practical experience in lab as well as field. Prereq: permission. 1–8 cr.

697. Special Topics in Anthropology
Occasional or experimental offerings. May be repeated for different topics. Prereq: permission. 4 cr.

699. Senior Thesis
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision prior to senior year. 4 or 8 cr. 2 semesters, 8 cr. required for honors; an "IA" grade (continuous course) given at end of first semester.

714. Caste, Class, and Colonialism
Peasants, urban communities, race and ethnicity, stratification, local-national integration, the effects of colonialism, modernization, and social change. Prereq: ANTH 411 or permission.

750. Middle East: Issues of Ethnicity, Work, and Identity
Community studies approach to such topics as ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as SOC 750.) 4 cr.

770. Culture, Personality, and Society
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as SOC 770.) 4 cr.

795, 796. Reading and Research in Anthropology
A) Cultural/Social Anthropology; B) Anthropological Linguistics; C) Archaeology; D) Physical Anthropology. Prereq: 12 credits of anthropology; permission. Variable (normally 2–8) cr.

797. Advanced Topics in Anthropology
Advanced or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions on file in department office during registration. A) Social Organization; B) Economic Anthropology; C) Anthropology of Religion; D) Political Anthropology; E) Social Impact Analysis; F) Cultural Ecology; G) Prehistoric Archaeology; H) Historic Archaeology; I) Cultural Resources Conservation; J) Lithic Analysis; K) Ceramic Analysis; L) Faunal Analysis; M) Human Evolution; N) Human Variations; O) Anthropological Theory. Prereq: ANTH 411 or 412 (as appropriate); /or permission. 4 cr.

The Arts (ARTS)

(For program description, see page 23.)

Chairperson: Michael P. McConnell
Professors: Arthur E. Balderacchi, Melvin J. Zabarsky
Adjunct Professor: Sigmund M. Abeles
Associate Professors: David S. Andrew, Carol Aronson, Margot Clark, Maryse Searls McConnell, Michael P. McConnell, David R. Smith, Daniel L. Valenza, Mara R. Witzling
Assistant Professors: Grant Drumheller, Patricia Emison, Chris Enos, Craig A. Hood, Scott Schnepf, Robert Sennhauser
Faculty in Residence, Assistant Professor: Robert T. Hooper
Adjunct Assistant Professor: Vicki C. Wright
Faculty in Residence, Instructor: James Charlton

Art Studio
Two-Dimensional Courses

532. Introductory Drawing
Students deal primarily with observational perspective problems (still life, architectural interiors, landscape, etc.), utilizing a full range of drawing materials. Lab. 4 cr.

632. Intermediate Drawing
Continued use of traditional subject matter with emphasis on drawing the human figure from life; composition and content development. Prereq: ARTS 532. May be repeated for a maximum of 8 credits. Lab. 4–8 cr.

732. Advanced Drawing
Treatment of more complex compositional problems; application of a broader range of solutions to pictorial concepts to reinforce individual concepts of image and technique. Prereq: ARTS 632 (8 cr.). May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

455. Introduction to Architecture
Study of architectural graphics, design theories, form determinants, and the architect in society. Includes case study projects. Lab. 4 cr.

546. Introductory Painting
Use of the still life and the figure. Color, value, composition, and some art history. Slide lectures. Prereq: ARTS 532. Lab. 4 cr.

646. Intermediate Painting
More complex issues of the visual language. Still life and the figure continue as dominant subject matter. Slide lectures. Prereq: ARTS 546. May be repeated for a maximum of 8 credits. Lab. 4–8 cr.

746. Advanced Painting
Development of a higher degree of technical skill to handle more advanced conceptual problems. Class assignments may be more individually directed. Prereq: ARTS 646. (8 cr.). Lab. 4–12 cr.

544. Water Media I
Transparent and opaque water color. Prereq: ARTS 546. Lab. 4 cr.

645. Water Media II
Continuation of ARTS 544; introduction to other water-based media. Prereq: ARTS 544 or 547. Lab. 4 cr.

551. Photography
Introduction to theory and practice of black and white photography as an expressive medium. Students provide their own cameras. Prereq: any art dept. course or permission. Lab. 4 cr.

651. Photography Workshop
Individualized projects involving creative methods, including color, manipulative, and documentary techniques. Students provide their own cameras. Prereq: ARTS 551. May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

536. Introduction to Printmaking: Intaglio
Study of intaglio printmaking techniques, including etching, dry point, and engraving. Prereq: ARTS 532 or permission. Lab. 4 cr.

537. Introduction to Printmaking: Lithography
Study of lithographic processes on stone and aluminum plate. Prereq: ARTS 532 or permission. Lab. 4 cr.

636. Printmaking Workshop
Emphasis on development of the individual's imagery in lithography and/or intaglio, including an introduction to multicolor printmaking. Prereq: ARTS 536 and/or ARTS 537.

May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

598. Sophomore Seminar
Encourages experimentation by integrating verbal and plastic understandings through readings, discussions, studio work. Field trips. Prereq: 2 art history courses and 2 studio arts courses. 4 cr.

695. Special Problems in the Visual Arts
(See description under Three-Dimensional Courses.)

796. Independent Study in the Visual Arts
A) Photography; B) Sculpture; C) Drawing; D) Painting; E) Graphics; F) Water Media; G) Architectural Design; H) Curatorial Assistant; I) Art History; J) Ceramics; K) Wood Design. Open to highly qualified juniors and seniors. Prereq: permission of department chairperson and supervising faculty member or members. May be repeated to a total of 8 cr. 1–8 cr.

798. Seminar/Senior Thesis
Readings and discussions oriented toward the intellectual premises of art. Culminates in mounting an exhibition of the student's work. Required of all students in the B.F.A. program. Other advanced students may elect with instructor's permission. A year-long course; an "IA" grade (continuous course) will be given at the end of the first semester. Lab. Variable credit; may be repeated to a total of 8 credits. B.F.A. majors must take 8 credits total. 1–8 cr.

Three-Dimensional Courses

All courses elective by permission of the Department of the Arts.

501. Ceramics
Theory and practice of basic ceramics; includes all methods of basic construction, decoration, glazing, and kiln firing. Emphasis on each individual's perceptual development. Lab. 4 cr.

601. Ceramics Workshop
Application of new ceramic materials and techniques, with emphasis on ideas and their expression through form and content. Experimentation encouraged. Prereq: ARTS 501. May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

701. Clay and Glaze Calculation
Presentation and practice of a scientific method for calculating glazes, based on the empirical formula technique. Includes background information on clay and the chemistry of glazes and glaze materials. Prereq: ARTS 501. Lab. 4 cr. (Not offered every year.)

525. Woodworking
Theory and application of basic woodworking principles; design concepts, primarily utilitarian, applied to shaping a mass, constructing volumetric and line/plane forms; use of a complete range of hand, portable powered, and stationary powered tools. Lab. 4 cr.

625. Wood/Furniture Design Workshop
Design and construction of the major furniture forms, using a broad range of techniques (including lamination, bending, and molding) to execute a series of concept areas relevant to furniture. Prereq: ARTS 525. May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

725. Wood Multiples
Development and construction of prototype furniture designs intended for more than one-of-a-kind production; jig and production strategies. (Offered concurrent to I.W.F.-sponsored biennial National Student Furniture Design Competition.) Prereq: ARTS 625 (8 cr.). Lab. 4 cr.

567. Introductory Sculpture
Theory and practice of designing three-dimensional compositions using a series of progressive assignments to develop a practical understanding of visual elements, including line, form, space, mass, and plane. Lab. 4 cr.

667. Sculpture Workshop
Design and production of sculpture focusing on various materials and techniques and how they relate to composition and content. Emphasis on understanding visual language while developing an individual style. Prereq: ARTS 567. May be repeated for a maximum of 12 credits. Lab. 4–12 cr.

767. Bronze Casting
Practice of designing, building, and maintaining a working sculpture foundry. Emphasis on a thorough understanding of the lost-wax investment casting process, including pattern making, mold making, wax working, investing, casting, chasing, and patination. Prereq: ARTS 667 (8 cr.). Lab. 4 cr.

598. Sophomore Seminar
(See description under Two-Dimensional Courses.)

695. Special Problems in the Visual Arts
Topics and prerequisites to be announced before preregistration. May be repeated with permission of the instructor. Lab. 4 cr.

(See also ARTS 796 and 798.)

Art History

Exemption from prerequisites by permission of instructor.

431. Visual Studies
Appreciation and understanding of the visual arts. Works from variety of periods; emphasis on style, formal analysis, methods, and materials of production. For freshmen and sophomores; open to juniors and seniors by permission. 4 cr.

487. Themes and Images in Art
Examination of one or two central ideas embodied in the artistic imagery of painting, sculpture, and architecture, covering a wide cultural spectrum. Stress on the interconnection between visual forms and the symbolic and philosophical concepts they express. Papers and essay examinations are required. A) Classicism and its Discontents; B) Nature and Culture in Art; C) World Mountain and Symbolic Circle; D) Major Mythic Images of Women; E) Symbols of Innocence and Experience in the New World; F) the Night Journey. Descriptions of sections available from the art department office. No more than one section of this course may be taken for credit. 4 cr.

570. Art of the Ancient World
The chief and representative monuments in architecture, sculpture, and painting from Paleolithic times to the late Roman Empire. The history of art from a broadly humanistic perspective with investigation of works such as Stonehenge, the pyramids at Giza, Mesopotamian votive figures, the Parthenon and its sculptures, and illusionistic Roman frescoes at Pompeii. 4 cr.

571. Art of the Middle Ages
The chief and representative monuments in architecture, sculpture, and painting from early Christian times to the Gothic era. The history of art from a broadly humanistic perspective with investigation of works such as the Constantinian basilicas, Byzantine mosaics, the Lindisfarne Gospels, the portal sculpture of Autun, and Chartres cathedral. 4 cr.

572. Art of the Age of Humanism
The chief and representative monuments in architecture, sculpture, and painting from the early Florentine Renaissance to the courtly era of Louis XVI. The history of art from a broadly humanistic perspective with investigation of works such as Masaccio's frescoes, Michelangelo's *David*, the Ghent Altarpiece, the basilica of St. Peter's, Rembrandt's self-portraits, and the Georgian house in Portsmouth. 4 cr.

573. Art of the Modern World
The chief and representative monuments in painting, sculpture, and architecture from the Age of Reason to the present. The history of art from a broadly humanistic perspective with investigation of works such as David's revolutionary paintings, Monet's *Water Lilies*, Picasso's *Guernica*, Pollock's drip paintings, Sullivan's skyscrapers, and Rodin's *Gates of Hell*. 4 cr.

574. Architectural History
A survey of the chief and representative buildings from the entire history of architecture. Analysis of buildings with regard to structure, form, and symbolic content, concentrating on major works such as the pyramids, the Roman Pantheon, the Gothic cathedral, the Renaissance palace, the Baroque church, and the modern skyscraper. 4 cr.

597. Art of the Far East
A basic survey of painting, sculpture, and architecture of India, China, and Japan, with emphasis on the relation of philosophical concepts to imagery. 4 cr. (Not offered every year.)

608. Arts and American Society: Women Writers and Artists, 1850–Present
Team-taught course studying the impact of gender definitions on the lives and works of selected American artists. Considers lesser-known figures such as Fannie Fern, Lilly Martin Spencer, and Mary Hallock Foote as well as better-known artists such as Willa Cather and Georgia O'Keeffe. Prereq: permission or one of the following: WS 401, HIST 566, ENGL 585, 586, 685, 785, or a 600-level art history course. (Also offered as ENGL 608, HUMA 608, and HIST 608.) Not for art studio major credit. 4 cr.

610. American Studies: New England Culture in Changing Times
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as ENGL 610, HIST 610, and HUMA 610.) Not for art studio major credit. 4 cr.

654. 17th- and 18th-Century American Architecture
Chief colonial architectural styles and monuments; their relation to European antecedents. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

655. Early Modern Architecture: Revolution to World War I
Chief styles and monuments of American and European architecture from the "visionaries" (Ledoux, Latrobe, Jefferson) to the birth of the skyscraper and "nonhistorical" architecture. Unique American contribution to modern architectural thought. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

656. Contemporary Architecture: The Buildings of Our Times
Chief styles and monuments of American and European architecture from Frank Lloyd Wright and the International Style to the present. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

675. Greek and Roman Art
Art and architecture in ancient Greece and Rome from about 1500 B.C. through the fourth century A.D. Emphasis on classical Greek art of the fifth century B.C. and Roman Imperial art of the first and second centuries A.D. Prereq: two 400- or 500-level art history courses. 4 cr.

677. Early Medieval Art
Development of Christian art from 300 to 1000 A.D. Study of the formulation of a new visual language via the intersection of Mediterranean and northern European traditions. Major focus on early Christian catacombs, Byzantine mosaics, insular manuscripts, and Carolingian imperial art. Prereq: two 400- or 500-level art history courses. 4 cr.

678. Romanesque and Gothic Art
The culmination of medieval artistic development through examination of major architectural monuments and their sculptural programs, as well as important centers of manuscript illumination. The period from the year 1000 through the beginnings of the Renaissance in the early 15th century will be stressed. Prereq: two 400- or 500-level art history courses. 4 cr.

679. Northern Renaissance Art I
Painting, sculpture, graphic arts, and manuscript illumination in France, Germany, and the Netherlands in the 14th and 15th centuries. Emphasis on the development of the traditions of Northern naturalism and the emergence in 15th-century Flanders of a distinct Renaissance consciousness, which runs parallel to contemporary trends in Italy. Major figures include the Limbourg brothers, Claus Sluter, Jan van Eyck, and Hugo van der Goes. 4 cr.

680. Northern Renaissance Art II
Painting, sculpture, and graphic arts in Germany and the Netherlands in the 16th century. Emphasis on the encounter of the Northern tradition with the classical and humanistic culture of the Italian Renaissance and on the impact of the Protestant Reformation. Major figures include Bosch, Dürer, Holbein, and Bruegel. Prereq: two 400- or 500-level art history courses. 4 cr.

681. Italian Renaissance Art I
Painting, sculpture, and architecture in Italy during the 14th and 15th centuries. The emergence of Renaissance style in the art of such masters as Giotto, Masaccio, Donatello, Bellini, and Piero della Francesca. Attention is also given to the broad cultural developments to which they belong. Prereq: two 400- or 500-level art history courses. 4 cr.

682. Italian Renaissance Art II
Continuation of ARTS 681. Primary focus on the formation of High Renaissance classicism in the art of Leonardo, Michelangelo, Raphael, Bramante, and Titian. Attention is also given to the subsequent crisis of the classical ideal in 16th-century Mannerism. Prereq: two 400- or 500-level art history courses. 4 cr.

683. Baroque Art in Southern Europe
Painting, sculpture, and architecture in Italy, France, and Spain during the 17th century. Emphasis on the diverse and innovative character of art in this period of crisis between the Renaissance and the modern era. Intensive analysis of the works of such major masters as Bernini, Caravaggio, Poussin, and Velázquez. Prereq: two 400- or 500-level art history courses. 4 cr.

684. Baroque Art in Northern Europe
Dutch and Flemish painting in the seventeenth century. Examination of such major figures as Rubens, Rembrandt, Van Dyck, and Vermeer. Attention is also given to the development of the genres and to the many "little masters" who practiced them. Prereq: two 400- or 500-level art history courses. 4 cr.

686. Nineteenth-Century European Art
European painting and sculpture in its sociopolitical context, with emphasis on the relation of idea to image, from David and the French Revolution to Cézanne, Seurat, and the Franco-Prussian War. Prereq: two 400- or 500-level art history courses. 4 cr.

688. Twentieth-Century European Art
Evolution of Modernism from Symbolism and Post-Impressionism; contributions to art theory of Cubism, Expressionism, Non-Objectivity, and Surrealism. Prereq: two 400- or 500-level art history courses. 4 cr.

689. Avant-Garde Art in America
Tentative history of the New York art scene, with emphasis on art theory and the new technical means becoming available. Prereq: two 400- or 500-level art history courses. 4 cr.

690. Women Artists of the Nineteenth and Twentieth Centuries
Examination of the works of women artists of the past two centuries. After considering current scholarship related to some of the theoretical issues involved in studying art by women, the works of women artists from the Middle Ages through the early 19th century will be surveyed briefly. Course will then focus on works by women artists of the past 150 years and their relationship to and impact on major movements in modern art. Prereq: one art history and another appropriate course. 4 cr.

693. American Art
A chronological survey of painting and sculpture in the United States from the colonial period to the present. Prereq: two 400- or 500-level art history courses. 4 cr.

695. Special Problems in the Visual Arts
(See description under Three-Dimensional Courses.)

696. Methods of Art History
Essential bibliography and the methodology of research; the variety of approaches to art historical scholarship. Readings, discussion, and projects in connoisseurship, iconography, and other art historical methods. Open to advanced students with a strong art history background. Prereq (for non-art history majors): permission. 4 cr. (Usually offered fall semester only.)

698. Seminar in Art History
Topics and prerequisites to be announced before preregistration. May be repeated with permission of instructor. 4 cr.

699. Museum Studies
Introduction to the history and practices of American museums, including their purposes, organization, interpretation, policies, and procedures. Use of University Art Galleries, visits to other museums, lecturers. Prereq: two courses in art history and permission. 4 cr.

(See also ARTS 796.)

Art Education Courses

All courses elective by permission of the Department of the Arts.

791. Art Education (Elementary)
Children's creative growth as revealed through their visual expression. Development of elementary art education programs with emphasis on objectives, methods, materials, and techniques to foster that creativity. Suggested prereq: EDUC 500. 4 cr.

792. Art Education (Secondary)
The creative process in the visual arts in relation to the development and skills of middle and high school students in the public schools; mechanics of beginning and maintaining a secondary art program; exploring resources for art education programs on the secondary level. Suggested prereq: EDUC 500. 4 cr.

797. Art Education Seminar
Architecture as a resource in teaching. Primarily for secondary school teachers and those involved in adult education. Not for major credit in art dept. 4 cr.

(See also ARTS 796.)

Biochemistry (BCHM)

(For program description, see page 37.)

Chairperson: Donald M. Green
Professors: Donald M. Green, Samuel C. Smith, James A. Stewart
Associate Professors: Clyde L. Denis, Stacia A. Sower
Assistant Professors: John J. Collins, Rick H. Cote, Anita S. Klein, Andrew P. Laudano, Thomas M. Laue

501. Biological Chemistry
Includes an introduction to organic chemistry. Special fee. Lab. 4 cr.

602. General Biochemistry
A one-semester, comprehensive, introductory course outlining the general principles of biochemistry. Three lectures, one recitation, one lab. Special fee. 5 cr.

656. Physiological Chemistry
Introductory biochemistry with emphasis on mammalian biochemistry. Chemistry and metabolism of proteins, nucleic acids, carbohydrates, and lipids. Lab includes procedures basic to chemical methods of medical diagnosis. Prereq: one semester organic chemistry. Special fee. Lab. 4 cr.

699. Senior Thesis
Research in biochemistry for senior majors. 2 cr.

705. Techniques in Endocrinology
Application of modern laboratory techniques to the study of hormonal and molecular mechanisms in the endocrine system. Prereq: ZOOL 704 or ANSC 701 or BCHM 751, 752, 753, 754 and permission. (Also offered as ZOOL 705.) Special fee. Lab. 4 cr.

706. Genetics Laboratory
Advanced experiments in yeast genetics, including research techniques in biochemical, transmission, and molecular genetics. Prereq: BIOL 604 or equivalent; a course in biochemistry is recommended. (Also offered as GEN 706.) 3 cr.

750. Physical Biochemistry
Structure, interactions, and physical-chemical properties of biomolecules. Thermodynamic, hydrodynamic, and spectroscopic methods for study of proteins and nucleic acids. Laboratory work focuses on theory and design of biochemical instrumentation. Prereq: CHEM 683; BCHM 752;/or permission. Special fee. Lab. 4 cr.

751-752. Principles of Biochemistry
Fundamental biochemistry; chemistry, metabolism, and biological function of nucleic acids, proteins, carbohydrates, and lipids. Prereq: organic chemistry or permission. 3 cr.

753-754. Biochemistry Laboratory
Coreq: BCHM 751-752. Special fee. 3 cr.

760. Enzyme Chemistry
Protein physical chemistry, enzyme structure, and enzyme kinetics; physical properties of enzymes and enzyme solutions in vitro and in vivo; methods of purification, structural analysis, and kinetic mechanisms. Prereq: calculus; BCHM 752;/or permission. 3 cr.

763. Biochemistry of Cancer
Molecular mechanisms of viral and chemical carcinogenesis; role of oncogenes in normal cell growth, development, and differentiation. Biochemical basis of cancer chemotherapy. Prereq: BCHM 752 or permission. 3 cr.

765. Plant Biochemistry
Structure, synthesis, metabolism, and regulation of cellular constituents of plants. Utilization of plant biochemistry in biotechnology. Prereqs: BCHM 656 or 752 or permission of instructor. 3 cr.

771. Biochemical Genetics
Mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Prereq: BCHM 752 or permission. (Also offered as GEN 771.) 3 cr. (Not offered every year.)

772. Introductory Laboratory in Molecular Genetic Techniques
Modern biochemical gene manipulation techniques including the genetic, physical, and enzymatic characterization of gene vectors, gene cloning, construction of genetic probes, and sequencing of nucleic acids. Prereq: BCHM 752; and either BCHM 771 or MICR 704. (Also offered as GEN 772.) Special fee. 3 cr.

795. Investigations in Biochemistry
Prereq: permission. Subject matter and hours to be arranged. Not more than 4 total credit hours can be applied to biochemistry or major electives. 1–4 cr.

Biology (BIOL)

(For program description, see page 37.)

Coordinator: James Pollard

401. Human Biology
Elementary study of structure, function, and development of all systems of the body. No credit toward major or minor. Cannot be taken for credit after ZOOL 507-508. 4 cr.

402. Environmental Biology
Basic interrelationships between organisms, populations, communities, and their environments; ecosystems; human modification of natural environments and its consequences. No credit toward a major or minor. Students with credit for BIOL 541 cannot receive credit for BIOL 402. Lab. 4 cr. (Fall semester only.)

403. Principles of Biology
General survey of plant and animal kingdoms; elementary principles of heredity, evolution, and ecology. No credit toward a major or minor. 4 cr.

404. Genetic Biology
Genetic basis for variation, including inheritance patterns, their chemical and physical basis, and human diversity; current technologies and issues associated with them. Biological science majors should enroll in BIOL 604. 4 cr.

409. Human Reproductive Biology
Aspects of human sexuality from anatomical, physiological, and other viewpoints. No credit toward a major or minor. 4 cr.

411-412. Principles of Biology I and II
General principles of biology; introduction to structure and function of cells; tissues and organs; physiological processes; genes and heredity; and the biology of organisms, including survey of kingdoms, behavior, evolution, and ecology. Two-semester sequence required for majors in the biological sciences. Special fee. Lab. 5 cr.

420. Parasites and Pestilence
Ecology of human disease; role of disease in history; biological, social, and economic problems involved in eradication and control. Particular attention to diseases that still account for serious sickness and mortality in overpopulated, underdeveloped countries. No credit toward a major or minor. 4 cr.

541. General Ecology
Physical and biological factors affecting distribution, abundance, and adaptations of organisms. Population, community, and ecosystem structure and function. Prereq: BIOL 411-412. Special fee. Lab. 5 cr.

543. Field Ecology
Consideration of ecological principles by inquiry in natural habitats and in the laboratory. Prereq: MATH 425, statistics, or equivalent; present or prior enrollment in BIOL 541; permission. Lab. 2 cr.

604. Principles of Genetics
Chemical structure of genetic material, Mendelism, gene recombination, and chromosome mapping. Mutation, gene expression and regulation, recombinant DNA. Quantitative inheritance and population genetics. Prereq: BIOL 411 and 412; CHEM 403 and 404. College math or statistics suggested. Offered each semester. Students may not receive credit for both BIOL 404 and BIOL 604. Special fee. Rec.; lab. 5 cr.

791. Problems in the Teaching of High School Biology
Objectives and methods; selection and organization of materials, preparation of visual aids and other projects; use of field trips. Prereq: two years of biological science; permission. 4 cr.

Departmental Biology Courses

(Full course descriptions are given under the appropriate department headings.)

Animal and Nutritional Sciences: ANSC 400, Food and People; 401, Intro. to the Animal Sciences; 502, Fundamentals of Animal Health; 605, Principles of Nutrition; 607, Small Animal Diseases; 612, Genetics of Domestic Animals; 614, Diseases and Parasites of Wildlife; 616, Wildlife Disease Laboratory; 617, Livestock Diseases; 619, Livestock Disease Clinic; 620, Equine Diseases and Parasites; 622, Equine Disease Clinic; 695-696, Supervised Teaching Experience; 701, Physiology of Reproduction; 702, Experimental Endocrinology of Reproduction; 704, Principles of Pathobiology; 712, Animal Breeding and Improvement; 716, Avian Diseases; 717, Mammalian Physiology I; 718, Mammalian Physiology II; 722, Immunobiology; 795-796, Investigations in the Animal Sciences.

Biochemistry: BCHM 501, Biological Chemistry; 656, Physiological Chemistry and Nutrition; 750, Physical Biochemistry; 751-752, Principles of Biochemistry; 753-754, Biochemistry Laboratory; 760, Enzyme Chemistry; 771, Biochemical Genetics; 772, Intro. Lab. in Molecular Gentic Techniques; 795, Investigations in Biochemistry.

Botany and Plant Pathology: BOT 412, Intro. Botany; 503, The Plant World; 566, Systematic Botany; 601, Terrestrial Plant Ecology; 606, Plant Physiology; 625, Intro. to Marine Botany; 651, Plant Pathology; 653, Forest and Shade Tree Pathology; 666, Summer Flora of New Hampshire; 714, Electron Microscopy; 715, Electron Microscopy Laboratory; 717, General Limnology; 719, Field Limnology; 721, The Microscopic Algae; 722, Marine Phycology; 723, Marine Algal Ecology; 724, Freshwater Algal Ecology; 727, Algal Physiology; 729, Algal Physiology Lab; 732, Cell Biology; 742, Physiological Ecology; 745, Plant Community Ecology; 747, Aquatic Higher Plants; 750, Morphogenesis; 752, Mycology; 754, Principles of Plant Disease Control; 755, Plant Virology; 757, Plant Bacteriology; 761, Plant Geography; 762, Morphology of Seed Plants; 764, Microtechnique; 768, Optical Microscopy and Photomicrography; 771, Computer Applications in Biology; 771A, Computer Application Techniques; 771B, Biological Programming in FORTRAN; 795, Investigations in Botany.

Entomology: ENTO 400, Insects and Society; 402, Intro. Entomology; 507, Field Entomology; 503, Principles of Applied Entomology; 506, Forest Entomolgy; 695, Problems in Entomology; 704, Medical Entomology; 705, Systematics and Taxonomy of Insects; 706, Terrestrial Arthropods; 709, Aquatic Insect Ecology; 710, Insect Morphology; 721, Principles of Biological Control; 722, Chemical Control of Insects; 725, Insect Ecology; 726, Integrated Pest Management; 799, Honors Senior Thesis.

Forest Resources: FORS 423, Dendrology; FORS 425, Field Identification of Trees and Shrubs; FORS 527, Forest Ecology; FORS 629, Silviculture; FORS 712, Sampling Techniques; FORS 713, Quantitative Ecology; FORS 720, Forest Genetics; FORS 722, Advanced Silviculture; FORS 757, Basics of Remote Sensing; SOIL 501, Soils and the Environment; SOIL 502, Soil-Plant Relationships; SOIL 703, Chemical Analysis of Soil; SOIL 705, Forest Soils; WILD 433, Wildlife Ecology; WILD 636, Wildlife Biology; WILD 772, Wildlife Energetics; WILD 737, Wildlife Population Dynamics; WILD 738, Wildlife Management.

Genetics: GEN 705, Population Genetics; 706, Genetics Lab; 740, Evolutionary Biology; 771, Biochemical Genetics; 772, Intro. Lab. in Molecular Genetics Techniques.

Microbiology: MICR 501, Public Health Microbiology; 503, General Microbiology; 600, Environmental Microbiology; 701, Taxonomy and Ecology; 704, Microbial Genetics; 705, Immunology, 706, Virology; 707, Marine Microbiology; 708, Microbial Biogeochemistry; 710, Microbial Cytology and Electron Microscopy; 795, Problems in Microbiology.

Nutritional Sciences: NUTR 400, Food and People; 405, Food and Society; 605, Principles of Nutrition; 699, Independent Study; 780, Critical Issues in Nutrition; 750, Human Nutrition; 775, Practical Applications in Normal and Therapeutic Nutrition; 755, Disorders in Energy Balance; 773, Clinical Nutrition; 795, Honors Thesis.

Plant Science: PLSC 421, Concepts of Plant Growth; 535, Domestication and Use of Plants; 606, Plant Physiology; 672, Plant Propagation; 705, Population Genetics; 740, Evolutionary Biology; 773, Breeding Improved Varieties; 776, Radioisotope Techniques for Life Science; 795, Advanced Topics in Plant Science; 799, Honors: Senior Thesis.

Zoology: ZOOL 412, Principles of Zoology; 503, Intro. to Marine Biology; 507-508, Human Anatomy and Physiology; 518, Vertebrate Morphology; 519, Comparative Animal Physiology; 542, Ornithology; 560, Anatomy and Behavior of the Gull; 629, Developmental Biology of the Vertebrates; 674, Field Marine Science; 704, Comparative Endocrinology; 707, Human Genetics; 711, Ichthyology; 712, Mammology; 713, Animal Behavior; 717, General Limnology; 719, Field Limnology; 720, Field Marine Science for Teachers; 721, Parasitology; 723, Molecular Biology of the Cell; 728, Developmental Biology of the Invertebrates; 730, Vertebrate Histology; 751, Adaptations of Marine Organisms; 753, Marine Vertebrates; 772, Fisheries Biology; 775, Invertebrate Embryology; 777, Intro. to Neurobiology; 791, 792, Advanced Studies in Zoology; 795, Special Problems in Zoology.

Botany and Plant Pathology (BOT)

(For program description, see page 38.)

Chairperson: Thomas C. Harrington
Professors: Robert O. Blanchard, A. Linn Bogle, William E. MacHardy, Arthur C. Mathieson, Subhash C. Minocha
Adjunct Professor: Alex L. Shigo
Associate Professors: Alan L. Baker, Garrett E. Crow, Thomas C. Harrington, Leland S. Jahnke, Thomas D. Lee
Adjunct Associate Professor: Walter C. Shortle
Assistant Professor: Wayne R. Fagerberg
Adjunct Assistant Professors: Kathleen Kromer Baker, Antoinette P. Hartgerink, Janet R. Sullivan

412. Introductory Botany
All groups of plants; growth, development, and environmental responses. Special fee. Lab. 4 cr.

414. Honors General Botany
Biology of plants: structure and function of cells and plants; genetics; evolution; and ecology. Special fee. Lab. 4 cr.

503. Evolution of Plants
Survey of the plant kingdom. The biology and economic significance of the major groups of plants; the major trends of evolutionary specialization in the form, structure and function, and the interrelationships of the major divisions. Lab. 4 cr.

566. Systematic Botany
Scientific basis of plant taxonomy and the identification and classification of major plant families, native trees, shrubs, and wild flowers. Prereq: one semester of biological science. Lab. 4 cr.

601. Terrestrial Plant Ecology
Regulation of distribution and abundance of terrestrial plants by physical and biotic environmental factors; ecology of plant life history patterns; development and structure of plant communities; ecosystem structure and function. Occasional Saturday field trips. Prereq: BOT 412, BIOL 412, or equivalent with permission. Lab. 4 cr.

606. Plant Physiology
Structure-function relationship of plants, in-

ternal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral nutrition. Prereq: BOT 412, BIOL 411-412, or PLSC 421; one year of chemistry;/or permission. Coreq: BOT 608.(Also offered as PLSC 606.) 3 cr.

608. Plant Physiology Laboratory
Analytical techniques for plant physiology, effects of growth regulators on plant growth and development, cell and tissue culture, enzyme kinetics, and plant water relations. Coreq: BOT 606. (Also offered as PLSC 608.) Special fee. 2 cr.

625. Introduction to Marine Botany
Life history, classification, and ecology of micro- and macroscopic marine plants, including phytoplankton, seaweed, and salt marsh plants, and the interactions between humans and marine plant communities. Occasional Saturday morning field trips. Prereq: BOT 412; a semester of biology;/or permission. Lab. 4 cr.

651. Plant Pathology
Nature, symptomatology, etiology, epidemiology, and control of important plant diseases. Prereq: BOT 412, BIOL 411-412, or equivalent. Lab. 4 cr.

653. Forest and Shade Tree Pathology
Principles, symptomatology, etiology, and control of forest and shade tree diseases. Prereq: BOT 412 or equivalent. Lab. 4 cr.

666. Summer Flora of New Hampshire
Study of the flora of New Hampshire with an in-depth look at the major vegetation types. Field work will include trips to study flora of forests, dunes, salt marshes, swamps, bogs, lakes, ponds, streams, and alpine. Prereq: basic botany or permission. 4 cr. (Summer Session only.)

714. Electron Microscopy
Theory and principles involved in preparing plant and animal tissue for observation with the transmission (TEM) and scanning (SEM) electron microscopes; shadow casting; photographic techniques; stereology; and presentation of micrographs for publication. Prereq: permission. Coreq: BOT 715. 2 cr.

715. Electron Microscopy Lab
Practical application of theoretical principles and practices used in preparing and observing plant and animal tissues with the transmission and electron microscopes. Student project assigned. Prereq: permission. Coreq: BOT 714. 3 cr.

717. General Limnology
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of the aquatic environment. Factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prereq: BIOL 541 or equivalent. (Also offered as ZOOL 717.) 4 cr.

719. Field Limnology
Freshwater ecology examined through laboratory exercises with freshwater habitats. Methods to study freshwater lakes; interpretation of data. Seminars and occasional Saturday field trips. Prereq: present or prior enrollment in BOT 717, ZOOL 717, or equivalent; permission. (Also offered as ZOOL 719.) 4 cr.

721. The Microscopic Algae
Survey of phytoplankton and periphyton in local marine and freshwater habitats. Identification, systematics, and evolution. Class and individual collection trips. Prereq: BOT 412 or 503. Lab. 4 cr.

722. Marine Phycology
Identification, classification, ecology, and life histories of the major groups of marine algae, particularly the benthonic marine algae of New England. Periodic field trips. Prereq: BOT 412 or 503. Lab. 4 cr. (Not offered every year.)

723. Marine Algal Ecology
Distribution, abundance, and growth of marine plants in relation to their environment. Scheduled field trips and an independent research project are required. Prereq: BOT 772 or permission. Lab. 4 cr. (Offered in alternate years.)

724. Freshwater Algal Ecology
Survey of freshwater algal habitats; physiological explanation of population models. Individual experimental projects. Prereq: BOT 717, 721, or permission. 4 cr.

727. Algal Physiology
A survey of major topics in the physiology and biochemistry of marine and freshwater algae including: nutrition, metabolic pathways, reproductive physiology, storage and extracellular products, cell inclusions, growth and development. Prereq: plant physiology and introductory biochemistry or permission. 2 cr. (Not offered every year.)

729. Algal Physiology Laboratory
Useful laboratory techniques in studying the physiology of freshwater and marine algae. Experiments in nutrition, metabolism, pigment and enzyme analysis. Small research project required. Prereq: concurrent registration in BOT 727; permission. 2 cr. (Not offered every year.)

732. Cell Biology
Relationship of cell structure to cell function, cell-to-cell communication, replication, and factors controlling cell structure. Cell interaction with its environment, and major tools used by the cell biologist to study cells. Prereq: one year of biology; intro chemistry course. 4 cr.

742. Physiological Ecology
Physiological responses of plants to the physical environment; energy exchange, light and photosynthesis, water relations, and mineral nutrition. Prereq: BOT 606 or permission. Lab. 4 cr.

745. Plant Community Ecology
Methods for analysis of biological communities; ordination and classification of communities; theoretical and empirical investigation of factors controlling community structure; theory and modeling of succession. Occasional Saturday field trips. Prereq: intro. statistics and intro. ecology (BIOL 541, BOT 601, or equivalent). Lab. 4 cr. (Not offered every year.)

747. Aquatic Higher Plants
Flowering plants and fern relatives found in and about bodies of water in the northeastern United States; extensive field and herbarium work, preparation techniques, and collections. Prereq: BOT 566 or permission. Lab. 4 cr. (Not offered every year.)

750. Morphogenesis
Principles of differentiation at molecular, cellular, and organismic level; internal and external factors regulating gene activity and differentiation. Prereq: BOT 606 or permission. Also offered as ZOOL 791J. 4 cr. (Not offered every year.)

752. Mycology
Classification, identification, culturing, life histories, and ecology of parasitic and saprophytic fungi, their role in the environment and human affairs. Prereq: elementary botany. Lab. 4 cr.

754. Principles of Plant Disease Control
Epidemiology of plant diseases and relationships to cultural practices, resistant varieties, biological control and chemical control; crop loss assessment; disease forecasting; disease pest management. Prereq: BOT 651 or 653. Lab. 4 cr. (Not offered every year.)

758. Plant Anatomy
Anatomy of vascular plants, emphasizing structure and development of basic cell and tissue types, and of the major plant organs. Prereq: BIOL 412 or BOT 412. Lab. 5 cr. (Not offered every year.)

761. Plant Geography
Distribution of plants, a consideration of world vegetation types and floras, and problems of endemism with emphasis on North America; major influential factors such as geologic, climatic, edaphic, and biotic. Three Saturday field trips. Prereq: BOT 566 or permission. 4 cr.

762. Morphology of Seed Plants
Comparative form and structure of the major living and extinct groups; evolutionary modifications of the vegetative and reproductive organs, and the basic life history pattern. Prereq: BIOL 412 or BOT 412. Lab. 4 cr. (Not offered every year.)

764. Microtechnique
Methods of preserving cell and tissue structure, embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Prereq: permission. Lab. 4 cr. (Not offered every year.)

768. Optical Microscopy and Photomicrography
Theory and techniques for the optimal use of the optical microscope, including bright field and dark field modes, various types of condensers, camera equipment, films, filters, and photographic techniques. Prereq: permission. Special fee. Lab. 4 cr.

771. Computer Applications in Biology
A set of 2-credit modules. Module A, first half of semester; Module B, second half of semester. Module A prerequisite to Module B. 2–4 cr.

771A. Computer Application Techniques
Methods of problem solving in biology with computer aid. Introduction to file structure and manipulation. Use of available software packages to process field or laboratory data including acquisition, storage retrieval, statistical analysis, plotting, and report generation.

771B. Biological Programming in FORTRAN
Fundamentals of FORTRAN programming including statements, arguments, functions, subroutines, and encode/decode useful in scientific programming. Design and application of FORTRAN programs for experimentation and modeling.

774. Plant Cell Culture and Genetic Engineering
Theory and techniques of cell/tissue culture and genetic manipulation in plants, transformation vectors, somatic cell genetics, regulation of foreign gene expression, molecular basis of agriculturally important traits, environmental and social implications of genetic engineering in plants. Prereq: BIOL 604 or permission. Coreq: BOT 775. (Also offered as GEN 774 and PLSC 774.) 3 cr.

775. Plant Cell Culture and Genetic Engineering Lab
Techniques of plant cell and tissue culture, protoplast fusion, genetic transformation. Mutant cell selection, analysis of foreign gene expression. (Also offered as GEN 775 and PLSC 775.) Coreq: BOT 774. Special fee. 2 cr.

795. Investigations in Botany
A) Systematic Botany; B) Plant Physiology; C) Plant Pathology; D) Plant Anatomy; E) Plant Ecology; F) Mycology; G) Cell Biology; H) Phycology; I) Botanical Teaching; J) Morphology; K) Cell Physiology; L) Scientific Writing; M) Microtechnique; N) Cell and Tissue Culture; O) History of Botany. Individual projects under faculty guidance. Prereq: permission. 1–6 cr. (4 cr. max. per semester for any single section.)

Chemical Engineering (CHE)

(For program description, see page 49.)

Chairperson: Stephen S. T. Fan
Professors: Stephen S. T. Fan, Virendra K. Mathur, Gael D. Ulrich
Associate Professors: Ihab H. Farag, Donald C. Sundberg
Assistant Professors: Dale P. Barkey, Russell T. Carr, Palligarnai T. Vasudevan

410. Survey of Current Energy and Pollution Control Technology
Energy supply in this country and the world; conventional fuel reserves: coal, oil, natural gas; alternative sources: nuclear, solar, geothermal, etc. Forecasts and strategies to meet needs. Environmental pollution, sources, and economic and environmental impacts. Methods for pollution control. Regulatory standards for environmental protection. Prereq: good background in high school chemistry. 4 cr.

501. Introduction to Chemical Engineering I
Systems of units; material balances and chemical reactions; gas laws; phase phenomena. 3 cr.

502. Introduction to Chemical Engineering II
Energy and material balances for systems with and without chemical reactions; design case studies. 3 cr.

601. Fluid Mechanics and Unit Operations
Continuity, momentum, and energy equations; laminar and turbulent flow in pipes; rheology. Applications to flow in porous media, filtration, and fluidization. 3 cr.

602. Heat Transfer and Unit Operations
Thermal properties of materials, steady-state and transient conduction and convection; radiation; applications to heat exchangers and process equipment. 3 cr.

603. Applied Mathematics for Chemical Engineers
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations; numerical solutions; series solutions; Bessel functions; Laplace transforms; matrix algebra. Interpretation and solution of partial differential equations. Prereq: knowledge of FORTRAN programming. Lab. 4 cr.

604. Chemical Engineering Thermodynamics
Volumetric and phase behavior of ideal and real gases and liquids; cycles; steady-flow processes; chemical equilibrium. Lab. 4 cr.

605. Mass Transfer and Stagewise Operations
Diffusion in gases, liquids, and solids; design and analysis of distillation, absorption, adsorption, extraction, and other stagewise equipment and operations. 3 cr.

606. Chemical Engineering Kinetics
Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions. 3 cr.

608. Chemical Engineering Design
Introduction to cost engineering. Application of acquired skills to design of chemical processes. Individual, major design project required. Lab. 3 cr.

609. Fundamentals of Air Pollution and Its Control
The origin and fate of air pollutants. Fundamentals of atmospheric meteorology, chemistry, and dispersion phenomena. Control of air pollutants and the related equipment. Current issues. Prereq: MATH 527; CHEM 403-404. Lab. 4 cr.

612. Chemical Engineering Laboratory I
Selected experiments in fluid mechanics, heat transfer, and unit operations. 2 cr.

613. Chemical Engineering Laboratory II
Selected experiments in mass transfer, stagewise operations, thermodynamics, and kinetics. 2 cr.

695. Chemical Engineering Project
Independent research problems carried out under faculty supervision. 1–4 cr.

696. Independent Study
Prereq: permission of the adviser and department chairperson; granted only to students having superior scholastic achievement. 1–4 cr.

701. Introduction to Polymer Engineering
Principles of polymer chemistry, polymerization kinetics, polymer rheology, and material characteristics. Design and analysis of polymer reactors, extruders, molding machines, and other forming operations. Lab. 4 cr.

705. Natural and Synthetic Fossil Fuels
Study of U.S. and foreign reserves of coal, oil, and natural gas. Petroleum processing and refining. Coal, oil shale, and tar sand. Gasification and liquefaction of coal. Lab. 4 cr.

712. Introduction to Nuclear Engineering
Development of nuclear reactors; binding-energy; radioactivity; elements of nuclear reactor theory; engineering problems of heat transfer, fluid flow, materials selection, and shielding; environmental impacts. 4 cr.

751. Process Simulation and Optimization
Techniques for computer-aided analysis of chemical processing systems. Development of mathematical models to describe process behavior. Application of optimization techniques. Prereq: a knowledge of FORTRAN programming. Lab. 4 cr.

752. Process Dynamics and Control
Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability analysis. Lab. 4 cr.

754. Graphic, Numerical, and Finite Element Applications in Chemical Engineering
Computational methods for solving differential equations resulting from the modeling of a process or physical phenomena. Graphical display of results of data and of curve-fitted equations. Use of interactive graphics and the solution of boundary-value problems. Applications of finite element analysis and discussion of other software available. Prereq: CHE

603 or permission of instructor; a knowledge of FORTRAN programming. 4 cr.

761. Biochemical Engineering
Immobilized enzyme technology, microbial biomass production, transport phenomena in microbial systems, biological reactor design, process instrumentation and control, applications in separation and purification processes. Lab. 4 cr.

772. Physicochemical Processes for Water and Air Quality Control
Origin and characterization of pollutants. Controls, including filtration, sedimentation, coagulation and flocculation, absorption and adsorption. Applied fluid mechanics, mass transfer, and kinetics. Thermal pollution, chemical treatment, oil spills on water, and aeration. Lab. 4 cr.

Chemistry (CHEM)

(For program description, see page 50.)

Chairperson: Frank L. Pilar
Professors: Kenneth K. Andersen, N. Dennis Chasteen, Clarence L. Grant, Colin D. Hubbard, Paul R. Jones, James D. Morrison, Charles W. Owens, Frank L. Pilar, W. Rudolf Seitz, James H. Weber
Associate Professors: Christopher F. Bauer, Richard P. Johnson, Gary R. Weisman, Edward H. Wong
Assistant Professors: Howard R. Mayne, Roy P. Planalp, Sterling A. Tomellini

***401-402. Introduction to Chemistry**
Elementary, broad view of chemistry; emphasizes topics related to everyday life. For students who do not intend to take any other chemistry courses, and those interested in satisfying a science requirement. Not a prerequisite for any other chemistry courses. Lab. 4 cr. (Not offered every year.)

***403-404. General Chemistry**
Fundamental laws and concepts applied to nonmetals, metals, and their compounds. For students who plan to take further chemistry courses. Previous chemistry recommended. Knowledge of algebra, exponentials, and logarithms required. Lab. 4 cr.

***405. General Chemistry**
Basic principles; atomic structure, bonding, equilibria, and thermodynamics. First course for chemistry majors. Prereq: one year of high school chemistry, algebra, and knowledge of exponentials and logarithms. Cannot be taken for credit if credit received for CHEM 403-404. Lab. 4 cr. (Honors lab available with permission.)

406. Quantitative Analysis
Studies of pollution, environmental problems, and the more traditional professional work in chemistry rely heavily on a sound knowledge of analytical chemistry. Gravimetric and volumetric analysis, potentiometry, spectrophotometry, and selected separations methods. Prereq: CHEM 404 or 405. Coreq: CHEM 407. 3 cr.

407. Quantitative Analysis Laboratory
Gravimetric and volumetric analysis; chemical separations; potentiometry and spectrophotometry. Treatment of data, error analysis, and calculation of results. Coreq: CHEM 406. 2 cr.

***409. Chemistry and Society**
Elementary survey of chemistry; integrates principles and applications. For students who do not intend to take any other chemistry courses and those interested in satisfying a general education science requirement. Not a prerequisite for any other chemistry course. Lab. 4 cr.

517. Quantitative Analysis
For students planning careers in medicine, dentistry, plant and animal science, nursing, oceanography, and environmental science. Volumetric methods, separations, and instrumental methods. Prereq: CHEM 404 or 405. Coreq: CHEM 518. 3 cr.

518. Quantitative Analysis Laboratory
Volumetric methods with an emphasis on technique; separations; and selected instrumental methods such as potentiometry, spectrophotometry, atomic absorption, and gas chromatography. Coreq: CHEM 517. 2 cr.

545. Organic Chemistry
Introductory study of carbon compounds for those who desire a brief terminal course. Prereq: CHEM 404 or 405. Coreq: CHEM 546. Students receiving credit for CHEM 545 may not receive credit for CHEM 402, 547-548, or 651-652. 3 cr.

546. Organic Chemistry Laboratory
Coreq: 545. 2 cr.

547-548. Organic Chemistry
Principal classes of organic compounds, aliphatic and aromatic; class reactions and structural theory. Intended primarily for chemistry, chemical engineering, and biochemistry majors. Prereq: CHEM 404 or 405; /or permission. Coreq: CHEM 549-550. Students receiving credit for CHEM 547-548 may not receive credit for either CHEM 545 or 651-652. 3 cr.

549-550. Organic Chemistry Laboratory
Coreq: 547-548. Lab. 2 cr.

651-652. Organic Chemistry
Principal classes of organic compounds, aliphatic and aromatic, class reactions and structural theory. Intended primarily for pre-healing arts, biological science, and health science students. Prereq: CHEM 404 or 405; /or permission. Coreq: CHEM 653-654. Students receiving credit for CHEM 651-652 may not receive credit for either CHEM 545 or 547-548. 3 cr.

653-654. Organic Chemistry Laboratory
Coreq: 651-652. 2 cr.

663. Introductory Radiochemical Techniques
Techniques and laboratory practice in the use of apparatus in many fields of science employing radiochemical operations. Prereq: general inorganic chemistry and general physics. Lab. 4 cr. (Not offered every year.)

683-684. Physical Chemistry I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Prereq: CHEM 404 or 405; MATH 426; pre- or coreq: PHYS 407 or 402; coreq: CHEM 685-686. 3 cr.

685-686. Physical Chemistry Laboratory
Measurement of thermodynamic properties, chemical kinetics, and methods of determining the structure of matter. Prereq: CHEM 404 or 405; MATH 426; pre- or coreq: PHYS 407 or 402; coreq: CHEM 683-684. 2 cr.

696. Independent Study
For exceptional students. Individual reading, writing, or laboratory work carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry. Prereq: approval of the adviser and department chairperson. Credits to be arranged.

697. Chemical Literature
The chemistry library as a research tool. Prereq: CHEM 548 or 652. 1 cr.

698. Seminar
Student reports on topics of interest. Prereq: CHEM 548 or 652; CHEM 684. 1 cr.

699. Thesis
Year-long investigation in a selected topic, with background and experimental investigation. For chemistry majors who have completed CHEM 548, 684, and 762. Required for B.S. majors. Strongly recommended for B.A. chemistry majors. Prereq: 2.50 average or permission. Lab. 8 cr.

708. Spectroscopic Investigations of Organic Molecules
Survey of the use of modern spectroscopic techniques for the identification and structural and dynamic characterization of organic compounds. Topics include proton and carbon-13 nuclear magnetic resonance, infrared spectroscopy, and mass spectroscopy. Problem solving is emphasized. 1–4 cr.

755. Advanced Organic Chemistry
Methods of synthesis and determination of structure, including stereochemistry of complex organic compounds. Prereq: CHEM 548 or 652 or equivalent. CHEM majors must register for 756 concurrently. 3 cr.

756. Advanced Organic Chemistry Laboratory
Synthesis and structural determination of complex organic compounds, techniques for

* *Students may receive credit for only one course from 401, 403, 405, and 409, and for only one course from 402, 404.*

the separation, determination of purity, and identification of compounds by spectroscopic and chemical means. Must be taken concurrently with 755 by CHEM majors. 2 cr.

762. Instrumental Methods of Chemical Analysis
Theory, instrumentation, and application of methods such as atomic absorption, coulometry, emission spectrography, gas and liquid chromatography, polarography, potentiometry, IR and UV-VIS absorption spectrophotometry, and mass spectrometry to chemical analysis. Prereq: CHEM 406 or 517; CHEM 684 as a pre- or corequisite; /or permission. Coreq: CHEM 763. 3 cr.

763. Instrumental Methods of Chemical Analysis Laboratory
Experimental parameters, error analysis, and applications of the methods covered in CHEM 762. Coreq: CHEM 762. 2 cr.

774. Inorganic Chemistry
Basic theoretical concepts and their applications to inorganic reactions and compounds. Prereq: organic chemistry; physical chemistry;/or permission. Coreq: CHEM 775. 3 cr.

775. Inorganic Chemistry Laboratory
Synthesis and characterization of inorganic compounds with an emphasis on techniques not taught in other laboratory courses. Undergraduates must take 774 concurrently. 2 cr.

776. Physical Chemistry III
Application of quantum theory to atomic electron structure, spectroscopy, and molecular structure. Prereq: CHEM 683-684. Lab. 4 cr.

778. Chemistry of Large Molecules
Basic chemistry of high-molecular-weight compounds, including synthetic polymers and substances occurring in living systems. Elementary aspects of the structures, syntheses, and properties of large molecules, and their roles in modern science, technology, and living systems. Prereq: one semester of organic chemistry. 4 cr. (Not offered every year.)

Chinese (CHIN)

401-402. Elementary Chinese
Aural-oral practice in meaningful contexts of the fundamental vocabulary and grammar of Mandarin Chinese. Reading and writing in romanization (pinyin) and in Chinese characters. 4 cr.

503-504. Intermediate Chinese
Continuation of CHIN 401-402. Conducted entirely in Chinese, with work on listening comprehension, speech, reading, and writing of Chinese characters, with increasing attention to reading contemporary Chinese texts. 4 cr.

Civil Engineering (CIE)

(For program description, see page 50.)

Chairperson: David L. Gress
Professors: Otis J. Sproul, Tung-Ming Wang
Adjunct Professor: Gerald M. Batchelder
Associate Professors: Pedro A. De Alba, Charles H. Goodspeed, David L. Gress, Robert M. Henry, Nancy E. Kinner, Paul J. Ossenbruggen
Assistant Professors: Thomas P. Ballestero, Richard Alan Behr, Jean Benoit, Michael R. Collins, James P. Malley
Research Assistant Professor: T. Taylor Eighmy

400. Civil Engineering Lectures
Introduction to the profession; the civil engineer as a planner, builder, and problem solver; and the goals of the civil engineering curriculum. Lectures by faculty and visitors. Required of CIE freshmen; open to others by permission. 0 cr. Cr/F.

505. Surveying
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its applications to state plane coordinate systems. Prereq: CIE majors. Coreq: MATH 426 or permission. Lab. 4 cr.

520. Environmental Pollution and Protection —A Global Context
Introduction to environmental science and the anthropogenic causes of environmental change. Emphasis on the causes, effects, and controls of air, water, and land pollution. The ecological, economic, and engineering aspects of pollution are discussed along with the political (both domestic and international) and legislative aspects of control. Not for CIE majors. 3 cr.

525. Mechanics I
Introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and virtual work. Prereq: MATH 425; MATH 426; PHYS 407. 3 cr.

526. Mechanics II
Introduction to strength of materials. Analysis of members under torsion, axial, shear, and bending stresses; superposition of stresses; stability of columns. Prereq: CIE 525. 3 cr.

527. Mechanics III
Introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: CIE 525 or permission. 3 cr.

530. Introduction to Civil Engineering Computer Applications
Computer applications in problem solving using matrix algebra, statistics, and Monte Carlo simulation. Emphasis on use of various computer systems and software libraries. Prereq: CS 410 and 410F. 3 cr.

622. Engineering Materials
Structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. Micro-structure and properties of common metals, plastics, and ceramics. Prereq: CIE 526. Lab. 4 cr.

630. Civil Engineering CAE Seminar
Lectures and seminars on the fundamentals of computers, hardware, software, applications, and computer management. Required of students in the CAE option. Prepares students for their senior CAE project. Prereq: CS 410; CS 410F; CIE 530. 1 cr.

633. Systems Analysis
Quantitative and economic techniques for optimum allocation of resources in planning and design of engineering systems. Topics include engineering economics, principles of optimization, and statistical decision analysis. Prereq: MATH 527. 3 cr.

642. Fluid Mechanics
Properties of fluids, fluid statics, continuity, momentum and energy equations, flow resistance. Measurement of fluids. Prereq: CIE 527 or permission. Lab. 4 cr.

643. Engineering Aspects of Environmental Pollution Control
Application of fundamental concepts of mass and energy balance in the design and description of pollutant flow and control. Physical, chemical, and biological aspects of pollution control are discussed. Economic and legislative aspects of pollution control are addressed briefly. Prereq: CHEM 403-404; MATH 425; 426. 3 cr.

644. Water and Wastewater Engineering
Fundamental design concepts for operations and processes used in water treatment and water pollution control. Prereq: CIE 643. 3 cr.

665. Soil Mechanics
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the behavior of soils subjected to various loading conditions. Prereq: CIE 622; CIE 642. Lab. 4 cr.

681. Classical Structural Analysis
Analytical stress and deflection analysis of determinate and indeterminate structures under static and moving load by classical methods. Prereq: CIE 525-526. 3 cr.

682. Project Planning and Design
Student groups will be formed into design teams to prepare a design plan for a large-scale civil engineering system including consideration of budgetary constraints, building code criteria, and environmental impacts. Each team prepares a final written and oral report. Prereq: senior CIE major or permission. 4 cr.

695. Civil Engineering Projects
Independent research, under faculty guidance, of a subject of particular interest to an individual or a small group. Prereq: approval of faculty member involved. 2–4 cr.

721. Pavement Design
Flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prereq: CIE 665 or permission. 3 cr.

722. Properties and Production of Concrete
Basic principles of hydraulic cements and mineral aggregates, and their interactions in the properties of plastic and hardened concrete; modifications through admixtures; production handling and placement problems; specifications; quality control and acceptance testing; lightweight, heavyweight, and other special concretes. Prereq: CIE 622 or permission. 3 cr.

723. Bituminous Materials and Mixtures
Considerations of major types of bituminous materials, asphalt cements, cutback asphalts, asphalt emulsions, and tars; influence of chemical composition on physical properties; desirable aggregate characteristics for bituminous mixtures; construction techniques; current practices for determining optimum asphalt contents. Prereq: CIE 622 or permission. 3 cr.

730. Civil Engineering CAE Project
Part lecture and part independent study. Lectures help the student bring together the materials of all the courses taken as part of the option and focus that information on the senior computer project. Prereq: CS 410; CS 410F; CIE 530; CIE 630. 3 cr.

734. Optimization of Engineering Systems
Application of methods to the optimum design of structures, treatment plants, and other large-scale facilities. Topics include linear and nonlinear programming, numerical methods, and linear regression analysis. Prereq: permission. 3 cr.

740. Rural Wastewater Engineering
Methods for collecting and treating wastewater in small communities and rural areas. Biological and physicochemical treatment systems for small communities; land application; soil absorption; gray water treatment; and septage treatment. Prereq: CIE 643. 3 cr.

741. Open Channel Flow
Energy and momentum principles in open channel flow; flow resistance; channel controls and transitions; unsteady open channel flows; convective and dispersive transportation of pollutants; and basic modeling techniques. Prereq: fluid mechanics or permission. 3 cr.

742. Hazardous Waste Management
A thorough examination of the hazardous waste management problem in terms of the magnitude of the problem, the regulation of hazardous wastes, hazardous waste treatment and disposal technology, siting requirements, and remedial actions required at uncontrolled dump sites. Prereq: CIE 644. 3 cr.

743. Environmental Sampling and Analysis
Laboratory exercises in the techniques of water, wastewater, and solid-waste sampling and analysis. Interpretation of results from pollution surveys and operation of pollution control facilities; statistics of sampling and statistical evaluation of analytical data. Prereq: CHEM 403-404. Lab. 3 cr.

744. Environmental Limnology
Biological, chemical, and physical processes that occur in lakes and impoundments are explored and interpreted with respect to the cultural activities of society. Basic concepts of lake origin, morphometric and trophic status, water movement and stratification, nutrient cycling, and others. Current limnologically related problems are explored from the environmental engineering standpoint. Term projects involving laboratory and fieldwork, and readings in the current scientific literature are required. Lab. 4 cr.

745. Engineering Hydrology
Hydrologic cycle, probability theory related to hydrology and the design of water resources structures, flood discharge prediction, hydrograph development, hydraulic and hydrologic river routing, reservoir routing, theory of storage, reservoir operations, hydropower development, multipurpose projects. Prereq: fluid mechanics or permission. 3 cr.

746. Wastewater Treatment Plant Design
Choice of treatment units. Design of the components; preparation of a plan for a particular city that includes a suitable combination of the units previously designed. Prereq: CIE 644. 3 cr.

747. Introduction to Marine Pollution and Control
Introduction to the sources, effects, and control of pollutants in the marine environment. Dynamic and kinetic modeling; ocean disposal of on-shore wastes, shipboard wastes, solid wastes, dredge spoils, and radioactive wastes; and oil spills. Prereq: CIE 644 or permission. 3 cr.

748. Solid Waste Management
Basic concepts and theories of solid waste management systems, including collection and disposal methods. Incineration, sanitary landfill design, etc.; resource recovery techniques; hazardous waste management. Prereq: CIE 643 or permission. 3 cr.

749. Water Chemistry
The application of chemical principles to the interpretation of water quality criteria and parameters and the use of chemistry in water and wastewater treatment will be discussed. The theory, applications, and the calculations of ionic equilibrium will be stressed. Major topics covered include acid/base, hydrolysis, complexation, precipitation/dissolution, and redox equilibria. The applicability of such results and kinetic principles to natural water chemistry will also be briefly discussed. Prereq: CHEM 403-404 or equivalent. 3 cr.

751. Transportation Planning
Transportation demand forecasting techniques applied to regional and urban situations. Calibration and use of mathematical models for forecasting land use, trip generation, trip distribution, modal choice, and trip assignment. Prereq: MATH 644. 3 cr.

752. Traffic Engineering
Fundamental relationships of traffic speed, density, and flow. Topics include correlation and linear regression analyses, design of roadways for uninterrupted and interrupted flow, analysis of signalized and unsignalized intersections, and classification of roadways by capacity and level of service. Prereq: MATH 644 or equivalent. 3 cr.

755. Design of Water Transmission Systems
Pressure, sewer, and open channel system design. Theory developed for individual components to large complex systems. Topics include closed conduit flow, open channel flow, groundwater flow, valves and meters, pump selection, system planning and layout, and system operation and maintenance. Prereq: CIE 642 or permission. 3 cr.

756. Wastewater Microbiology
Concepts of wastewater treatment microbiology. Topics include taxonomy of wastewater species; cellular chemical composition and ultrastructure of sewage microorganisms; microbial metabolism, interaction, and growth kinetics in wastewater treatment; biogeochemical cycling in polluted water; and effects of environmental parameters on wastewater microbial processes. Laboratory projects examine these concepts. Prereq: CIE 644 or permission. Lab. 4 cr.

757. Coastal Engineering and Processes
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave-structure interaction. Introduction to mathematical and physical modeling. Prereq: CIE 642 or permission. 3 cr.

760. Foundation Engineering
Subsurface investigation and characterization using current methods of laboratory and in situ testing. Application of consolidation theory to settlement problems. Bearing capacity theory and design of shallow foundations including footings and rafts. Design and analysis of deep foundations including piles, piers, and caissons. Prereq: CIE 665 or permission. 3 cr.

761. Earth Structures
Earth pressure theory and design of temporary and permanent retaining structures including retaining walls, sheet-pile walls, braced and tieback walls. Design and analysis of slurry trench cutoffs and walls. Dewatering with design of shallow and deep systems. Slope stability theory and applications. Embankment

design. Prereq: CIE 665; CIE 760;/or permission. 3 cr.

774. Reinforced Concrete Design
Introduction to the design of reinforced concrete structural members. Includes beams, columns and foundations, and construction details of reinforcing. Prereq: CIE 681. 4 cr.

782. Timber Design
Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members, and connections in beams, columns, and trusses, and glued laminates of wood. Prereq: CIE 681 or permission. 3 cr.

783. Matrix Structural Analysis
Analysis of determinate and indeterminate structures; nonprismatic members subject to static and moving loads. Solution by matrix and computer-applied methods. Prereq: CIE 681 or permission. 3 cr.

784. Civil Engineering Analysis with Numerical Techniques
Unifying concepts of civil engineering analysis, theory, and numerical techniques. Discussion includes assumptions required by numerical techniques and their relationship to the theory and analytical results. Prereq: permission. 3 cr.

785. Introduction to Structural Vibrations
Dynamic analysis of single- and multi-degree-of-freedom systems. Simple beam and frame structures. Earthquake analysis and design. Co- or prereq: CIE 685. 3 cr.

786. Introduction to Finite Element Analysis
Topics include basic matrix theory, Galerkin method, direct stiffness method, calculus of variations, development of finite element theory, and modeling techniques. Applications in solid mechanics, heat transfer, fluids, dynamics, and electromagnetic devices, via both commercially available codes and student-written codes. Prereq: CS 410F; ME 603;/or permission. (Also offered as ME 786 in alternate years.)

791. Prestressed Concrete
Design of prestressed and post-tensioned concrete sections in flexure and shear. Prestressing systems and ultimate strength methods will be introduced. Prereq: CIE 774 or permission. 3 cr.

793. Structural Design in Steel
Design of members and connections: tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Introduction to plastic design of beams and frames. Prereq: CIE 681 or permission. 4 cr.

795-796. Independent Study
A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigations. (May repeat.) 1–4 cr.

Classics (CLAS)

Department of Spanish and Classics
(For program description, see page 25; see also course listings under Greek and Latin.)

Chairperson: John C. Rouman
Associate Professor: John C. Rouman
Assistant Professors: Richard E. Clairmont, Richard V. Desrosiers, Jeanne G. Kurtz

411-412. Elementary Hittite
Elements of grammar, reading of simple prose. 4 cr.

413-414. Elementary Sanskrit
Elements of grammar, reading of simple prose. 4 cr.

501. Classical Mythology
Survey of the myths and sagas of ancient Greece and Rome. No classical preparation necessary. Background course for majors in English, the arts, music, history, classics, etc. One session weekly devoted to related art and music. 4 cr.

502. Hellenic and Roman Institutions
Lecture, discussion. Introduction to ancient Greek and Roman literature. Emphasis on the institutions from the earliest period to the end of the classical age. Open to all students. 4 cr.

503. Cicero and the Roman Republic
Introduction to the political background of Cicero's career and study of the role played by the greatest of Roman orators in the constitutional crisis of the last century of the Republic. Open to all students. 4 cr.

504. The Augustan Principate
A study of the early Roman Empire as created by Augustus and his immediate successors; glorified by Vergil, Horace, and the poets of the Golden Age; and described by Tacitus, Suetonius, and the prose writers of the Silver Age. Open to all students. 4 cr.

506. Introduction to Comparative and Historical Linguistics
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and LING 505 desirable. (Also offered as LING 506.) 4 cr.

511. Major Greek Authors in English
Major classical authors such as Homer, the Tragedians of Athens, Herodotus, Thucydides, and Plato in the context of their civilization, from which so much of our contemporary culture derives. For students unprepared to read Greek. Background for majors in English, history, Latin, Greek, the arts, music, philosophy, modern languages, etc. Open to all students. 4 cr.

512. Major Roman Authors in English
Major classical authors such as Plautus, Terence, Cicero, Catullus, Vergil, Ovid, Seneca, Juvenal, and Tacitus in the context of their civilization, from which so much of our contemporary culture derives. For students unprepared to read Latin. Background for majors in English, philosophy, history, Latin, Greek, the arts, music, modern languages, etc. Open to all students. 4 cr.

521, 522. Masterpieces of Greco-Roman Culture in English
More advanced study of the writings of classical civilization centered on a single theme and taught in the Socratic method. For students with some classical preparation, although no knowledge of the Greek and Latin languages is required. Background for prelaw students as well as majors in English, history, Latin, Greek, modern languages, and political science. 4 cr.

525. Greek and Latin Origins of Medical Terms
Study of medical terminology. Exercises in etymology and the development of vocabulary in a context at once scientific, historical, and cultural. No knowledge of Greek or Latin is required. Useful to premedical, predental, preveterinary, nursing, medical technology, and other students in the biological and physical sciences. Open to all students. 4 cr.

595, 596. Topics in Classics
Introduction and elementary study related to linguistic study of Latin and Greek or relevant to Greco-Roman culture and history. Primarily for students unprepared to read Latin and Greek. Topics: A) Byzantine Heritage; B) Grammar: Comparative Study of English and the Classical Languages; C) Greek and Latin Origins of Legal Terms; D) Greek and Latin Origins within the English Language; E) Classical Backgrounds of Modern Literature; F) Classical Archaeology. 4 cr.

695, 696. Special Studies in Classics
Advanced work in classics. Research paper. Not open to freshmen and sophomores. 2 or 4 cr.

Communication (CMN)

(For program description, see page 25.)

Chairperson: Barbara M. Montgomery
Professor: Joshua Meyrowitz
Associate Professors: Sheila McNamee, Barbara M. Montgomery, Wilburn L. Sims
Assistant Professors: William Husson, Beverly James, John Lannamann, Lawrence J. Prelli
Faculty in Residence, Assistant Professors: James Farrell, Eveline Lang, Gene Lerne
Faculty in Residence, Instructor: Bruce Weal
Lecturers: Amy Chartoff, Patrick J. Daley

402. Communication and Social Order
Introduction to human communication from a broad liberal arts perspective; emphasizing the role of symbolic interaction in the construction of social reality. Processes of intrapersonal, interpersonal, group, public, and mass communication. Freshman, sophomore priority. 4 cr.

455. Introduction to Mass Communication
Nature, development, and effects of mass

media. Overview of mass communication history and theory. 4 cr.

456. Propaganda and Persuasion
Introduction to theories of propaganda and persuasion. Examination of symbolic strategies designed to secure or resist social and institutional change. Attention given to case studies of social, political, economic, and religious reformation. Special consideration of the ethical ramifications of such efforts. 4 cr

457. Introduction to Interpersonal Communication
Research and theory that define the area of interpersonal communication. Examination of the associations between communication and such social phenomena as self-concept, social attraction, relationship development, and health. 4 cr.

500. Public Speaking
Performance course buttressed by practical theories of public discourse. Focus on analysis of speaking situations and audiences, message construction, presentation, and critical evaluation. 4 cr.

503. Introduction to Group Process
Focuses on a variety of concepts relevant to the study, analysis, and understanding of communication in the small group setting. Issues include leadership, group roles, problem-solving and decision-making processes in task-oriented groups. 4 cr.

504. Introduction to Argumentation
Principles of inquiry and advocacy; philosophical and logical frameworks of argument; analysis, discovery, and testing of data; forms of argument; testing of arguments; patterns of proof. 4 cr.

505. Analysis of Popular Culture
Locates the development of popular cultural artifacts and practices within the 20th-century social history of the U.S. Examines the political-economic forces that underpinned the commercialization of art, leisure, sports, and other elements of culture in industrial and post-industrial America. 4 cr.

506. Communication as Social Influence
Examines cognitive and social bases of persuasion and social influence, drawing from systems theory, constructivism, cognitive science, dissonance theories, and interpretative social theory. Focuses on processes of change as applied to face-to-face interaction, group and family settings, and mediated communication. 4 cr.

507. Rhetorical Foundations of Human Communication
Explication of major theoretical precepts of rhetoric through communication analysis. Examination of several humanistic perspectives toward communication, application of basic conceptual tools of rhetorical analysis, consideration of ways in which our symbolic behaviors shape our lives. 4 cr.

515. Analyzing News
Explores the psychological, social, economic, political, and cultural factors that influence the definition and reporting of "news." 4 cr.

519. Advertising as Social Communication
Social role of advertising, public policy debates concerning advertising, influence of advertising on culture, and methods of analyzing advertising messages. 4 cr.

530. Family Communication
Comparison and evaluation of selected theories of communication developed for the analysis of family interaction. Focus on pattern development and intervention, change, stability, and coherence in family interaction. 4 cr.

533. Introduction to Film
The art, history, technology, and theory of the narrative motion picture from the silent period to the present. Examination of films by such filmmakers as Griffith, Keaton, Eisenstein, Renoir, Welles, Hitchcock, Bergman, Kurosawa. (Also offered as ENGL and THEA 533; communication majors must register for CMN 533.) 4 cr.

556. Introduction to Television Production
Theory and actual studio experience, practice, and procedures. All aspects of television work and formats. Students operate every piece of studio equipment and write, produce, and direct several shows. Prereq: CMN 455 or permission. (Also offered as THEA 556; communication majors must register for CMN 556.) 4 cr.

560. Filmmaking
Theory of cinematic construction grounded in production work. Visualization, storyboarding, pictorial composition, creation of filmic reality, narrative devices, and editing. Students produce own short films. Lab fee. Prereq: permission. (Also offered as THEA 560.) 4 cr.

567. Images of Gender in the Media
Portrayal of women and men in a variety of media. Communication research methodologies employed to examine media attempts to persuade, reinforce, and manipulate attitudes. 4 cr.

572. Language and Behavior
Focus on language and how a person's, group's, society's, and culture's use of language is associated with different behavioral patterns and world views. Topics include the relationship of language to social standing, race, minority group membership, gender, and stereotyping. 4 cr.

580. Broadcast News Preparation and Delivery
Introduction to radio and television news writing, editing, and delivery. Emphasis on practical radio news-writing experience. (Also offered as THEA 580.) 4 cr.

583. Gender and Expression
Analysis of the different ways people communicate about gender, the different ways men and women communicate, and the consequences of these differences. 4 cr.

596. Special Topics in Media Studies
Selected topics not covered by existing courses in media studies. Topics vary; course descriptions are available in departmental office during preregistration. May be repeated for credit if topics differ. 4 cr.

597. Special Topics in Rhetorical Studies
Selected topics not covered by existing courses in rhetorical studies. Topics vary; course descriptions are available in departmental office during preregistration. May be repeated for credit if topics differ. 4 cr.

598. Special Topics in Interpersonal Studies
Selected topics not covered by existing courses in interpersonal communnication. Topics vary; course descriptions are available in department office during preregistration. May be repeated for credit if topics differ. 4 cr.

602. Theories of Interpersonal Communication
Analysis and criticism of contemporary perspectives on interpersonal communication. Theories, concepts, issues, and research models are examined as they contribute to our understanding of social interaction. Prereq: any CMN 500-level interpersonal studies course or permission. 4 cr.

604. Fields of Argument
Studies of argumentation, advocacy, and inquiry, within different discursive fields. Particular attention to public discourse in such areas as politics, ethics, law, science, and the arts. Prereq: any 500-level rhetorical studies course (CMN 504 recommended). 4 cr.

605. Argumentation and Public Advocacy
Ideas and methods of adversarial and consensual public advocacy. Applied emphasis on public policy argumentation and decision making. Prereq: any 500-level rhetorical studies course; CMN 500 or 504 recommended. 4 cr.

616. Studies in Film
Advanced, focused study of the cinema. Topics vary from year to year and with instructor. Focus may range from general considerations of film theory, film criticism, and film history, to specific analyses of selected genres, directors, and periods. Course descriptions available in departmental office during preregistration. (Also offered as ENGL and THEA 616; CMN majors must register for CMN 616.) Prereq: CMN/ENGL/THEA 533 or permission. 4 cr.

630. Psychology of Communication
Exploration of differing world views in the study of the individual in interaction, with emphasis on how they generate very different conceptions of the human communication process. Specific attention to the theoretical models that represent varying epistemological orientations and the treatment within each perspective of such notions as the construction of social meaning, the construction of self, and

the construction of interactive patterns. Prereq: any 500-level interpersonal studies course or permission. 4 cr.

632. Communication Theory
Terminology, concepts, theoretical models, functions, levels, modes and media, and role taking in human communication. Prereq: any 500-level CMN course (three 500-level courses recommended) or permission. 4 cr.

638. Media and Social Thought
Situates the development of media, public attitudes toward media, and academic study of media within late 19th- and 20th-century social theories, including mass society theory, functionalism-pluralism, and European critical theories. Traces the fragmentation of 19th-century social philosophy into discrete specialized academic disciplines in the 20th century, and discovers the roots of modern media studies in such cognate fields as sociology, psychology, anthropology, and linguistics. Prereq: any 500-level media studies course or permission. 4 cr.

640. Media, Culture, and Society
Focuses on culture as an intermediary in the influence of media on social life. Uses ethnography and interpretive social theory to study the role of media in the construction and maintenance of social differentiation. Prereq: any 500-level media studies course or permission. 4 cr.

656. Principles of Rhetorical Criticism
Application of critical principles to message evaluation. Consideration of the varying roles, methods, and standards of rhetorical critics. Special attention to major perspectives on rhetorical criticism including neo-Aristotelian, historical, dramatistic, generic, literary, and psychological. Prereq: any 500-level rhetorical studies course (CMN 507 recommended). 4 cr.

657. Public Address
American public address examined as a branch of the history of ideas. Variable course content focuses on historical development of significant ideas and issues as expressed through popular discourse. Prereq: any 500-level rhetorical studies course (CMN 507 recommended). 4 cr.

658. Media Analysis and Criticism
Approaches and methodologies for media criticism. Analysis of sample studies. Students work on original media analysis projects. Prereq: any two 500-level CMN courses (three 500-level courses recommended) or permission. 4 cr.

670. Systems and Theories of Rhetoric
Critical interpretation of significant works in the history of rhetorical theory and the major philosophical systems underlying them. Selected contemporary theories of rhetoric examined as they relate to classical perspectives. Explores fundamental philosophical and theoretical questions asked by rhetorical theorists and several responses to those questions. Prereq: any 500-level rhetorical studies course (CMN 597 recommended). 4 cr.

672. Theories of Language and Discourse
Focus on different theoretical orientations to the study of language and specific models for analyzing conversation. Specific issues include conversational rules and coherence, turn taking, narrative development and analysis, speech act analysis, accounts analysis, and conversational analysis. Prereq: any 500-level interpersonal studies course or permission (572 recommended). 4 cr.

680. Perspectives on Culture and Communication
Theoretical and practical problems of intercultural communication. Explores how communication transactions create, maintain, and separate different cultures. Prereq: any 500-level interpersonal studies course or permission. 4 cr.

696. Communication Seminar in Media Studies
Variable topics in media research, theory, and practice. May be repeated for different topics. Topic descriptions available in departmental office during preregistration. Prereq: any 500-level media studies course or permission. 4 cr.

697. Communication Seminar in Rhetorical Studies
Variable topics in rhetorical research, theory, and practice. May be repeated for different topics. Topic descriptions available in departmental office during preregistration. Prereq: any 500-level rhetorical studies course or permission. 4 cr.

698. Communication Seminar in Interpersonal Studies
Variable topics in interpersonal research, theory, and practice. May be repeated for different topics. Topic descriptions available in departmental office during preregistration. Prereq: any 500-level interpersonal studies course or permission. 4 cr.

701. Modes of Communication Inquiry
Overview of selected philosophical orientations, issues, and concepts central to communication research. Examination of both qualitative and quantitative methods. Prereq: two 500-level CMN courses or permission. 4 cr.

702. Seminar in Interpersonal Communication Theory
In-depth concentration on a particular theoretical orientation in interpersonal communication. Original works are read. Theoretical orientation varies by semester. Theories covered include rule theories, systems theories, individual difference theories, symbolic interactionism, constructivism, hermeneutics, phenomenology, cybernetics, etc. Prereq: three 500-level CMN courses with at least one in interpersonal studies or permission. 4 cr.

703. Seminar in Rhetorical Theory
Focused study of problems in rhetorical theory construction through examination and criticism of selected theoretical frameworks used to explain or interpret rhetorical phenomena. Prereq: permission. 4 cr.

772. Seminar in Media Theory
Detailed analysis of major theories related to the interaction of communication technologies and society. Application to current examples in politics, advertising, and entertainment. Prereq: at least one 600-level course or permission. 4 cr.

795. Independent Study
Advanced individual study in rhetoric, media, or interpersonal communication. Project to be developed with supervising instructor. May be repeated for credit. Prereq: permission. Variable to 4 cr.

Communication Disorders (COMM)

(For program description, see page 60.)

Chairperson: Frederick C. Lewis
Associate Professors: Stephen N. Calculator, Frederick C. Lewis
Adjunct Associate Professors: Linda Hanrahan, Frederick P. Murray
Assistant Professor: Penelope E. Webster
Adjunct Assistant Professors: Richard Guare, Mark Hammond, Bernard Henri
Instructor/Clinical Supervisor: Amy S. Plante
Clinic Coordinator: Penelope E. Webster

COMM 520 is a prerequisite for all courses in the department.

520. Survey of Communication Disorders
Causes, diagnosis, and treatment of speech, language, and hearing disorders. 4 cr.

521. Anatomy and Physiology of the Speech and Hearing Mechanisms
Anatomy, physiology, neurology, and function of the mechanisms for the production and perception of speech. 4 cr.

522. The Acquisition of Language
Review of research and theories in speech pathology, education, linguistics, and learning theory related to development of language in the normal child. 4 cr.

523. Clinic Observation
Formal observation of diagnosis and therapy being conducted for individuals with a variety of communication disorders. Prereq: COMM 520. 1 cr. Cr/F.

524. Applied Phonetics
Application of the International Phonetic Alphabet to normal and clinical populations; use of broad and narrow transcriptions. Basic speech science, acoustic phonetics, and acoustic analysis of speech production. 4 cr.

530. Technical Skills in Speech Pathology
Introduces basic skills essential to the study of communication disorders: critical reading, professional writing, objective observation, treatment program development. History, requirements, and governance of the profession. 2 cr.

631. Speech Pathology I
Research, diagnosis, and therapy procedures as applied to articulation and language disorders. 4 cr.

632. Speech Pathology II
Diagnosis, therapy, and counseling procedures applied to communication disorders; emphasis on cleft palate, cerebral palsy, and aphasia. Prereq: COMM 631 or permission. 4 cr.

633. American Sign Language I
Introduction to the vocabulary, finger spelling, and grammatical processes of American Sign Language. Emphasis on applying basic principles of sign language, psychosocial aspects of deafness, and the deaf person as bilingual. Prereq: permission. 2 cr.

634. Introduction to Clinical Procedures
Clinical procedures and client management. Treatment techniques for disorders of articulation and language. Parent interview and counseling, facilitating target behaviors, and report writing. Prereq: COMM 530; COMM 631. Coreq: COMM 635. 2 cr. Cr/F.

635. Clinical Practicum in Speech-Language Pathology
Supervised experience in diagnosis and therapy with speech- and language-impaired children and adults. Experience with individual and group therapy. Prereq: COMM 530; COMM 631. Coreq: COMM 634. 3 cr.

650. Principles and Practice of Public School Speech Therapy
Principles, goals, and philosophy of public school speech and language therapy. Supervised practicum. Prereq: COMM 634. Lab. 4 cr.

660. Special Problems in Communication Disorders
Individual or group projects to enrich or expand theoretical knowledge and to afford an opportunity for applied experience. Prereq: permission and arrangement with faculty. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

701. American Sign Language II
Advanced phonology, syntax, and semantics of American Sign Language. Emphasis on grammatical processes that modulate meaning of signs in discourse and development of receptive language skills. Prereq: COMM 633 and permission. 2 cr.

702. American Sign Language III
Emphasis on the advanced linguistic principles of American Sign Language including idioms, slang, and their place in the communication patterns of the deaf. Improvement of speed and accuracy in receptive and expressive skills for communicating with the deaf. Educational and vocational problems associated with deafness. Prereq: COMM 701 and permission. 2 cr.

704. Basic Audiology
Normal hearing process and pathologies of the auditory system. Hearing screening, pure-tone testing, and speech audiometry. Prereq: COMM 521 or permission. 4 cr.

705. Introduction to Auditory Perception and Aural Rehabilitation
Research, testing, and clinical procedures of auditory perception, applied to the communicatively impaired. Prereq: COMM 704; permission. 4 cr.

777. Speech and Hearing Science
Physical, acoustical, and perceptual correlates of normal speech production and audition. Includes theoretical models along with the generation, transmission, detection, and analysis of speech signals. 3 cr.

780. Diagnosis of Speech and Language Disorders
Principles and practice for diagnosis of speech and language disorders; examination procedures and measurement techniques. Prereq: COMM 632. 4 cr.

795. Independent Study
Application of the theory to specific communication disorder areas for individual or group projects. Prereq: permission. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

Community Development (CD)

Department of Resource Economics and Community Development
(For program description, see page 38; for faculty listing, see page 155; see also course listings under Resource Economics.)

415. Community Issues and Perspectives
Introduction of the concept of community and issues that are facing contemporary communities as they undergo change. Investigations of the required components for a successful community and the role and responsibilities of professional administrators and individual citizens in the dynamic process of community policy formulation, decision making, and administrative implementation. 4 cr.

508. Applied Community Development
Students work in an actual community, assisting individuals and groups to identify needs and problems, establish attainable and objective goals, assess requirements and resources, and formulate programs for development; methods of collection, analysis and integration of pertinent primary and secondary economic, social, political, and physical data for community development. Prereq: CD 415 or permission. Lab. 4 cr.

531. Fundamentals of Real Estate
Examination of title and legal processes involved in the acquisition and sale of real estate, including real estate rights, limitations and restrictions of rights, contracts and agreements, transferring property, types of deeds, financing the purchase of real estate, the closing statement, real estate law and ethics, and estimating real estate value. 4 cr.

532. Real Estate Appraisal
Intensive study of the principles of residential and commercial appraising. Topics include influences affecting value, the three approaches to value, principles of land and building analysis, building cost estimation, and depreciation —its causes and effect. Prereq: CD 531. 4 cr.

535. Real Estate Law
Fundamentals of real estate law; nature and classes of property; ownership; purchase and sales; and the rights, duties, and responsibilities of the broker. 3 cr.

536. Real Estate Finance
Types and sources of funding for residential and commercial property. Financial evaluation of loan proposals, mortgage processing, and loan management and servicing. 3 cr.

607. Community Administration and Development
Principal theories and methods of community administration and development; skills required for professional and citizen volunteers who are involved in decision making and administrative activities in local communities. Emphasis on the responsibilities and strategies of individuals working in the field of local public administration. 4 cr.

614. Community Planning
Community planning process in nonmetropolitan communities; practical application of planning techniques. Community components: housing, jobs, schools, recreation, transportation; community appearance and the administrative structure for planning. Use of planning tools: data gathering and analysis, the master plan, zoning and subdivision regulations, community development programs. Prereq: RECO 411; CD 415; /or permission. 4 cr. (Not offered every year.)

627. Community Economics and Finance
Economic and financial factors affecting community and local government decisions. Emphasis on use of economic theory and analytical techniques to evaluate problems in contemporary New England communities and towns. Prereq: RECO 411 or ECON 402. (Also offered as RECO 627.) 4 cr. (Offered every other year.)

710. Community Development Seminar
Seminars arranged to students' needs and offered as demand warrants: in-depth treatment of area, including classic works. May be repeated. 2–4 cr.

717. Law of Community Planning
Common law and the Constitution with respect to property law, including eminent domain, land-use planning, urban renewal, and zoning. Makes the nonlawyer aware of the influence and operation of the legal system in community development. 4 cr.

795, 796. Investigations in Community Development
Special assignments in readings, investigations, or field problems. May be repeated. Prereq: permission. 2–4 cr.

Computer Engineering

(See Electrical and Computer Engineering.)

Computer Science (CS)

(For program description, see page 52.)

Chairperson: Robert D. Russell
Professor: Shan S. Kuo
Associate Professors: R. Daniel Bergeron, Eugene C. Freuder, Robert D. Russell, James L. Weiner
Assistant Professors: Philip John Hatcher, Michael J. Quinn
Adjunct Assistant Professor: Sylvia Weber Russell
Instructors: Brian Leigh Johnson, Paul Arthur Sand
Lecturers: Donald A. Barre, Mark D. LeBlanc, Priscilla Malcolm

403. Introduction to Digital Computer Programming
Development of algorithms and programs. Basic programming and programming structure utilizing FORTRAN language; use of an operating system, computer solution of numerical and nonnumerical problems. Intended for chemical engineering majors. No credit toward a math or CS major. Credit cannot be received for both CS 403 and CS 410F. 2 cr.

406. Introduction to Computers and Programming
Introduces computers, computer systems, and their applications, with emphasis on the concepts and techniques of computer programming using several programming languages. Intended primarily for liberal arts and other nontechnical students who plan no further study in computer science. Requires skills in reasoning and systematic problem solving. Not open to majors. 4 cr.

The drop/add deadline for all CS 410 courses is the third Friday of class.

410. Introduction to Computer Programming
A set of 2-credit modules. Introductory module, first half of the semester. Other modules usually second half of the semester. Introductory module prerequisite for all other modules. Permission required to register for less than 4 credits. 2 or more cr.

410. Introductory Programming
Introduction to the concepts and techniques of computer programming. Particular emphasis is placed on good programming style. The programming language PASCAL is used. 2 cr.

410C. Introduction to Data Structures with C
Basic data structures including strings, lists, stacks, and queues. Programming with data abstractions. Programming in C including double precision, file handling, recursion, and address manipulation. Prereq: CS 410. 2 cr.

410F. Scientific Programming with FORTRAN
Introduction to basic algorithms and techniques used in scientific programming. The FORTRAN programming language is taught and used for the programming assignments. Prereq: CS 410. 2 cr.

415-416. Introduction to Computer Science I and II
Theory and practice of computer science. Algorithm development and analysis; data abstraction techniques; elementary data structures; programming with imperative languages, functional languages, and logic programming languages. Computer systems and applications. Intended for CS majors. 4 cr.

610. Operating System Fundamentals
Introduction to operating system concepts and design. Job, process, and resource management; I/O programming. Hands-on use of laboratory mini- or microcomputer. Prereq: CS 410C or 416. 4 cr.

611. Assembly Language Programming and Machine Organization
Assembly language programming and machine organization: program and data representation; registers, instructions, and addressing modes; assemblers and linkers. Impact of hardware on software and software on hardware. Historical perspectives. Prereq: CS 410C or 416. 4 cr.

612. Data Structures and Algorithms
Review of basic data structures; advanced data structures such as graphs, B-trees, and AVL trees; abstract data structure design and programming techniques; use of a data abstraction language. Introduction to algorithm analysis. No credit toward CS major. Prereq: CS 410C. 4 cr.

658. Analysis of Algorithms
Introduction to use of basic mathematics in design and analysis of computer algorithms. Topics include O-notation, divide and conquer, the greedy method, dynamic programming, and NP-completeness. Prereq: MATH 531C; CS 416 or 612. 4 cr.

671. Programming Language Concepts and Features
Concepts of programming languages illustrated through comparison and use of various languages. Formal definition of programming languages; specification of syntax and semantics. Properties of algorithmic languages, data abstraction languages and special purpose languages for list processing and symbol manipulation; run-time representation of program and data structures. Prereq: CS 416. 4 cr.

696. Independent Study
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1–6 cr.

710. Advanced Systems Programming
Topics in systems programming, including organization and implementation of assemblers, linkage editors, job schedulers, command language decoders. File systems, protection, security, performance evaluation, and measurement. Prereq: CS 610 and CS 611. 4 cr.

712. Compiler Design
Formal languages and formal techniques for syntax analysis and parsing; organization of the compiler and its data structures; problems presented by error recovery and code generation. Classical top-down and bottom-up techniques currently in widespread use, general discussion of LL(k) and LR(k) parsers; automatic methods of compiler generation and compiler compilers. Students required to define a simple, nontrivial programming language and to design and implement its compiler. Prereq: CS 671. 4 cr.

713. Computer Graphics
Input-output and representation of pictures from hardware and software points of view; interactive techniques and their applications; three-dimensional image synthesis techniques. Prereq: CS 416 or 612. 4 cr.

714. Introduction to Programming Semantics
Informal, nonmathematical introduction to descriptive techniques of denotational semantics. Provides framework needed to describe formally programming languages such as PASCAL. No previous knowledge of the theory of computation or of any particular programming language is assumed. Prereq: CS 671 or permission. 4 cr.

715. Introduction to Artificial Intelligence
Machine intelligence, representation and control issues, search methods, problem solving, learning computer vision, natural language understanding, knowledge engineering, game playing. Heuristic programming and the LISP language. Prereq: CS 671. 4 cr.

716. Database Techniques
Database analysis and design. Hierarchic, network, and relational models. Data normalization, data manipulation tools, data description languages, query functions and facilities, design and translation strategies, file and index organizations, data integrity and reliability, data security techniques, distributed database systems, actual usage of selected DBMS on computers. Prereq: CS 610; CS 416 or 612. 4 cr.

717. Computer Communications Software Design
Telecommunications software; error detection algorithms; asynchronous and synchronous communications software; network architectures; protocol definition and implementation; links through a local area network; timing considerations. Selected communications software will be implemented. Prereq: CS 610. 4 cr.

753. Numerical Methods and Computers I
Use of scientific subroutine and plotter routine packages, floating point arithmetic, polynomial and cubic spline interpolation, implementation problems for linear and nonlinear equations, random numbers and Monte Carlo method, Romberg's method, optimization techniques, finite elements. Selected algorithms programmed for computer solution. Prereq: MATH 426; CS 410C, 410F, or 416. (Also offered as MATH 753.) 4 cr.

754. Numerical Methods and Computers II
Mathematical software. Computer solutions of differential equations; eigenvalues and eigenvectors. Prereq: MATH 527; CS 410C, 410F, or 416. (Also offered as MATH 754.) 4 cr.

760. Semantic Issues in Natural Language Processing
Introduction to computational analysis of natural language with a focus on semantic issues. Syntax and formal grammars, parsing, semantic representations, inference, memory. Ambiguity, metaphor, noun groups. Prereq: elementary knowledge of a programming language such as LISP or PROLOG or permission. 4 cr.

762. Introduction to Natural Language Processing
The problem of natural language processing as viewed within the disciplines of artificial intelligence, linguistics, psycholinguistics, psychology, and neuroscience. Topics covered include: comprehension, production, and acquisition of language; and neurological aspects of language performance. Prereq: CS 715 or permission. 4 cr.

790. Topics in Computer Science
Offered on an irregular basis with varying content. 4 cr.

Dance (DANC)

Department of Theater and Dance
(For program description, see page 34; for faculty listing, see page 162; see also course listings under Theater.)

441. Exploring Theatrical Process
Introduction to the process of creation. Investigation of interaction of stimulus and artwork. Exploration of classic to modern works in theater and dance illuminating artist, process, and product. (Also offered as THEA 441.) 4 cr.

461. Modern Dance I
Introductory course that includes techniques and improvisation as well as lectures in history and theory. 4 cr.

462. Ballet I
Introductory course: technique; historical development of ballet. 4 cr.

463. Theater Dance I
Introductory course: techniques; improvisation; lectures on jazz, ethnic, and other theatrical dance forms. 4 cr.

470. Theater Movement
Stage movement for actors. Open to theater majors only. 2 cr.

487. The Dance
Historical and philosophical consideration of dance trends. Not a performance course. 4 cr.

561. Modern Dance II
Intermediate-level course that includes techniques and improvisation. Prereq: DANC 461 or permission. May be repeated for credit. 2 cr.

562. Ballet II
Extension of Ballet I syllabus; emphasis is on technique, with additional step vocabulary. Prereq: DANC 462 or permission. May be repeated once for credit. 2 cr.

563. Theater Dance II
Technique; Afro-Cuban, modern, and East Indian dance; body movement through exercise and combinations involving stretch, strength, and flexibility. Prereq: DANC 463 or permission. May be repeated once for credit. 2 cr.

576. Pointe
Beginning/advanced beginning course in art of dancing in toe shoes. Focus on technique involved in gaining strength and on methodology for understanding the art of the ballerina. 2 cr. Cr/F.

597. Dance Theater Performance
Designed for students participating in UNH Dance Theater Company. Skill development through rehearsal and actual performance experience. 2 cr. Cr/F.

633. Dance Composition I
Practical, developmental approach to process of creating dances. Prereq: DANC 561, 562, 563, or permission. 2 cr.

634. Dance Composition II
Use of music; group choreography. Prereq: DANC 633. 2 cr.

640. Labanotation
Study and practice of recording human movement by the method of Labanotation. Prereq: permission. 2–4 cr.

661. Modern Dance III
Advanced-level course in technique and composition. Prereq: DANC 561 or permission. May be repeated for credit. 2 cr.

662. Ballet III
Advanced-level course in technique; pointe work included. Prereq: DANC 562 or permission. May be repeated for credit. 2 cr.

663. Theater Dance III
Extension of Theater Dance I and II; brings students to a more advanced technical level. Prereq: Theater Dance I and II; or permission. May be repeated for credit. 2 cr.

684. Special Topics in Dance
Exploration of topics agreed upon by students and instructor. Topics vary. May be repeated. 2–4 cr.

732. Choreography
Theoretical and practical consideration of the creative and aesthetic aspects of ballet, modern, and jazz dance. Prereq: DANC 634 or permission. 4 cr.

Division of Continuing Education (DCE) Career Concentration Courses

(For program description, see page 78.)

Dean, Continuing Education and Summer Session: William F. Murphy

The following courses are open to all students.

506. Field Experience
Supervised work experience with planned learning objectives relating to student's career concentration. Prereq: permission. May be repeated to a maximum of 8 credits for associate in arts degree students. 1–4 cr.

519. Career Planning
Skills and methods of career planning, including integration of career and educational goals. Topics include self-assessment, occupational investigation, occupational selection and decision making, goal setting, and job search techniques. Available to associate degree students, freshmen, and sophomores; others by permission. 2 cr.

599. Special Topics
Occasional course offerings of specialized material in A.A. career concentrations; general studies topics for nontraditional learners; travel/study programs. Prereq: permission. 1–4 cr.

606. Field Experience
Supervised work experience with planned learning objectives related to the student's major or area of concentration. May be repeated to a maximum of 4 credits for baccalaureate degree students. Prereq: permission. 1–4 cr. Cr/F.

607. Field Experience in Engineering and Physical Sciences
Supervised work experience with planned learning objectives related to the student's major or area of concentration. May be repeated to a maximum of 2 credits. Prereq: permission. 1 cr. Cr/F.

608. Professional Practice
Based on an appropriate concurrent work experience, student readings, and reports to articulate the learning that takes place in the transition from college to professional employment. Deals with the appropriate attitudes, habits, and skills for success. May be repeated to 4 cr. Prereq: permission. 1–2 cr. Cr/F.

Computer Information Studies

491. Introduction to Computer Information Studies I
Computer components and computer applications. Emphasis on using microcomputers and application software to solve particular problems. Not open to students who have completed ADMN 526, EE 405, EE 531, or INCO 491. Not open to WSBE majors. 2 cr.

492. Introduction to Computer Information Studies II
Information system concepts and applications, including system comparisons, information processing, networking, telecommunications, ergonomics, and office automation. Laboratory assignments focus on information processing using application software. Prereq: CS 406 or CS 410; DCE 491 or INCO 491. Not open to WSBE majors. 2 cr.

590. Information Systems Applications
Emphasizes practical experience in using microcomputers for software applications, such as word processing, data base management, accounting, decision making, spreadsheets, and business graphics. Students use and adapt/develop software packages. Prereq: DCE 492. 4 cr.

591. Systems Analysis and Design
Design and implementation of integrated systems such as inventory control or accounting, including topics such as human factors, file creation and maintenance using CRT on-line communications facilities, sorting, and report writing on both large and micro-computer systems. Prereq: CS 406 or 410; DCE 492. Not open to WSBE majors. 4 cr.

592. Data Base Applications
Students use data base software and design and implement a management information system using a data base management system. Prereq: CS 406 or 410; DCE 492. Not open to WSBE majors. 4 cr.

595. Independent Study in Computer Information Studies
Students adequately prepared by coursework and/or experience pursue in-depth project under the direction and supervision of the coordinator. Prereq: permission prior to registration. 1–4 cr.

596. Technical Writing
Students learn to produce both technical and nontechnical documents for applications in education, business, industry, and the home. Each student creates small manuals for critique by the instructor and the class. Topics include logical thinking and organization, interviewing skills, technical writing styles and formats, word processing/graphic programs, pasteup, color usage, cover selection/design, interfacing with a print shop, and budget analysis. Prereq: ENGL 401 or 501; INCO 491. 4 cr.

597. Documentation Practicum
This independent work project stresses techniques and mechanics required to produce a highly useful, professional document. Under the direction of a coordinator, students apply knowledge previously acquired through courses in this program to create substantial, final product. Prereq: DCE 596 or permission. 2 cr.

Criminal Justice

550. Criminal Justice Administration and Organization
Contemporary methods of administrative practice for efficient use of personnel, facilities, and equipment; planning and research; budgeting and control; decision making; communications. 4 cr. (Not offered every year.)

551. Crime Prevention and Control
Coordinating the efforts of the community and criminal justice agencies. Problem solving in specific crime analysis—the offense, the offender, and community environment. 4 cr. (Not offered every year.)

552. Corrections Treatment and Custody
Scientific diagnosis and treatment of offenders. Institutional administration methods—climate, personnel, structure, and procedure. 4 cr. (Not offered every year.)

554. Juvenile Justice Administration and Organization
Techniques and methods of organizing and administering police juvenile units: role, function, and responsibilities of juvenile officers within the juvenile justice system. Prereq: permission. 4 cr. (Not offered every year.)

555. Delinquency Prevention and Control
Causes of delinquency; pathogenic patterns; and diagnosis of child abuse. Prevention and treatment of child abuse and delinquency through coordination of the efforts of community and criminal justice agencies. Prereq: permission. 2 cr. (Not offered every year.)

Merchandising

410. Fundamentals of Merchandising
Practices and procedures in marketing goods and services; retailing and wholesaling; channels of trade; functions of middlemen. Not open to ADMN, ECON, or HOTL majors. 4 cr. (Not offered every year.)

411. Promotion and Advertising
Mass communication in marketing; use of advertising media; integration of promotional plans and sales techniques; evaluation of promotional efforts. Not open to ADMN, ECON, or HOTL majors. 4 cr. (Not offered every year.)

510. Retailing
Managing a goods or services retail enterprise; store location and organization, layout, buying and pricing, advertising and sales promotion, inventory control, and personnel policies. Not open to ADMN, ECON, or HOTL majors. 4 cr. (Not offered every year.)

512. Fashion Merchandising and Display
Principles and procedures used in selection, promotion, and selling of fashion apparel and accessories. Analysis of principles of display. Prereq: DCE 410 or permission. Not open to ADMN, ECON, or HOTL majors. 4 cr. (Not offered every year.)

531. Salesmanship
Principles and techniques of personal selling; customers' needs and satisfaction. Not open to ADMN, ECON, or HOTL majors. 4 cr.

Earth Sciences (ESCI)

(For program description, see page 52.)

Chairperson: Herbert Tischler
Professors: Franz E. Anderson, Francis S. Birch, Wallace A. Bothner, Wendell S. Brown, S. Lawrence Dingman, Henri E. Gaudette, Francis R. Hall, Robert C. Harriss, Paul A. Mayewski, Herbert Tischler
Adjunct Professors: Eugene L. Boudette, Anthony Jack Gow, Berrien Moore III, Lincoln R. Page
Associate Professors: Jo Laird, Theodore C. Loder III, William Berry Lyons
Adjunct Associate Professor: Mary E. Dowse
Research Associate Professors: James D. Irish, Neal R. Pettigrew
Assistant Professor: David A. Gust
Adjunct Assistant Professor: Judith Spiller
Research Assistant Professors: Patrick M. Crill, Mark E. Hines, Julie M. Palais, Mary Jo Spencer, Robert W. Talbot

401. Principles of Geology I
The earth; earth materials (rocks and minerals), landforms, and the processes that form them (volcanism, earthquakes, glaciation, etc.). Field trips. Lab. 4 cr.

402. Principles of Geology II
Geological history of the earth: interpretation of past geologic events emphasizing the geological development of North America and the evolution of life. Prereq: ESCI 401. Lab. 4 cr.

409. Environmental Geology
Environmental impact of geologic processes; natural hazards—landslides, earthquakes, volcanoes, flooding, erosion, and sedimentation; land exploitation and site investigations; environmental considerations of water-supply problems; the recovery of energy and mineral resources. Lab. Students may not receive credit for both ESCI 401 and ESCI 409. 4 cr.

450. Introduction to the Earth Sciences
Modular course introducing contemporary topics in earth sciences. Successful completion of 4 modules fulfills one gen ed group 3 (physical science) requirement. Each module is approximately 3.5 weeks. Four of the following topics are offered each semester (check Time and Room Schedule for current semester offerings): A) Hypersaline Lakes; B) Planetary Geology; C) Plate Tectonics; D) Rocks and Minerals; E) Earthquakes; F) Hydrology of New England; G) Springs and Underground Rivers; I) Evolution of Mountains; J) Volcanoes; K) The Global Ocean; L) The Gulf Stream; M) Geologic Time; N) Climate Change; O) Beaches and Coasts; P) Prehistoric Life. Additional topics may be available. Lab. 1 cr.

501. Introduction to Oceanography
Physical, chemical, geological, and biological processes in the sea. Lab. 4 cr.

512. Principles of Mineralogy
Natural history of the solid state; introductory crystallography, diffraction, and structure of minerals. Silicate minerals; their chemical and physical properties, origins, occurrences, and uses. Nonsilicates. Prereq: CHEM 401, 403, or 405. Field trips. Lab. 4 cr.

530. Field Geology
Standard geological field-mapping techniques, including pace and compass and plane table and alidade; bedrock and surficial mapping on topographic and aerial photographic bases in local areas; one 4- to 5-day exercise in a selected area of the northern Appalachian Mountains. Prereq: ESCI 401 or 409; 402. Lab fee (includes transportation and housing in the field). 4 cr.

561. Geomorphology
Processes leading to the development of landforms. Field trips. Lab. 4 cr.

614. Optical Mineralogy and Petrography
Description and classification of igneous, sedimentary, and metamorphic rocks in hand specimen and thin section; optical mineralogy. Prereq: ESCI 512. Lab. 4 cr.

631. Structural Geology
Structural units of the earth's crust and mechanics of their formation. Prereq: ESCI 530. Lab and fieldwork. 4 cr.

652. Paleontology and Biostratigraphy
Systematic study of major invertebrate fossil groups emphasizing their stratigraphic and paleoecologic uses. Prereq: ESCI 402 or permission. Lab. 4 cr.

703. Fluvial Hydrology
Mechanics of flows in the hydrologic cycle. Natural open-channel flows: forces, energy principles, velocity profiles, flow resistance, erosion and sediment transport, alluvial channel form, computation of flow profiles, weirs, hydraulic jumps, complete equations for stream-flow routing. Principles of porous-media flows: Darcy's law, soil physics, complete equations for ground-water and soil-water flow. Lab and field exercises. Prereq: one year each of calculus and physics. 4 cr.

705. Principles of Hydrology
Physical principles important in the hydrologic cycle, including: basic equations, properties of water, movement of water in natural environments, formation of precipitation, relations between precipitation and streamflow, snow-melt, evapotranspiration, interception, infiltration, relations between groundwater and stream-flow, and hydrologic aspects of water quality. Problems of measurement and aspects of statistical treatment of hydrologic data. Transportation fee. Prereq: one year each of calculus and physics. Lab. 4 cr.

710. Groundwater Hydrology
Principles for fluid flow in porous media with emphasis on occurrence, location, and development of groundwater but with consideration of groundwater as a transporting medium. Major topics include well hydraulics, regional groundwater flow, exploration techniques, and chemical quality. Laboratory exercises involve use of fluid, electrical, and digital computer models to illustrate key concepts. Prereq: 705 or permission. Lab. 4 cr.

725. Igneous Petrology
Origin, formation, and geologic history of igneous rocks as determined from field and laboratory studies of occurrences, mineral assemblages, rock composition, and texture. Interpretation of rock and mineral compositional diagrams; application of experimental investigations. Prereq: ESCI 614. Field trips. Lab. 4 cr.

726. Metamorphic Petrology
Origin, formation, and geologic history of metamorphic rocks; undertaken in same manner as ESCI 725 above. Prereq: ESCI 614. Field trips. Lab. 4 cr.

732. Regional Geology and Advanced Structure
Readings, discussion, and field/lab exercises in the tectonic analysis of mountain systems. Emphasis on the northern Appalachian Orogen. Application of modern structural analysis. Field excursion, lab fee. Prereq: ESCI 631 or permission. 4 cr.

734. Applied Geophysics
Gravity, magnetic, seismic, electrical, and thermal methods of investigating subsurface geology. Fieldwork and use of computers in data analysis. Prereq: ESCI 401; one year of calculus; one year of college physics;/or permission. Lab. 4 cr.

741. Geochemistry
Thermodynamics applied to geological processes; geochemical differentiation of the earth; the principles and processes that control the distribution and migration of elements in geological environments; stable and radiogenic isotopes in geologic processes. Prereq: ESCI 512-513 or permission. 4 cr.

750. Biological Oceanography
Biological processes of the oceans, including primary and secondary production, trophodynamics, plankton diversity, zooplankton feeding ecology, microbial ecology, and global ocean dynamics. Emphasis on experimental approaches. Term project involves either development of an ecosystem model or performance of a field experiment. Field trips on R/V *Jere Chase* and to the Jackson Estuarine Laboratory. Prereq: one year of biology or permission of the instructor. (Also offered as ZOOL 750.) 4 cr.

752. Chemical Oceanography
Water structure, chemical composition and equilibrium models, gas exchange, biological effects on chemistry, trace metals, and analytical methods. Lab includes short cruise aboard R/V *Jere A. Chase*. Prereq: permission. Lab (optional). 3 or 4 cr.

754. Modern Sediments
Examines recent sediments from their source area to the depositional environment. Emphasis on shallow-water clastic sediments and their characteristic properties. Weekly lab, conducted off campus at the Jackson Estuarine Laboratory, is concerned with aspects of textural and compositional analysis. New analytical techniques compared with classical sediment analysis. Lab. 4 cr.

756. Estuarine Sedimentation
Examines all aspects of estuarine sedimentation, from erosion and transportation to deposition. Emphasis on fine-grained estuarine sediments and factors affecting particulate matter transport. Animal/sediment and plant/sediment interactions considered in detail. Includes an in-depth field research project in student's area of interest conducted by graduate students with undergraduate participation at the Jackson Estuarine Laboratory. Subject matter is relevant to students in related disciplines in which animal/plant/sediment relationships are important. Lab. 4 cr.

758. Introductory Physical Oceanography
Descriptive treatment of atmosphere-ocean interaction; general wind-driven and thermohaline ocean circulation; waves and tides; continental shelf and nearshore processes; instrumentation and methods used in ocean research. Simplified conceptual models demonstrate the important principles. Prereq: college physics; ESCI 501;/or permission. 4 cr.

759. Geological Oceanography
Major geological features and processes of the ocean floor; geological and geophysical methods; plate tectonics. Prereq: permission. 4 cr.

762. Glacial Geology
Glacial environment: glacier dynamics and glacial erosion and deposition. Review of world glacial stratigraphy in light of causes of glaciation and climatic change. Field trips. Prereq: ESCI 561 or permission. Lab. 4 cr.

763. Glacier Research
Glaciers as proxy indicators of climatic change with specific emphasis on the interpretation of physical and chemical time series collected from glaciers. Field and laboratory work used as a tool in the course. Prereq: geomorphology; glacial geology; one year of college calculus; one semester each of college physics and chemistry;/or permission. 4 cr.

771. Mineral Deposits
Introduction to the processes of formation, geological characteristics, and environments of deposition of metallic mineral deposits, and a brief survey of the unique nature and importance of the mineral industries. Prereq: ESCI 531; 614. 4 cr.

795. Topics in Earth Sciences
A) Tectonics; B) Geochemistry; C) Geomorphology, Advanced; D) Geophysics; E) Glacial Geology, Advanced; F) Groundwater Geology; G) Historical Geology, Advanced; H) Hydrology; I) Micropaleontology; J) Water Resource

Management; K) Mineralogy, Advanced; L) Optical Crystallography; M) Ore Deposits; N) Paleontology, Advanced; O) Petrology, Advanced; P) Regional Geology; Q) Sedimentation; R) Stratigraphy; S) Structural Geology, Advanced; T) Marine Geology; U) Physical Oceanography; V) History of Geology; W) Earth Science Teaching Methods; X) Senior Synthesis; Y) Chemical Oceanography; Z) Glaciology, Advanced. Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. 1–4 cr.

796. Topics in Earth Sciences
A) Thermodynamics in Geology; B) Earth Systems; C) Earth Resource Policy. Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. 1–4 cr.

Economics (ECON)

(For program description, see page 68.)

Program Director: Evangelos O. Simos
Professors: Manley R. Irwin, Robert C. Puth, Kenneth J. Rothwell, Dwayne E. Wrightsman
Associate Professors: Richard W. England, Marc W. Herold, Richard W. Hurd, Richard L. Mills, Evangelos O. Simos, Allen R. Thompson, James R. Wible
Adjunct Associate Professor: Evangelos Charos
Assistant Professors: Adrienne M. McElwain, Neil B. Niman, Karen M. Smith
Instructor: Torsten Schmidt

400. Economic Issues
Economic analysis applied to current issues such as environmental pollution, federal deficit spending, monopoly and waste, poverty, racism, the energy shortage, the urban crisis, war and the economy, etc., discussed in a nontechnical, conceptual framework. Reports and discussion on outside readings. No credit toward a major or minor in economics; cannot be taken concurrently with ECON 401 or 402 or after completion of ECON 401 or 402. 4 cr.

401. Principles of Economics (Macro)
Basic functions of the United States economy viewed as a whole: policies designed to affect its performance. Economic scarcity, supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and international money matters. 4 cr.

402. Principles of Economics (Micro)
Functions of the component units of the economy and their interrelations. Units of analysis are the individual consumer, the firm, and the industry. Theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. (Not open to students who have had RECO 411.) 4 cr.

515. Economic History of the United States
United States economy from colonial times to the present. Models of economic development applied to the United States. How social, political, technological, and cultural factors shape economy; development and influence of economic institutions. Prereq: ECON 401 or 402;/or permission. 4 cr.

518. European Economic History
Western European economies from medieval times to the present. Explanations for differential growth rates and patterns; contrasts between political, social, and economic events. Prereq: ECON 401 or 402;/or permission. 4 cr.

601. Income Distribution: Wealth and Poverty
Examination and discussion of problems/issues of historical and current interest. Topics include comparative review of distribution systems, redistribution, poverty, the impact of inflation and taxation, normative and positive dimensions of the distribution of income and wealth. 4 cr.

602. Introduction to Political Economy
Theoretical and historical analyses of capitalism and socialism. Specific topics such as racism, monopoly, miltarism, technological change, pollution, and business cycles. Prereq: ECON 401; ECON 402;/or permission. 4 cr.

605. Intermediate Microeconomic Analysis
Analysis of supply and demand. Determination of prices, production, and the distribution of income in noncompetitive situations and in the purely competitive model. General equilibrium. Prereq: ECON 402. 4 cr.

611. Intermediate Macroeconomic Analysis
Macroeconomic measurement, theory, and public policy determination. Prereq: ECON 401 and 402. 4 cr.

615. History of Economic Thought
Examination and critical appraisal of the work of major economists, including the work of contemporary economists, and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prereq: ECON 401 and 402. 4 cr.

626. Applied Regression Analysis
Introduction to regression techniques as used in economics and management; estimation and statistical inference in the context of the general linear model; discussion of problems encountered and their solutions; extensions of the general linear model. Prereq: ADMN 424. (Also offered as ADMN 630.) 4 cr.

630. Comparative Study of Economic Systems
Interdisciplinary examination of welfare capitalist, advanced socialist, and Third World socialist systems, including Sweden, France, the USSR, the German Democratic Republic, Hungary, and Cuba. Prereq: ECON 401 or permission. 4 cr.

635. Money and Banking
Study of interest rates, financial markets, financial institutions, monetary institutions, the supply of money, the demand for money, monetary theory, and monetary policy. Prereq: ECON 401 and 402. 4 cr.

641. Public Finance
Alternative prescriptions and explanations concerning the role of government in contemporary market economies. General principles of public expenditure analysis. Selected case studies of public spending programs; e.g., welfare, defense, education. Analysis of various federal, state, and local taxes. Prereq: ECON 401; ECON 605;/or permission. 4 cr.

645. International Economics
Trade theory and commercial policy. Free trade, protection, common markets. Economic aspects of international relations, with particular reference to recent policy issues. Prereq: ECON 401 and 402. 4 cr.

651. Government Regulation of Business
Mergers, competition, monopoly, and the regulated industries. 4 cr.

655. Labor Unions and the Working Class
Workers' role in the economy and the unions they form to protect their interests. History of the American labor movement; evaluation of the success of unions in fulfilling workers' needs. Management's relationship with workers in the context of a power struggle between unions and managers. Government's role in collective bargaining as intermediary and as employer. 4 cr.

656. Labor Economics
Functioning of labor markets from theoretical and policy perspectives. Labor demand and supply, wages and employment. Welfare programs, human capital, discrimination in the labor market, unions, wage differentials. Prereq: ECON 401; ECON 402; ECON 605 recommended. 4 cr.

658. Women and Work
Women's experience as workers. Significance for the economy of their work in the labor force and their unpaid labor in the home. Emphasis on the U.S., with some attention to socialist and less-developed countries. Readings contrast different theoretical approaches. Prereq: ECON 401; ECON 402;/or permission. 4 cr.

668. Economic Development
Theories of development/underdevelopment. Trade, growth, and self-reliance. The role of agriculture (land tenure, food crisis, Green Revolution). World Bank policy. Industrialization strategies. Role of the state. Prereq: ECON 401; ECON 402;/or permission.

670. Economics of Energy
The availability and use of inanimate energy resources and their relation to economic activity. Investigates energy demand, energy sup-

ply, the relation of energy to economic growth, and energy policy. Prereq: ECON 605 or permission. 4 cr.

685-686. Study Abroad
Open to students studying abroad in the discipline as approved by the economics program director. 1–16 cr. Cr/F.

695. Independent Study
Individual research projects that are student designed. Initial sponsorship of an economics faculty member must be obtained, and approval of WSBE adviser and dean. For juniors and seniors in high standing. Variable (in multiples of 2) 2–12 cr.

696. Supervised Student Teaching Experience
Participants are expected to perform such functions as leading discussion groups, assisting faculty in undergraduate courses that they have successfully completed, or working as peer advisers in the Advising Center. Enrollment limited to juniors and seniors who have above average G.P.A.s. Reflective final paper is required. Prereq: permission of instructor, program director, and director of advising. 1–4 cr. May be repeated to a maximum of 4 cr. Cr/F.

698. Topics in Economics
Special topics. May be repeated. Prereq: permission. 4 cr.

707. Economic Growth and Environmental Quality
Analysis of the interrelationships among economic growth, technological change, population increase, natural resource use, and environmental quality. Application of alternative theoretical approaches drawn from the social and natural sciences. Focus on specific environmental problems, e.g., health effects of air pollution, environmental impact of technology transfer to less-developed nations. Prereq: ECON 605; ECON 611;/or permission.

711. Economic Fluctuations
Recurrent movements of prosperity and depression; emphasis on causes and public policy implications. Prereq: ECON 611 or permission. 4 cr.

715. Marxian Economic Analysis
Analysis of capitalism by Marx and contemporary Marxists. Discussion of social class, values and prices, technical change, capital accumulation, and socioeconomic crises. Prereq: ECON 605; ECON 611;/or permission. 4 cr.

720. U.S. Economic History
From colonial times to the present. Applied economic theory; economic models and interpretation of data. Influence of technology, industrialization, foreign trade, monetary factors, and government; noneconomic factors. Prereq: ECON 605; ECON 611;/or permission. 4 cr.

725. Mathematical Economics
Principle mathematical techniques and their application in economics. Topics covered: matrix algebra, derivatives, unconstrained and constrained optimization, linear and nonlinear programming, game theory, elements of integral calculus. 4 cr.

727. Advanced Econometrics
Relatively advanced econometric techniques such as simultaneous equation models, distributed lag models, nonlinear estimation, and limited dependent variables. Prereq: ECON 626/ ADMN 630 or ECON 826;/or permission. 4 cr.

735. Economics of Financial Markets
Economic analysis of financial market systems. Topics include financial market functions, theories of saving and investment, financial intermediation, flow-of-funds analysis, loanable funds theory, interest rate forecasting, portfolio theory, capital-asset pricing models, structure of interest rates (including term-structure theory), and macroeconomic models of the financial sector. Prereq: ECON 635. 4 cr.

736. Seminar in Monetary Theory and Policy
Contemporary developments in monetary theory and the evaluation of policy measures. Prereq: ECON 635. 4 cr.

745. International Trade
Contemporary issues in international economic theory and policy. Analysis of trade theory, dynamics of world trade and exchange, and international commercial policy. Prereq: ECON 645. 4 cr.

746. International Finance
International monetary mechanism; balance of payments, international investment; exchange rates, adjustment systems, international liquidity, foreign aid, multinational corporations. Prereq: ECON 401 and 402. 4 cr.

747. Multinational Enterprises
Internationalization of economies. Growth and implications of multinational corporations at the level of systems. Theories of imperialism, international unity/rivalry; theories of direct investment, exercise of influence and conflict, technology transfer, bargaining with host country; effects on U.S. economy. Prereq: permission. 4 cr.

752. Technology, Information, and Public Policy
The U.S. as a post-industrial economy. Impact of microelectronics upon manufacturing, distribution, employment, and competition. Finally, both domestic and international policy implications of information transfer. 4 cr.

755. Collective Bargaining
Historical development of the U.S. labor movement and the industrial relations system. Contemporary collective bargaining issues; the role of public policy in industrial relations. 4 cr.

756. Labor Economics
Recent developments in labor market analysis and public policies related to contemporary labor issues. Labor supply, the structure and stratification of labor markets, economic discrimination, unemployment and poverty, inflation, and wage-price controls. Prereq: ECON 656. 4 cr.

757. Economics of Work
Organization of work under capitalism. Competing management philosophies; response of workers to management practices. Satisfaction of workers with their jobs, trends in worker productivity, alternative work arrangements, and worker participation in management. Prereq: ECON 655 or ECON 656;/or permission. 4 cr.

768. Seminar in Economic Development
Advanced reading seminar. Topics include methodologies underlying economic development theory; industrialization and post-import substitution; state capitalist development; stabilization policies; appropriate technologies; the capital goods sector; agricultural modernization schemes; and attempts at transition to socialism. Prereq: permission. 4 cr.

769. Case Studies in Economic Development
A) Southeast Asia; B) Cost-Benefit and Project Analysis; C) Africa; D) Latin America; E) Middle East. Problems and policies in selected countries; evaluations of national plans, programs, and projects; comparative analysis. Prereq: ECON 401 and 402;/or permission. 4 cr.

798. Economic Problems
Special topics; may be repeated. Prereq: permission of adviser and instructor. 2 or 4 cr.

799. Honors Thesis
Supervised research leading to the completion of an honors thesis; required for graduation from the honors program in economics. 4–8 cr.

Education (EDUC)

(For program description, see page 25.)

Chairperson: Bruce L. Mallory
Professors: Michael D. Andrew, Richard F. Antonak, Angelo V. Boy, Donald H. Graves, Richard H. Hersh, Roland B. Kimball, John H. Lawson, Carleton P. Menge
Associate Professors: Charles H. Ashley, John J. Carney, John G. Chaltas, Grant L. Cioffi, Ellen P. Corcoran, Ann L. Diller, David D. Draves, Susan D. Franzosa, Jane A. Hansen, David J. Hebert, Bruce L. Mallory, Sharon N. Oja, Richard L. Schwab, M. Daniel Smith, Deborah E. Stone, Dwight Webb
Adjunct Associate Professor: Richard H. Goodman
Assistant Professors: Calvin F. Dill, Nancy E. Ellis, Janet Elizabeth Falvey, Virginia E. Garland, Georgia Kerns, Judith A. Kull, Jane E. Nisbet, William L. Wansart
Lecturer: Marcia Higgins

410. Women and Education
Examination and analysis of women's educational experience. Study of contemporary and historical processes and structure for educating girls and women. Review and discussion of current research in the education of women,

issues of discrimination, and equity and alternative strategies for restructuring society's curriculum for the female. 4 cr.

500. Exploring Teaching
For students considering a teaching career. In-school experiences to develop introductory skills in observation and teaching. On-site seminars for analysis and evaluation. Assessment and advising related to teaching as a career. Prerequisite for further work toward teacher certification. Minimum of 7 hours a week, plus travel time, required. Prereq: permission. 4 cr. Cr/F.

653. Humanities and Education: Society and the Formation of Character
Interdisciplinary modular course examines the manner in which society forms character through custom, laws, and formal institutions. Works by Plato, Rousseau, and Dewey explore if and how we can become educated. Students take three successive 5-week modules during the semester. (Also offered as HUMA 653.) 4 cr. (Not offered every year.)

694. Courses in Supervised Teaching
Supervised Teaching of Music. 8 cr. Cr/F. Supervised Teaching of Vocational/Technical and Adult Education. 8 cr. Cr/F. Supervised Teaching of Physical Education. 8 cr. Cr/F. Supervised Teaching of Mathematics. 8 cr. Cr/F.

700. Educational Structure and Change
A) Educational Structure and Change; B) Education in America: Backgrounds, Structure, and Function; C) Governance of American Schools; D) School and Cultural Change; E) Teacher and Cultural Change; F) Social Perspectives of Conflict in the Schools; G) Nature and Processes of Change in Education; H) What Is an Elementary School?; I) Schooling for the Early Adolescent; J) Children with Special Needs: Historical and Institutional Aspects; K) Curriculum Structure and Change; L) Stress in Educational Organizations. Organization, structure, and function of American schools; historical, political, and social perspectives; nature and processes of change in education. Two- and 4-cr. courses offered each semester (listed in department prior to preregistration; refer to Time and Room Schedule). Minimum of 4 cr. required for teacher certification. Prereq. for teacher certification students: EDUC 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

701. Human Development and Learning: Educational Psychology
A) Human Development and Learning: Educational Psychology; B) Human Development: Educational Psychology; C) Human Learning: Educational Psychology; D) Developmental Bases of Learning and Emotional Problems; E) Learning Theory, Modification of Behavior, and Classroom Management; F) Cognitive and Moral Development; G) Evaluating Classroom Learning; H) Deliberate Psychological Education; I) Sex Role Learning, and School Achievement; J) The Development of Thinking. Child development through adolescence, learning theory, cognitive psychology, research in teaching and teacher effectiveness, and evaluation, all applied to problems of classroom and individual teaching and therapy. Full 4-cr. course and 2-cr. minicourses offered each semester (listed in department prior to preregistration; refer to Time and Room Schedule). Minicourses emphasize either development (first half of semester) or learning (second half). Candidates for teacher certification are required to have at least 2 cr. of development and 2 cr. of learning, or the full 4-cr. course (701A). Prereq. for teacher certification students: EDUC 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

703. Alternative Teaching Models
A) Alternative Teaching Models; B) Curriculum Planning for Teachers; C) Alternative Strategies for Maintaining Classroom Control; D) Nature and Goals of Social Studies: K-12; E) Social Studies Instructional Materials: K-12; F) Teaching Elementary School Science; G) Language Arts for Elementary Teachers; H) Experiential Curriculum; I) Children with Special Needs: Teaching Strategies for the Classroom Teacher; K) Writing across the Curriculum; L) Learning and LOGO; M) Teaching Elementary School Social Studies. Basic teaching models, techniques of implementation, and relationships to curricula. Two- or four-cr. courses offered each semester (listed in department prior to preregistration; refer to Time and Room Schedule). Minimum of 4 cr. required for teacher certification. For secondary teacher candidates, the appropriate methods course, taught in the department of the major, or EDUC 791 for physical science candidates, usually satisfies this requirement. EDUC 703F and 703M are required for candidates for elementary teacher certification. Prereq. for teacher certification students: EDUC 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

705. Alternative Perspectives on the Nature of Education
A) Contemporary Educational Perspectives; B) Controversial Issues in Education; C) Ethical Issues in Education; D) Concepts of Teaching: Differing Views; E) Curriculum Theory and Development; F) Readings on Educational Perspectives; G) Philosophy of Education; I) Education as a Form of Social Control; K) Schooling and the Rights of Children; L) Education, Inequality, and the Meritocracy; M) Readings in Philosophies of Outdoor Education; N) Alternative Perspectives on the Nature of Education; O) Classrooms: The Social Context; P) Teaching: The Social Context; Q) School and Society. Students formulate, develop, and evaluate their own educational principles, standards, and priorities. Alternative philosophies of education; contemporary educational issues. Variable credit modules offered each semester (listed in department prior to preregistration; refer to Time and Room Schedule). Minimum of 4 cr. required for teacher certification. Prereq. for teacher certification students: EDUC 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

706. Introduction to Reading Instruction in the Elementary Schools
Reading process; current procedures and materials; diagnostic techniques; practicum experience. Course satisfies reading requirement for prospective elementary teachers in the five-year teacher education program and may be included in the 12 required graduate credits in education at the graduate level. May also be taken for undergraduate credit before entrance into fifth year; in this case the course satisfies reading requirement but is not applicable toward the 12 required graduate credits. Prereq: EDUC 500. 4 cr.

707. Teaching Reading through the Content Areas
Approaches and methods of teaching reading through content materials; coursework includes practical applications through development of instructional strategies and materials. Required for candidates seeking certification in art, biology, chemistry, earth science, general science, home economics, physical education, physics, or social studies. 2 cr.

720. Introduction to Computer Applications for Education
Examination of major issues related to classroom computer applications: historical development, computer functioning, methods of introduction, problem solving, educational software development and evaluation, psychological and sociological impact of the computer on children and learning. Introduction to classroom applications of the programming language LOGO and the authoring language PILOT. A practical approach is stressed. Lab. 4 cr.

733. Introduction to the Teaching of Writing
Development of writers from child to adult; ways to respond to writing; organization of the classroom for the teaching of writing. Prereq: permission. 4 cr.

734. Children's Literature
Interpretive and critical study of literature for children in the elementary, middle, and junior high schools. Methods of using literature with children. 4 cr.

741. Exploring Mathematics with Young Children
A laboratory course offering those who teach young children mathematics and who are interested in children's discovery learning and creative thinking an opportunity to experience exploratory activities with concrete materials. It offers, on the adult level, mathematical investigations through which one may develop

the ability to provide children with a mathematically rich environment, to become adept at asking problem-posing questions, and to establish a rationale for so doing. 4 cr.

742. The Young Gifted Child
Identification and teaching of young gifted children (preschool through primary). Considers historical perspectives, issues, exemplary models of gifted education, multiple teaching strategies, and relevant materials. Of interest to pre-service and in-service teachers, parents, and advocates for the gifted. 4 cr.

750. Introduction to Exceptionality
Social, psychological, and physical characteristics of exceptional individuals, including intellectual, sensory, motor, health, and communication impairments. Implications for educational and human service delivery. 4 cr.

751. Educating Exceptional Learners
Foundations of special education and introduction to the techniques of special teaching. Primary application to learners with mild and moderate handicaps. 4 cr.

752. Diagnosis and Remediation of Learning Disabilities
Terminology, etiology, common characteristics, and symptoms; theory and practice in gross-motor, visual, and auditory remediation; testing procedures used in diagnosis and remediation programs. 4 cr.

753. Children with Behavior Disorders
Nature and scope of emotional disturbances and social maladjustment in children, including causes, characteristics, treatment implications, and educational problems. 4 cr.

754. Survey of Developmental Disabilities
The causal factors, physical and psychologicl characteristics, and educational and therapeutic implications of mental retardation, cerebral palsy, epilepsy, autism, and related handicapping conditions. Observations of programs and services for the developmentally disabled are required. 4 cr.

758. Program Development and Administration in Special Education
Analysis and application of techniques for program development and administration, including grantsmanship, program planning, staff supervision, program evaluation, fiscal management, and statutory issues. 4 cr.

760. Introduction to Young Children with Special Needs
Needs of children (birth to eight years) with handicaps or at-risk for handicaps. Strengths and special needs of handicapped children; causes, identification, and treatment; current legislation; parent and family concerns; program models. 4 cr.

764. Television and the Young Child
Emergence of television as a cultural force; impact on development of the young child: physical, social, emotional, intellectual; past and present research studies; helping parents, teachers, and children become better television consumers; planning alternatives for more positive use of television technology. 4 cr.

776. Reading for Children with Special Needs
Techniques and procedures for teaching reading to children with special learning needs: the mentally retarded; learning disabled; gifted, culturally diverse. Emphasis on the implications of providing reading instruction in the least restrictive alternative. 4 cr.

781. Probability and Statistics
Introductory-level coverage of applied probability and statistical methods. Problems selected from many disciplines, with a focus on the behavioral and social sciences, to illustrate the logic and typical application of the techniques. Emphasis on understanding concepts through analyses of prepared data. 4 cr.

785. Educational Tests and Measurements
Theory and practice of educational evaluation; uses of test results in classroom teaching and student counseling; introductory statistical techniques. 4 cr.

791. Methods of Teaching Secondary Physical Science
Application of theory and research findings in science education to classroom teaching with emphasis on inquiry learning, developmental levels of children, societal issues, integration of technology, critical evaluation of texts and materials for science teaching, and planning for instruction. Lab. 4 cr.

795, 796. Independent Study
Juniors and seniors only, with approval by appropriate faculty member. Neither course may be repeated. 2 or 4 cr.

797. Seminar in Contemporary Educational Problems
Issues and problems of special contemporary significance, usually on a subject of recent special study by faculty member(s). Prereq: permission. May be repeated for different topics. 1–4 cr.

Electrical and Computer Engineering (EE)

(For program description, see page 53.)

Chairperson: John L. Pokoski
Professors: Ronald R. Clark, Albert D. Frost, Glen C. Gerhard, Joseph B. Murdoch, John L. Pokoski, Kondagunta Sivaprasad
Adjunct Professors: Sidney W. Darlington, Robert E. Levin
Associate Professors: Kent A. Chamberlin, Allen D. Drake, Filson H. Glanz, L. Gordon Kraft, John R. LaCourse, Donald W. Melvin, W. Thomas Miller III, Paul J. Nahin
Assistant Professors: Michael J. Carter, Richard A. Messner, Andrzej Rucinski, Weicheng Shen
Adjunct Assistant Professor: Stuart M. Selikowitz
Instructor: Francis C. Hludik, Jr.

405. Introduction to Computer Technology
Technical aspects of computer technology. Emphasis on hardware, but software and applications are also examined, and the potential benefits and limitations of computers are discussed. Lab includes hands-on experiences with digital systems and small computers. Not open to engineering, physics, or computer science majors. No credit subsequent to CS 406 or CS 410. Lab. 4 cr.

431. Speech, Music, and Noise: The Science of Sounds
Physical nature of sound waves. Production of sounds by mechanical vibration in string instruments, drums, loudspeakers, or by air column resonances in horns and organ pipes. Characteristics of hearing; human perception of sound, loudness, pitch, and intensity. Speech communication and the acoustics of the classroom, theater, or concert hall. Noise, its control and reduction; criteria for the judgment of annoyance. Application of acoustics and noise control for environmental protection and in industry, transportation, biology, and medicine. Amplification, storage, and reproduction of sound. Open for credit to nonengineering and nonphysics students only. Prereq: high school mathematics. Lab. 4 cr.

432. Light: Sources and Uses
Edison's lamp to the laser; production of light; color, the spectrum, and the human eye; sources of light; lenses and reflectors; the four factors of seeing; daylighting, energy, designing lighting installations. Lighting applications in interior spaces and outdoors. Open for credit to nonengineering and nonphysics students only. Prereq: high school algebra, trigonometry, and physics, or college courses in these. Lab. 4 cr.

496. Elementary Topics in Electrical Engineering
Introductory topics in electrical engineering. Prereq: permission. 1–4 cr.

535. Circuits and Signals
Circuit elements, signal waveforms, circuit laws and theorems, transfer functions, Laplace transforms, free, forced, and steady-state responses, power. Non-EE majors only. Prereq: MATH 426; Phys 408. Lab. 4 cr.

536. Electronics and Electromagnetics
Semiconductor diode and transistor theory and application, amplifiers and frequency response, magnetic fields and circuits, three-phase, transformers, DC machines. Non-EE majors only. Prereq: EE 535. Lab. 4 cr.

541. Electrical Circuits
Linear passive circuit theory. Circuit element characteristics. Fundamental circuit laws, equivalent circuits, power and energy relations, mesh and node analysis applied to resistive circuits. Transient and steady-state circuit analysis using Laplace Transform techniques, steady-state phasor AC circuit analysis. For EE majors only. Prereq: MATH 426; pre- or coreq: PHYS 408. Lab. 4 cr.

543. Introduction to Digital Systems
Fundamental analysis and design principles. Number systems, codes, Boolean algebra, and combinational and sequential digital circuits. Lab: student-built systems using modern integrated circuit technology and an introductory design session on a CAD work-station. Lab. 4 cr.

544. Engineering Analysis
Review of infinite series and multiple integrals. Differential calculus of functions of several variables. Vector differential and integral calculus with applications to electrostatics and magnetostatics. Prereq: MATH 527. 3 cr.

548. Circuits and Electronics
Continuation of Electrical Circuits, including power in AC circuits, frequency response, and resonance. Linear active circuit theory. Topics include semiconductor devices and applications, bias design, amplifier behavior and modeling, special amplifiers, and amplifier frequency response. Prereq: EE 541. Lab. 4 cr.

596. Topics in Electrical Engineering
Topics in electrical engineering. Prereq: permission. 1–4 cr.

603. Electromagnetic Fields and Waves I
Maxwell's equations in integral and differential form with applications to static and dynamic fields. Uniform plane waves in free space and material media. Boundary conditions; simple transmission line theory; parallel plate and rectangular waveguides; simple radiating systems. Prereq: MATH 527; PHYS 408; EE 544 or equivalent. 3 cr.

612. Computer Organization
Basic computer structure, including arithmetic, memory, control, and input/output units; the trade-offs between hardware, instruction sets, speed, and cost. Laboratory experiments involving machine language programming and I/O interfacing using microcomputers. Prereq: CS 410; EE 543; permission. Lab. 4 cr.

617. Junior Laboratory I
Application of laboratory instrumentation to the investigation of active and passive circuit characteristics; introduction to computer-aided design, analysis, and testing; development of report writing skills. Coreq: EE 651; EE 645. 2 cr.

618. Junior Laboratory II
Laboratory exercises in the design and analysis of active circuits, techniques of signal processing, and the properties of distributed circuits. Continued development of report writing skills. Prereq: EE 617. Coreq: EE 603. 2 cr.

620. Electronics and Instrumentation
For nonengineering and nonphysics students; no mathematical or engineering detail. Techniques for using electronic instruments and equipment. DC and AC circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. Prereq: junior standing. 4 cr.

645. Electrical Networks
Two ports and transfer functions, time and frequency domain concepts, Fourier series and transforms, state equations, convolution, introductory network synthesis, passive and active filter design, and approximation. Prereq: EE 541. 3 cr.

647. Random Processes in Electrical Engineering
Emphasis on applied engineering concepts such as component failure, quality control, noise propagation. Topics include random variables, probability distributions, mean and variance, conditional probability, correlation, power spectral density. Prereq: EE 544. 2 cr.

651. Advanced Electronics I
Small signal, power, and differential amplifiers; feedback theory, analysis, and design. Sinusoidal oscillators and analog circuits. Analysis of switching circuits. Prereq: EE 543; EE 548. 3 cr.

652. Advanced Electronics II
Semiconductor physics; discrete devices beyond the BJT and FET; practical limitations in operational amplifier circuits and operational amplifier configurations; interfacing; transducers; signal amplification and processing. Prereq: EE 651. 4 cr.

657. Electromechanical Energy Conversion
Magnetic circuits; theory and analysis of transformers and of induction; synchronous, dc, brushless, and stepping motors and generators. Design of systems with these components. Prereq: EE 548. Coreq: EE 603. 2 cr.

681. Teaching Experience
Credit for assisting in the instruction of undergraduate laboratories. Available on a limited basis to students selected by the department chairman. May be repeated for credit up to a total of 4 credits. 1 cr.

691, 692. Electrical and Computer Engineering Seminar
Includes periodically scheduled seminars presented by outside speakers and UNH faculty and graduate students. Topics are in general areas of interest to electrical, electronics, and computer engineers. 1 cr. Cr/F.

695. Electrical Engineering Projects
Laboratory or advanced study course. Students either join a department research project or engage in a project in an area of staff interest. Prereq: acceptance by staff member. 1–4 cr.

700-level courses offered subject to adequate student demand.

704. Electromagnetic Fields and Waves II
Loop antennas; aperture and cylindrical antennas; self and mutual impedance; receiving antennas and antenna arrays; bounded plane waves; rectangular and cylindrical waveguides; waveguide discontinuities and impedance matching; solid state microwave sources. Prereq: EE 603. 4 cr.

705. Semiconductor Devices
Physical theory of semiconductors: models of solids, electronic properties, energy bonds, transport processes. PN junction theory, bipolar and field effect transistors, charge transfer devices, optoelectronic devices, integrated devices, and device fabrication technology. Prereq: PHYS 505; EE 651; EE 603. 4 cr.

711. Digital Systems
Digital design principles and procedures, including top-down design techniques, prototyping and documentation methods, and realistic considerations such as grounding, noise reduction, loading and timing; digital design and development tools; computer-aided design using microprocessor development systems and engineering workstations including hands-on experience with state-of-the-art design automation systems. Prereq: EE 612; permission. Lab. 4 cr.

712. Advanced Digital System Design
Further development and application of concepts introduced in EE 711. A semester project involving the design and development of either a microprocessor-based system or an ASIC (Application-Specific Integrated Circuit) device is required. Classroom emphasis on creative design techniques, trouble-shooting strategies, and current micro-computer, off-the-shelf, PLA, and semi-custom VLSI technology. Students make oral presentations and write formal engineering reports. Prereq: EE 711; permission. Lab. 4 cr.

714. Real-Time Computer Applications
Organization and programming of real-time computer-based systems. Special purpose peripherals, digital filters, program and data organization, priority interrupt processing of tasks, real-time monitor systems. Applications to communication, automated-measurement, and process-control systems. Semester design project required. Prereq: EE 612; senior standing; programming experience; permission. Lab. 4 cr.

717. Introduction to Digital Image Processing
Digital image representation; elements of digital processing systems; sampling and quantization, image transformation including the Fourier, the Walsh, and the Hough transforms; image enhancement techniques including image smoothing, sharpening, histogram equalization, and pseudo-color processing; image restoration fundamentals. Prereq: EE 645; EE 647; CS 410 or equivalent experience; permission. Lab. 4 cr.

741. Nonlinear Systems Modeling
Modeling of hydraulic, pneumatic, and electromechanical systems. Solutions methods including linearization and computer simulation of nonlinear equations. Development of methods of generalizing the nonlinear models for design purposes. (Also offered as ME 741.) 4 cr.

745. Fundamentals of Acoustics
Acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics and measurement of acoustical sources; hu-

man perception of sound, loudness, intensity; microphones; acoustical materials; problems in environmental sound control; ultrasonics; architectural acoustics. Prereq: PHYS 408; MATH 527; permission. Lab. 4 cr.

757. Fundamentals of Communication Systems
Discussions of deterministic signals, Fourier spectra, random signals and noise, baseband communication, analog and digital modulation schemes, and system signal to noise ratio. Prereq: EE 647; permission. Lab. 4 cr.

758. Communication Systems
Design of high-frequency communication systems. RF amplification, modulators for AM and FM systems, receiving techniques, antennas, free-space propagation, propagation characteristics of the ionosphere. Prereq: EE 603; EE 757 or equivalent; permission. Lab. 4 cr.

760. Introduction to Fiber Optics
Basic physical and geometric optics; solution of Maxwell's equations for slab waveguides and cylindrical waveguides, of both step index and graded index profiles; modes of propagation and cutoff; polarization effects; group and phase velocity; ray analysis; losses; fabrication; sources; detectors; couplers; splicing; cabling; applications; system design. Prereq: PHYS 703 or EE 603 or permission. Lab. 4 cr.

761. Optical Engineering
First-order imaging optics, thin and thick lenses, aberrations, mirrors, stops, apertures, gratings, prisms, resolution, interferometry, diffraction, ray tracing, design of optical instruments, image evaluation, modulation transfer function, optical system design by computer. Prereq: PHYS 408; MATH 527;/or permission; CS 410 or equivalent experience. Lab. 4 cr.

762. Illumination Engineering
Radiation; spectra, wave and particle nature of light, physics of light production, light sources and circuits, luminaires, science of seeing, color theory, measurements, control of light, light and health, lighting calculations. Open to juniors and seniors in CEPS. Prereq: MATH 527 and Physics 408. Lab. 4 cr.

763. Lighting Design and Application
Lighting design process, modeling, interior and exterior lighting calculation and design, flux transfer, form and configuration factors, lighting quantity and aesthetics, daylighting calculations, lighting economics, lighting power and energy analysis, selected applications of light in interior and exterior spaces. Prereq: EE 762. Design lab. 4 cr.

771. Linear Systems and Control
Fundamentals of linear system analysis and design in both continuous and discrete time. Design of feedback control systems. Topics include modeling; time and frequency analysis; Laplace and Z transforms; state variables; root locus; digital and analog servomechanisms; proportional, integral, and derivative controllers. Demonstrations and computer simulations included. Prereq: senior standing in EE or ME or permission. (Also offered as ME 771.) 3 cr.

772. Control Systems
Extension of EE 771 to include more advanced control system design concepts such as Nyquist analysis; lead-lag compensation; multi-input/multi-output systems; state feedback; parameter sensitivity; controllability; observability; decoupling; introduction to nonlinear and modern control. Includes interactive computer-aided design and real-time digital control. Prereq: EE 771 or permission. (Also offered as ME 772.) Lab. 4 cr.

775. Applications of Integrated Circuits
Design and construction of linear and nonlinear electronic circuits using existing integrated circuits. Limitations and use of operational amplifiers. Laboratory course in practical applications of nondigital integrated circuit devices. Prereq: EE 652; permission. Lab. 4 cr.

781. Physical Instrumentation
Analysis and design of instrumentation systems. Sensors, circuits, and devices for measurement and control. Elements of probability and statistics as applied to instrument design and data analysis. Transmission, display, storage, and processing of information. The design, implementation, testing, and evaluation of a relevant instrument system is an integral part of the course. Prereq: senior standing in EE or permission. 4 cr.

784. Biomedical Instrumentation
Principles of physiological and biological instrumentation design including transducers, signal conditioning, recording equipment, and patient safety. Laboratory includes the design and use of instrumentation for monitoring of electrocardiogram, electromyogram, electroencephalogram, pulse, and temperature. Current research topics, such as biotelemetry, ultrasonic diagnosis, and computer applications. Prereq: permission. Lab. 4 cr.

785. Underwater Acoustics
Vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small- and large-signal considerations. Prereq: permission. 4 cr.

786. Introduction to Radio Astronomy
Electromagnetic radiation, propagation. Positional astronomy and the radio sky, discrete radio sources, source-structure distribution, the sun as a radio source, flare and burst activity, planetary emissions, quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prereq: senior or graduate status in engineering and physical sciences; permission. 4 cr.

787. Analysis and Design of Human Physiological Control Systems
Analysis and design of human physiological control systems and regulators through the use of mathematical models. Identification and linearization of systems components. Membrane biophysics. Design of feedback systems to control physiological states through the automatic administration of drugs. System interactions, stability, noise, and the relationship of system malfunction to disease. Prereq: EE 771 or permission. 4 cr.

796. Special Topics in Electrical Engineering
New or specialized courses and/or independent study. Prereq: permission. 1–4 cr.

Engineering Technology (ET)

(For program description, see page 54.)

Program Chairperson: T. A. Parssinen
Associate Professor: David A. Forest
Assistant Professors: Ralph W. Draper, T. A. Parssinen, Jill Schoof

Permission of instructor is a prerequisite to all engineering technology courses.

633. Business Organization and Law
Corporations; proprietorships; product liability; contracts; O.S.H.A.; commercial paper; conditions of employment; I.R.S.; bankruptcy; U.C.C. 4 cr.

634. Economics of Business Activities
Elementary financial accounting; compound interest and time value of money; sources of capital; cost estimating; depreciation; risk and insurance; personal finance. Prereq: differential and integral calculus. 4 cr.

637. Heat and Fluid Power I
Work and heat, first and second laws of thermodynamics, chemical reactions, heat engines and refrigerators; applied to various cycles (i.e., power plants, turbines, jet engines, etc.). Field trips. Prereq: differential and integral calculus; physics. Lab. 4 cr.

638. Heat and Fluid Power II
Continuation of 637 for M.E.T. students only. Further applications of thermodynamics. Additional topics include heat transfer and fluid dynamics. Prereq: ET 637 or equivalent. Lab. 4 cr.

641. Production Systems
Production standards—sources, uses; manufacturing capacity—design, analysis; manufacturing inventories and their control; production scheduling; quality control. Prereq: differential and integral calculus. 4 cr.

644. Mechanical Engineering Technology Concepts in Design and Analysis
Kinematics, kinetics, work and energy, and vibrations; application of these concepts to problems in machine design. Prereq: strength of materials and dynamics. 4 cr.

645. Instrumentation
Statistics of experimentation; quantity standards and measurement; design of experiments; use of laboratory gear including dyna-

mometer and viscosimeter; field trips. Prereq: differential and integral calculus; ET 644 or equivalent. Lab. 4 cr.

651. Mechanical Engineering Technology Project
Group project; students required to find solutions to actual technological problems in design, fabrication, and testing as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. Prereq: senior standing. A year-long course: 4 cr. each semester, 8 cr. total; an "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

671. Digital Systems
Digital systems design and applications using TTL and CMOS MSI and LSI devices. Topics include logic design of memory systems, interfacing (serial and parallel), and an introduction to microcomputers. Digital design project required. Prereq: introductory digital design. Lab. 4 cr.

674. Control Systems and Components
Feedback, principles; stability, Nyquist criteria; performance charts; introduction to equalizer design; control system components. Analog computer simulations. Prereq: differential and integral calculus. Lab. 4 cr.

675. Electrical Technology
Electrical circuits—DC and AC network analysis; transformers; physical principles of electronic devices; power supplies; transistor amplifiers—frequency response; introduction to operational amplifiers and digital electronics; transducers and instrumentation systems. Prereq: differential and integral calculus. Lab. 4 cr.

677. Analog Systems
Op Amp specifications, instrumentation and bridge amplifiers, advanced Op Amp circuits and linear ICs. Interfacing techniques, and A/D and D/A converts. Lab applications. Prereq: intro analog design. Lab. 4 cr.

680. Communications and Fields
Modulation and demodulation; noise, filter design, active filters and phase-lock loops; electric and magnetic fields; transmission lines; waveguide principles and components; antennas and radiation. Prereq: differential and integral calculus. Lab. 4 cr.

690. Microcomputer Technology
Microprocessors; their operation, programming, interfacing, nd various uses. The 8085A is used as an operational model for hardware and software applications. SDK-85 microcomputer development systems are used for lab. Microcomputer applications, with emphasis on lab work. Prereq: ET 671. Lab. 4 cr.

691. Electrical Engineering Technology Project
Group project; students are required to find solutions to actual technological problems in design, fabrication, and testing, as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. Prereq: senior standing. A year-long course: 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at end of first semester. Withdrawal from course results in loss of credit.

695. Independent Study
A) Topics in Engineering Technology Mathematics; B) Topics in Mechanical Engineering Technology; C) Topics in Electrical Engineering Technology. 1–4 cr.

English (ENGL)

(For program description, see page 27.)

Chairperson: Michael V. DePorte
Professors: Thomas A. Carnicelli, Michael V. DePorte, Karl C. Diller, Burt Feintuch, Elizabeth H. Hageman, Robert Hapgood, Jean E. Kennard, Andrew H. Merton, Philip L. Nicoloff, John C. Richardson, Susan Schibanoff, Charles D. Simic, Mark R. Smith, Thomas A. Williams, Jr., John A. Yount
Associate Professors: Janet Aikins, Mary Morris Clark, Robert J. Connors, Michael K. Ferber, Lester A. Fisher, Melody G. Graulich, Rochelle Lieber, Mekeel McBride, Thomas R. Newkirk, Hugh M. Potter III, Patrocinio P. Schweickart, David H. Watters
Assistant Professors: Brigitte Gabcke Bailey, Jane T. Harrigan, Susan Margaret Hertz, Christopher Hoile, Romana C. Huk, Lisa Watt MacFarlane, Sarah Way Sherman, Sandhya Shetty, Patricia A. Sullivan, Rachel Trubowitz
Faculty in Residence, Assistant Professors: Kevin Donovan, Susanne Collier Lakeman

See departmental brochure for detailed descriptions of course offerings.

English 401 is a prerequisite for all English courses but 400.

400. English as a Second Language
Improves the competence of foreign students in listening comprehension, speaking, reading, and writing. Recommended as preparation for ENGL 401. Prereq: student should meet with and have the permission of the instructor. 4 cr.

401. Freshman English
Training to write more skillfully and to read with more appreciation and discernment. Frequent individual conferences for every student. Special fee. 4 cr.

402. Writing about Reading
Emphasis on close reading of a variety of nonfiction sources and on intensive writing to develop interpretive skills. Prereq: ENGL 401 or permission. 4 cr.

403. Introduction to the Study of Literature
The art of thoughtfully enjoying various kinds of literature, the substance and language of literature, and literary techniques. 4 cr.

501. Introduction to Prose Writing
Nonfiction writing; weekly papers and frequent conferences. May be repeated for credit with the approval of department chairperson. 4 cr.

505. Introduction to Linguistics
Overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as LING 505.) 4 cr.

511. Major Writers in English
In-depth study and discussion of a few American and/or British writers. Topics and approaches vary depending on instructors. 4 cr.

512. Introduction to American Literature
Works of major American writers from Irving to Faulkner, with emphasis on how to adapt and present the material to high school English classes. Open only to English teaching majors. 4 cr. (Not offered every year.)

513, 514. Survey of British Literature
Selected classic works in poetry and prose considered in chronological order and historical context. Attention to the works and to the ideas and tastes of their periods. 513: Beowulf through 18th century. 514: 1800 to the present. 4 cr.

515, 516. A Survey of American Literature
515: From the beginning of American literature to the Civil War. 516: from the Civil War to the present. 4 cr.

518. The Bible as Literature
Literature of the Old and New Testaments and the Apocrypha, primarily in the King James version. 4 cr.

519. Introduction to Critical Analysis
Critical analysis of fiction, poetry, and drama. Frequent short papers. Required of all English majors; should be taken early in their programs. 4 cr.

520. Literature and the History of Ideas
Interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Barring duplication of subject, may be repeated for credit. 4 cr.

521. The Nature Writers
Fiction, poetry, and nonfiction books on the natural environment. Such books as Thoreau's *Walden* or *Maine Woods*, Leopold's *Sand County Almanac*, Beston's *Outermost House*, Dillard's *Pilgrim at Tinker Creek*, books by naturalists who observe nature vividly and knowingly and who write out of their concern for the environment. 4 cr.

522. American Literary Folklore
Folktales, songs, proverbs, beliefs, superstitions, and their use by such American authors as Irving, Hawthorne, Longfellow, Melville, Thoreau, Twain, Frost, and Faulkner; some emphasis on oral folk culture of New Hampshire. 4 cr.

523. Madness in Literature
How various writers depict insanity, and how they approach the problem of determining what attitudes and what behavior are truly sane. Emphasis on 19th- and 20th-century works, but works from earlier periods also considered. Euripides' *The Bacchae*, Shakespeare's *King Lear*, Cervantes's *Don Quixote*, Hoffman's *The Golden Pot*, Dostoevsky's *Notes from the Underground*, Robbe-Grillet's *The Voyeur*, Nabokov's *Pale Fire*, and other texts. 4 cr.

525. Popular Culture in America
Cultural expression in popular media. Verbal arts (best sellers, magazines, newspapers, speeches); some attention to television, film, comics, popular music. The multidisciplinary approach deals with historical context, cultural institutions, and distinctions between "popular arts" and "great literature." Recurrent images, situations, and themes are investigated to see what values are celebrated and fears revealed. 4 cr.

533. Introduction to Film
The art, history, technology, and theory of the narrative motion picture from the silent period to the present. Examination of films by such filmmakers as Griffith, Keaton, Eisenstein, Renoir, Welles, Hitchcock, Bergman, Kurosawa. (Also offered as CMN and THEA 533; students not majoring or minoring in communication or in theater must register for ENGL 533.) 4 cr.

581. Introduction to Third World Literature
Consideration of some of the literature that has come out of the Third World since the end of colonialism. Treated will be such writers as Rushdie, Césaire, Walcott, Achebe, Naipaul, Narayan, and Márquez. 4 cr.

585. Introduction to Women in Literature
Survey of images of women in literature. Content and approach vary depending on instructor. 4 cr.

586. Introduction to Women Writers
Survey of women writers. Content and approach vary depending on instructor. 4 cr.

595. Literary Topics
Various faculty members investigate topics of special interest at a level appropriate for nonmajors. See department for details of current offerings. 1–4 cr.

608. Arts and American Society: Women Writers and Artists, 1850–Present
Team-taught course studying the impact of gender definitions on the lives and works of selected American artists. Considers lesser-known figures such as Fannie Fern, Lilly Martin Spencer, and Mary Hallock Foote as well as better-known artists such as Willa Cather and Georgia O'Keeffe. Prereq: permission or one of the following: WS 401, HIST 566, ENGL 585, 586, 685, 785, or a 600-level art history course. (Also offered as ARTS 608, HIST 608, and HUMA 608.) 4 cr.

609. Ethnicity in America: The Black Experience in the Twentieth Century
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as HUMA 609 and MUSI 609.) 4 cr.

610. American Studies: New England Culture in Changing Times
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as ARTS 610, HIST 610, and HUMA 610.) Not for art studio major credit. 4 cr.

616. Studies in Film
Advanced, focused study of the cinema. Topics vary from year to year and with instructor. Focus may range from general consideration of film theory, film criticism, and film history, to specific analyses of selected genres, directors, and periods. (Also offered as CMN and THEA 616; students majoring or minoring in communication or in theater must register for CMN or THEA 616.) Prereq: ENGL/CMN/THEA 533 or permission. 4 cr.

619. Critical Approaches to Literature
Selected methods of literary criticism applied to fiction, poetry, and/or drama with critical approaches varying from year to year. A follow-up of 519, course provides a second semester of training in critical reading and writing, examining such major modern strategies as formalist, biographical, archetypal, psychological, sociological, historical, feminist, and structuralist criticism. Prereq: ENGL 519 or equivalent. 4 cr.

621. Newswriting
Workshops to develop reporting and writing skills. Prereq: ENGL 501 or equivalent; written permission. May be repeated for credit with the approval of the department chairperson. 4 cr.

625, 626. Writing Fiction
Workshop in the fundamental techniques of fiction writing. Student work is criticized by fellow students; individual conferences with instructor. Prereq: ENGL 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

627, 628. Writing Poetry
Workshop in the fundamental techniques of poetry writing. Class discussion and criticism of poems written by students. Individual conferences with instructor. Prereq: ENGL 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

630. Poetry
American and British poetry. Various poetic techniques and their demonstration. See course descriptions available in department office for further information. 4 cr. (Not offered each semester.)

631. The Drama
Nature and types of drama illustrated by major English, American, and (translated) European plays. How to read a play. Live and filmed performances studied as available. 4 cr.

632. Fiction
Modern novels and/or short stories. The ways in which fiction communicates its meanings; the tools and methods at the fiction writer's disposal, primarily as they function in individual works. See course descriptions available in department office for further information. 4 cr. (Not offered each semester.)

650. Studies in American Literature and Culture
Special topics in American Studies, varying from year to year. 4 cr. (Not offered every year.)

651, 652. Comparative Literature
Comparative studies of major authors representative of important periods of world literary achievement. 651: Homer to Dante; common themes and the development of the epic tradition in early Western literature. 652: Renaissance to modern. Topics and approaches vary from semester to semester. 4 cr.

655. Chaucer
Study of Chaucer's earlier works in the context of their continental sources and analogues. All readings in translation. 4 cr.

657. Shakespeare
Ten major plays representative of the main periods of Shakespeare's career and the main types of drama which he wrote (tragedy, comedy, history). Live and filmed performances included as available. Restricted to undergraduates and designed for both English majors and students majoring in other fields. 4 cr.

685. Women's Literary Traditions
Intensive study of theme, topics, and techniques in women's literature. Topics vary from year to year. 4 cr.

690. Introduction to Black Literature in America
Selected prose, fiction, drama, and poetry. Individual works and historical-cultural background. Course varies from year to year. 4 cr.

695, 696. Senior Honors
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work; permission required. May be counted as two courses toward the ten that constitute a major in English. 4 cr. (Not offered every year.)

697, 698. English Major Seminar
Intensive study of specialized topics that vary from year to year. Enrollment in each seminar is limited to 15 so that all students can take an active part in discussion and work closely with the instructor on their papers. Prereq: a grade of B or better in ENGL 519 and permission. For details, see course description available in the department office. 4 cr.

701. Advanced Writing of Fiction
Workshop discussion of advanced writing problems and readings of students' fiction. Individual conferences with instructor. Prereq: 625, 626, or equivalent; written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

703, 704. Advanced Nonfiction Writing
Workshop course for students intending to write publishable magazine articles or nonfiction books. Equal stress on research and writing techniques. Prereq: ENGL 621; 622 recommended. Written permission of instructor required. May be repeated for credit with the approval of the department chairperson. 4 cr.

705. Advanced Writing of Poetry
Workshop discussion of advanced writing problems and submitted poems. Individual conferences with instructor. Prereq: ENGL 627, 628, or equivalent; written permission of instructor. May be repeated for credit with the approval of the department chairperson. 4 cr.

707. Form and Theory of Fiction
A writer's view of the forms, techniques, and theories of fiction. The novels, short stories, and works of criticism studied will vary, depending on the instructor. 4 cr.

708. Form and Theory of Nonfiction
A writer's view of contemporary nonfiction, emphasizing the choices the writer faces in the process of research and writing. 4 cr. (Not offered every year.)

709. Form and Theory of Poetry
A writer's view of the problems, traditions, and structures of poetry. 4 cr.

710. Teaching Writing
Introduction to various methods of teaching writing. Combines a review of theories, methods, and texts with direct observation of teaching practice. 2 or 4 cr.

711. Editing
Emphasis on newspaper editing but principles applicable to magazine and book editing also covered. Prereq: ENGL 501; permission. 4 cr.

713, 714. Literary Criticism
Major critics from Plato to the present; the chief critical approaches to literature. 4 cr. (Not offered every year.)

715. TESL: Theory and Methods
How linguistic, psychological, sociological, and neurological theory influence or even determine the choice of methods of language teaching. Research on second language acquisition and bilingualism, language aptitude, and the cultural context of language acquisition. Introduction to standard and exotic methods of language teaching. 4 cr.

716. Curriculum Design, Materials, and Testing in English as a Second Language
Study of the problems in designing an effective teaching program for various types of ESL students. Competence and aptitude testing; choosing and adapting materials for ESL classes. 4 cr.

718. English Linguistics and Literature
Introduction to linguistics for students of literature. Includes a survey of the grammar of English (phonology, morphology, syntax, dialect variation, historical change) with applications to the analysis of the language of poetry and prose. 4 cr. (Not offered every year.)

720. Newspaper Internship
Students intending to pursue careers in journalism spend a semester working full or part time for a daily newspaper under close supervision of editors. Reporting is stressed, but students may do some editing as well. The number of internships is very limited. Prereq: ENGL 621 or its equivalent; permission. 4–16 cr.

722. Advanced Newswriting
Students refine interviewing, reporting, and writing techniques. Emphasis on in-depth features. Prereq: ENGL 621; permission of instructor. May be repeated for credit with the approval of department chairperson. 4 cr.

741. Literature of Early America
Prose and poetry of the periods of exploration, colonization, early nationalism, Puritanism, Enlightenment. Individual works and historical-cultural background. 4 cr. (Not offered every year.)

742. American Literature, 1815–1865
Fiction, nonfiction, and poetry in the period of romanticism, transcendentalism, nationalism. Individual works and cultural background. 4 cr. (Not offered every year.)

743. American Literature, 1865–1915
Fiction, nonfiction, and poetry in the period of realism, naturalism, industrialism, big money. Individual works and cultural background. 4 cr.

744. American Literature, 1915–1945
Fiction, poetry, and drama in the period of avant-garde and leftism, jazz age, and depression. Individual works and cultural background. 4 cr.

745. Contemporary American Literature
A gathering of forms, figures, and movements since 1945. Individual works and cultural background. 4 cr.

746. Studies in American Drama
Topics vary from year to year. Examples: 20th-century American drama; contemporary playwrights; theatricality in American life. 4 cr. (Not offered every year.)

747. Studies in American Poetry
Topics vary from year to year. Examples: poets of the open road; Pound and his followers; major American poets; contemporary American poetry. 4 cr. (Not offered every year.)

748. Studies in American Fiction
Topics vary from year to year. Examples: the romance in America; the short story; realism and naturalism; the city novel; fiction of the thirties. 4 cr.

749. Major American Authors
Intensive study of two or three writers. Examples: Melville and Faulkner; Fuller, Emerson, and Thoreau; James and Wharton; Dickinson and Frost. 4 cr.

750. Special Studies in American Literature
Topics vary from year to year. Examples: the Puritan heritage; ethnic literatures in America; landscape in American literature; five American lives; pragmatism; American humor; transcendentalism; women regionalists. 4 cr.

751. Medieval Epic and Romance
The two major types of medieval narrative; comparative study of works from England, France, Germany, and Iceland, including *Beowulf*, *Song of Roland*, *Niebelungenlied*, Gottfried's *Tristan*, Njal's *Saga*, and Malory's *Morte d'Arthur*. All works read in modern English translations. 4 cr. (Not offered every year.)

752. History of the English Language
Evolution of English from the Anglo-Saxon period to the present day. Relations between linguistic change and literary style. 4 cr. (Not offered every year.)

753. Old English
Introduction to Old English language and literature through the readings of selected poetry and prose. 4 cr.

754. Beowulf
A reading of the poem and an introduction to the scholarship. Prereq: ENGL 753. 4 cr.

755, 756. Chaucer
755: *Troilus and Criseyde*, in the context of medieval continental literature by Boccaccio and other influences. 756: *The Canterbury Tales* in its original language. 4 cr.

758. Shakespeare
A few plays studied intensively. Live and filmed performances included as available. 4 cr.

759. Milton
Milton and his age. Generous selection of Milton's prose and poetry, with secondary readings of his sources and contemporaries. 4 cr. (Not offered every year.)

763. Continental Backgrounds of the English Renaissance
Major philosophers, artists, and writers of the continental Renaissance (in translation): Petrarch, Ficino, Pico, Vives, Valla, Castiglione, Machiavelli, Luther, Calvin, Rabelais, Montaigne, Cervantes, Erasmus, and Thomas More, as representative of the early English Renaissance. 4 cr. (Not offered every year.)

764. Prose and Poetry of the Elizabethans
Shakespeare and his contemporaries. Major works, including Spenser's *Fairie Queene*, Sidney's *Astrophil and Stella*, Shakespeare's *Sonnets*, Marlowe's *Dr. Faustus*: their literary and intellectual backgrounds. 4 cr. (Not offered every year.)

765. English Literature in the 17th Century
Major writers of the 17th century, including Donne, Jonson, Herbert, Bacon, and Hobbes. 4 cr. (Not offered every year.)

767, 768. Literature of the Restoration and 18th Century
Representative works; texts studied closely; the ways they reflect the central intellectual problems of their age. 767: Dryden, Rochester, Restoration plays, Bunyan, Defoe, Montesquieu, and Swift. 768: Pope, Fielding, Johnson, Boswell, Voltaire, Sterne, Rousseau, Beckford, Diderot, and Blake. 4 cr.

769, 770. The English Romantic Period
Major literary trends and authors, 1798 to 1832. Focus on poetry but attention also to prose works and critical theories. 769: Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey; 770: Byron, Shelley, Keats. 4 cr. (Not offered every year.)

771. Victorian Prose and Poetry
Major writers; social and cultural history. Selections vary from year to year. 4 cr. (Not offered every year.)

773, 774. British Literature of the 20th Century
Poets and novelists of the modernist and postmodernist periods. 773: W. B. Yeats, James Joyce, Virginia Woolf, E. M. Forster, D. H. Lawrence, and other modernists. 774: a selection of post-modernist or contemporary writers, such as William Golding, Doris Lessing, John Fowles, Philip Larkin, Seamus Heaney, Margaret Drabble, and others. 4 cr.

775. Irish Literature
Survey from the beginnings to present; works in Irish (read in translation) such as *The Cattle Raid of Cooley*, medieval lyrics, and *Mad Sweeney*; and works in English from Swift to the present. Twentieth-century authors: Joyce, Yeats, Synge, O'Casey, Beckett, and Flann O'Brien. 4 cr. (Not offered every year.)

778. Brain and Language
Introduction to neurolinguistics, a study of how language is related to the structure of the brain. Biological foundations of linguistic universals and language acquisition. Examination of evidence from aphasia and from normal language use. 4 cr.

779. Linguistic Field Methods
Study of a non–Indo-European language by eliciting examples from an informant, rather than from written descriptions of the language. Students learn how to figure out the grammar of a language from raw data. 4 cr. (Not offered every year.)

780. English Drama to 1640
Development of the drama through the Renaissance, emphasizing the Elizabethan and Jacobean dramatists. 4 cr.

781. English Drama, 1660–1780
Representative plays, both serious and comic, by such writers as Wycherly, Congreve, Etherege, Goldsmith, Sheridan, Davenant, Dryden, Otway, Rowe, and Lillo. 4 cr.

782. Modern Drama
Major English, American, and (translated) European plays of the modern period by such playwrights as Shaw, Ibsen, Chekhov, Strindberg, Pirandello, O'Neill, Brecht, Beckett, Williams, Miller, Pinter. Live and filmed performances studied as available. 4 cr. (Not offered every year.)

783. The English Novel of the 18th Century
Rise and development of the novel through study of selected major works by Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. 4 cr.

784. The English Novel of the 19th Century
Representative novels from among Austen, Scott, Dickens, Thackeray, Emily Brontë, Charlotte Brontë, Trollope, George Eliot, Hardy, and Conrad. 4 cr.

785. Major Women Writers
Intensive study of one or more women writers. Selections vary from year to year. 4 cr.

790. Special Topics in Linguistic Theory
Advanced course on a topic chosen by the instructor. Inquire at the English department office for a full course description each time the course is offered. Topics such as word formation, dialectology, linguistic theory and language acquisition, history of linguistics, language and culture, cross-disciplinary studies relating to linguistics. Also offered as LING 790. Barring duplication of subject, may be repeated for credit. 4 cr.

791. English Grammar
Survey of the grammar of English (pronunciation, vocabulary, sentence structure, punctuation, dialect variation, historical change) with special attention to the distinction between descriptive and prescriptive grammar and to the problems students have with formal expository writing. 4 cr.

792. Teaching Secondary School English
Methods of teaching language, composition, and literature in grades 7–12. Required of all students in the English teaching major. Open to others with permission. 4 cr.

793. Phonetics and Phonology
The sound system of English and other languages as viewed from the standpoint of modern linguistic theory, including the following topics: the acoustic and articulatory properties of speech sounds, the phonemic repertoires of particular languages, phonological derivations, and prosodic phenomena such as stress and intonation. Also offered as LING 793. Prereq: a basic linguistics course or permission. 4 cr.

794. Syntax and Semantic Theory
Relationship of grammar and meaning as viewed from the standpoint of modern linguistic theory. Emphasis on the syntax and semantics of English, with special attention to the construction of arguments for or against particular analyses. Also offered as LING 794. Prereq: a basic linguistics course or permission. 4 cr.

795. Independent Study
Open to highly qualified juniors and seniors. To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit up to a maximum of 16 credits. 1–16 cr.

797, 798. Special Studies in Literature
A) Old English Literature; B) Medieval Literature; C) 16th Century; D) 17th Century; E) 18th Century; F) English Romantic Period; G) Victorian Period; H) 20th Century; I) Drama; J) Novel; K) Poetry; L) Nonfiction; M) American Literature; N) A Literary Problem; O) Literature of the Renaissance. The precise topics and methods of each section vary. Barring duplication of subject, may be repeated for credit. For details, see the course descriptions available in the English department. 2–6 cr.

Entomology (ENTO)

(For program description, see page 39.)

Chairperson: Paul C. Johnson
Professor: James S. Bowman
Associate Professors: John F. Burger, Donald S. Chandler, G. Thomas Fisher, Paul C. Johnson, R. Marcel Reeves
Adjunct Assistant Professor: Siegfried E. Thewke

400. Insects and Society
Insects and their relations to humans, their environment, and their activities. Not for major credit. 4 cr.

402. Introductory Entomology
Insect structure and function, development, classification, ecology, behavior, and evolution for students in the biological sciences; importance of insects in terrestrial and aquatic

ecosystems. Insect collection required. Special fee. Lab. 4 cr.

503. Principles of Applied Entomology
Nature of destructive and beneficial insects and the fundamentals of insect pest management in our modern society. Elective for sophomores, juniors, and seniors. 4 cr.

506. Forest Entomology
Especially for forest resources majors. Structure, development, classification, and control of representative forest insects. Insect collection required. Special fee. Lab. 4 cr.

507. Field Entomology
Combination field and lab course covering full range of insect diversity, identification of insects, development and maintenance of a collection. Wide array of collecting techniques for use in diverse habitats. Field trips. Special fee. 4 cr.

510. Economic Insects of New England
Practical identification of the principal arthropod pests of New England. Emphasis on lab/field identification of pest specimens associated with major commodity groups, including structures, ornamentals, and turf, as well as forest products and agricultural crops. Prereq: intro entomology course (ENTO 402, 503, or 506) or permission. Special fee. 4 cr.

695. Problems in Entomology
Problems and independent investigations in the various fields of basic and applied entomology. Prereq: ENTO 402 and 503; permission. 2–4 cr.

704. Medical Entomology
Survey of past and present trends in arthropod-borne diseases transmitted to human populations, emphasizing dynamics of arthropod-host-pathogen/parasite relationships, natural nidality of disease, and role of arthropods and other animals as reservoirs or vectors of disease and maintenance of zoonoses. Lab emphasizes survey of arthropod groups important as disease vectors or envenomizing humans. Elective for juniors and seniors. Lab. 4 cr.

705. Systematics and Taxonomy of Insects
The kinds and diversity of insects and their relationships, emphasizing methods of species and population analysis, concepts of classification and nomenclature, and application to identification. Prereq: ENTO 402; ZOOL 412 or BIOL 411-412;/or permission. Lab. 4 cr.

706. Terrestrial Arthropods
Biology, ecology, and systematics of the principal terrestrial arthropods, with emphasis on forest and grassland communities. Role of arthropods in decomposition and nutrient cycling; effects of forestry and agricultural practices on fauna. Collection, extraction, identification, and experimental procedures. 2 lectures, 1 lab/fieldwork, and discussions. Prereq: permission. (Also offered as FORS 706.) 4 cr. (Not offered every year.)

709. Aquatic Insect Ecology
Biology, ecology, and taxonomy of aquatic insects, including their role in succession and food webs of aquatic ecosystems, origin and evolution of adaptations to aquatic environments and relationship between habitat type and faunal diversity. Lab emphasizes qualitative and semi-quantitative sampling techniques, collection and identification of principal aquatic groups. Prereq: ENTO 402, ZOOL 412, or BIOL 411-412; permission. Lab. 4 cr. (Not offered every year.)

710. Insect Morphology
Study of homology of insect structure with that of other arthropods using evolutionary morphology approach. Integration of external and internal anatomy in delineating relationships within the *Insecta* and *Arthropoda*. Prereq: permission. Special fee. 4 cr. (Not offered every year.)

721. Principles of Biological Control
Natural and applied aspects of biological control of insect and plant pests. Prereq: permission. 4 cr. (Not offered every year.)

722. Toxicology
For advanced students in applied entomology. Review of the chemical compounds for insect control. Modes of pesticide entry; toxicology. Basic understanding of chemistry is desired. Prereq: permission. Lab. 4 cr. (Not offered every year.)

724. Industrial and Domestic Pest Management
For students wishing to study household and industrial entomology. Prereq: permission. Lab. 4 cr. (Not offered every year.)

725. Insect Ecology
Role of insects in coevolution of plant-herbivores and predator/parasite-prey systems, ecosystem energetics, population dynamics, niche theory, competition, coexistence, diversity, and stability. Prereq: permission. Not for graduate credit. 4 cr. (Not offered every year.)

726. Integrated Pest Management
Integration of pest management techniques involving biological, cultural, and chemical control with principles of ecology into management approaches for pests. Prereq: permission. 4 cr.

799. Honors Senior Thesis
Students conduct an individually designed research project under the direction of an honors thesis committee. The research should address a real issue in entomology related to students' interests and should result in a written thesis that is defended in an oral presentation to members of the committee. Restricted to seniors seeking "honors in major." Prereq: permission. 4 cr.

Environmental Conservation (EC)

Department of Forest Resources
(For program description, see page 39; for faculty listing, see page 118; see also course listings under Forest Resources, Soil Science, Wildlife Management, and Water Resources Management.)

401. Orientation to Environmental Conservation
Orientation to the nature, theory, process, and application of environmental conservation. Required of all beginning environmental conservation students. Prereq: majors only. 2 cr. Cr/F.

501. Environmental Philosophy
Provides a grounding in philosophical and social theory underlying environmental studies and approaches to environmental conservation. Students conduct critiques of extensive readings and write papers creatively analyzing aspects of selected philosophical works. Major research manuscript required for 4 credits. 2–4 cr.

502. Conservation Biology Forum
Introduction to conservation biology and issues of loss in species diversity. Study of the biology of human-caused extinction. Discussion of current events and their relation to loss in diversity. 2 cr.

503. Wetlands Resources
Examination of coastal and adjacent freshwater and estuarine wetlands from historical, destruction, and preservation perspectives. Field trips and laboratory sessions emphasize succession and investigation of dominant plant, insect, and vertebrate associations. Daily and evening lectures, labs, and field work. Prereq: one full year of college-level biology. 1 cr. (Offered summers at the Shoals Marine Laboratory.)

595, 596. Problems in Natural and Environmental Resources
Students pursue field, laboratory, or library problems in natural and environmental resources that are not covered by other courses. A faculty consultant and a study topic must be chosen before registration for the course. In consultation with the faculty adviser, students select the problem area, create a bibliography for reflection, and find channels to actively pursue the topic. A professionally written paper is expected at termination of the study. May be repeated once for credit. Prereq: permission. 2–4 cr.

601. Environmental Conservation Internship
Practical internship and field experience in a location removed from the University milieu to give the environmental conservation student a dimension and insight into sustainable resource management systems not available in the campus experience. Prereq: EC majors only. 4 cr. Cr/F.

635. Contemporary Conservation Issues
How human technology causes biological and social conflicts when applied to the ecosystem;

multiple demands of game, timber, water, minerals, and soil ecosystems vs. economic growth. Not open to freshmen. 4 cr.

637. Practicum in Environmental Conservation
Independent participation in an environmental conservation activity in the area of the student's specialization. Individual or group project may be developed under the supervision of any faculty member within or outside forest resources or with supervisors in public and private agencies, upon approval of the course instructor. Research projects not acceptable. Prereq: senior standing in the environmental conservation program. Lab. 4 cr. Cr/F.

702. Natural Resources Policy
Contemporary issues in the management and allocation of natural resources; impact of humans on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. (Also offered as RECO 702.) 4 cr.

710. Environmental History
History of ideas, beliefs, values, and actions regarding the environment and the socioeconomic matrix within which they lie, with special reference to the American experience. Prereq: senior standing in the environmental conservation program or permission. 4 cr. (Offered every other year.)

718. Law of Natural Resources and Environment
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prereq: EC 635, RECO 606, or equivalent. (Also offered as RECO 718.) 3 cr.

799. Senior Thesis and Seminar
Writing and completion of a senior thesis synthesizing the environmental conservation undergraduate experience, supported by a weekly seminar with all thesis writers. Prereq: majors only, senior standing. 4 cr. Cr/F.

Environmental Engineering

(See pages 47, 49, and 51.)

Family Studies (FS)

(For program description, see page 60.)

Chairperson: Larry J. Hansen
Associate Professors: Elizabeth M. Dolan, Larry J. Hansen, Michael F. Kalinowski, Victor R. Messier, Elizabeth A. Snell
Assistant Professors: Kristine M. Baber, Barbara R. Frankel

455. Introduction to Consumer Studies
Survey of consumer studies. Introduction to consumer decision making, consumer problems, consumer protection. 4 cr.

525. Human Development
Developmental information from conception through death; theoretical perspectives and research methods in human development; emphasis on student's communication and analytical skills. 4 cr.

553. Personal and Family Finance
Applied financial management; allocation of income to maximize wealth. Topics include banking, investments, credit, insurance. 4 cr.

555. Management and Decision Making
Theories of management, information processing, and decision making in the allocation of resources. 4 cr.

556. Housing and Design
Housing examined in terms of design, physical, socio-psychological, and community needs. 4 cr. (Not offered every year.)

615. Field Experience
Work with agency, institution, or organization concerned with the welfare of families and individuals. Students plan with department adviser and apply for approval. Prereq: approval of departmental faculty. 1–6 cr.

623. Developmental Perspectives on Infancy and Early Childhood
Integrative view of the developing child from conception through childhood within the family context. Prereq: FS 525. 4 cr. (Fall semester only.)

624. Developmental Perspectives on Adolescence and Early Adulthood
Developmental information from pubescence through early adulthood; the concept of identity and influences on identity formation. 4 cr.

635. Learning in Child Development Settings
Current theoretical approaches to communicating with children and influencing their behavior. Weekly four-hour laboratory experience working with preschool children is required at UNH Child-Family Center. Weekly three-hour seminar. Prereq: FS 525; permission. 4 cr.

645. Family Relations
Theories and research relating to the family and its role in individual development. 4 cr.

653. Consumer Problems
Examination of contemporary problems confronting consumers. 4 cr.

654. Consumer Protection
Types of protection available to consumer. Agencies that have consumer mandates, the laws pertaining to them, their functioning, and their effectiveness. 4 cr.

664. Consumer Behavior
Survey of consumer behavior theory and research from economic, psychological, and sociological perspectives. Examination of the effects of business, marketing, and advertising strategies on purchase decisions. 4 cr.

695. Independent Study
Scholarly project in the area of child, family, and consumer studies. Regular conferences with supervising faculty required. Prereq: approval of departmental faculty. 1–6 cr.

707. Practicum
Supervised in-depth experience in teaching, research, or advocacy in a professional setting to increase the student's understanding of children, families, or consumer issues. A) Child; B) Family; C) Consumer Studies. Prereq: FS major; permission. 1–6 cr. Cr/F.

708. Child and Family Center Internship
Supervised position within the UNH Child and Family Center nursery school programs: a) videotape assistant; b) assessment assistant; c) toddler program assistant; d) 3–5 year old assistant; e) computer technology assistant; f) international perspectives assistant. May be repeated up to a total of 9 credits. Prereq: FS 635; permission. 1–6 cr. Cr/F.

709. Child Study and Development Center Internship
Supervised positions within the UNH Child Study and Development Center child care programs: a) videotape assistant; b) assessment assistant; c) infant assistant; d) toddler assistant; e) 3–5 year old assistant; f) computer technology assistant; g) international perspectives assistant; h) health issues assistant. May be repeated up to a total of 9 credits. Prereq: FS 635; permission. 1–6 cr. Cr/F.

733. Supervising Programs for Young Children
Philosophical bases and theoretical rationales of various programs for young children; program alternatives and resources; issues in administration including supervision, finances, and regulations. Prereq: permission. 4 cr. (Fall semester only.)

734. Curriculum for Young Children
Designing and implementing developmentally appropriate activities for young children; assessing the effectiveness of activities; evaluating materials and equipment. Prereq: FS 525; 623; 635; 733; permission. 4 cr. (Spring semester only.)

741. Marital and Family Therapy
Introduction to the theory and practice of marital and family therapy. Major approaches to be examined include strategic, transgenerational, structural, experiential/humanistic, and behavioral. Prereq: FS 645 or equivalent; permission. 4 cr.

743. Parents, Children, and Professionals
Exploration of professional roles related to child and family advocacy. Consideration of philosophical, ethical, and pragmatic issues in the helping professions; evaluation and design of advocacy programs. Prereq: permission. 4 cr. (Fall semester only.)

746. Human Sexuality
Investigation of physiological, psychological, and sociological aspects of human sexuality.

Particular attention to various social practices, policies, and programs that affect sexual attitudes and behaviors. 4 cr.

753. Family Economics
Impact of economic change on families, family income, and resource allocation. Prereq: one course in economics or permission. 4 cr.

754. Consumers in Society
Problems and issues facing selected groups of consumers: the elderly, the poor, children and adolescents, women, and others. Prereq: permission. 4 cr.

782. Family Internship
Supervised experience in working with families. Students spend a minimum of 20 hours a week in a selected program that offers educational services to families. Students must apply during the spring semester of their junior year. Prereq: FS major; FS 525; 623; 635; 645; 743; permission. Coreq: FS 792. 8 cr. Cr/F. (Spring semester only.)

785-786. Seminar for Student Teachers
These seminars supplement the student teaching experience and effect a transition to the profession of teaching for those students admitted to the early childhood certification option. 2 cr.

788. Student Teaching of Young Children
Supervised teaching experience. Students spend a minimum of 20 hours per week in a selected program for young children working with a cooperating teacher. Students must apply during the spring semester of their junior year. Prereq: FS major; FS 525; 623; 635; 645; 733; 734; 743; EDUC 500 and 706; PHED 675; THEA 520; MATH 621; permission. Coreq: FS 785-786. 8 cr. Cr/F. (Spring semester only.)

791. Methods of Teaching
Curriculum materials, methods, and resources in teaching family and consumer studies. Prereq: permission. 4 cr.

792. Seminar for Family Interns
This weekly seminar focuses on issues of concern to family internship students, provides advanced training in educational strategies for working with families, and develops students' professional skills. Prereq: admission to family internship program. Coreq: FS 782. 4 cr. (Spring semester only.)

794. Families and the Law
Exploration of laws affecting families and the interaction of family members with each other and with society. Prereq: FS 555; 645; and permission of instructor. 4 cr.

797. Special Topics
Highly focused examination of a particular theoretical, methodological, or policy issue. Prereq: permission. 4 cr.

799. Honors Senior Thesis
Under direction of a faculty sponsor, students plan and carry out an independent investigative effort in an area of family, child, and/or consumer studies, resulting in a written thesis and an oral presentation before students and faculty. Prereq: majors only; senior standing; permission. Two-semester sequence as continuing course. 2–4 cr.

Forest Resources (FORS)

Department of Forest Resources
(For program description, see page 39; see also course listings under Environmental Conservation, Soil Science, Water Resources Management, and Wildlife Management.)

Chairperson: Harold W. Hocker, Jr.
Professors: James P. Barrett, John E. Carroll, Robert A. Croker, Nicolas Engalichev, Robert D. Harter, John L. Hill, Harold W. Hocker, Jr., William W. Mautz, David P. Olson
Adjunct Professor: Robert S. Pierce
Associate Professors: John D. Aber, Robert T. Eckert, Theodore E. Howard, R. Marcel Reeves, Barrett N. Rock, Richard R. Weyrick
Adjunct Associate Professors: C. Anthony Federer, James W. Hornbeck, William B. Leak, Sidney A. L. Pilgrim, Lawrence O. Safford
Assistant Professors: William B. Bowden, Christine V. Evans, John A. Litvaitis, Richard G. Parker, C. Tattersall Smith
Faculty in Residence, Assistant Professors: Mark J. McGuire, Peter Pekins
Adjunct Assistant Professors: Peter W. Garrett, Mary K. Reynolds

400. Orientation in Forestry
Presentations, class discussions, and projects directed toward providing understanding of studies in forestry and preparation for careers in forestry. Required of all new students in the forestry program. 0 cr. Cr/F.

423. Dendrology
North American forest trees: taxonomy, silvical characteristics, community relationships; major forest regions. Restricted to forest resources and wildlife management majors; others by permission of instructor. Coreq: FORS 425. 2 cr.

425. Field Identification of Trees and Shrubs
Identification and nomenclature of important North American trees; emphasis on trees and associated woody species of the Northeast. Coreq for forest resources and wildlife management majors: 423. Special fee. Lab. 2 cr.

426. Wood Science and Technology
Wood microstructure and identification: physical, chemical, and mechanical properties; characteristics of wood including those produced by growth and form (i.e., knots, crossgrain) and those produced by degradation (i.e., stain, decay); log and lumber processing and quality evaluation; preparation of wood for use, including drying, gluing, and protection against degrade. Special fee. Lab. 4 cr.

500. Summer Work Experience
Work in forestry or closely related field; must be performed under professional supervision or approved by forest resources faculty. Students are responsible for arranging their own experience. (Forest resources majors only.) May be repeated. 0 cr. Cr/F.

501. Working with Forests
Integrated study of scientific, technical, administrative, and social elements of forest resource management. Emphasis on tree identification, measurement, and protection techniques. Of interest to students in unrelated as well as related fields. Not open to FORS majors. Special fee. Lab. 4 cr.

502. The Endangered Forests
Discussion of the two major international problems in forestry: dying of forests due to air pollution in developed countries; and loss of forests due to clearing and heavy cutting in tropical countries. The value of forests and their importance to people. Guest speakers and field trip. 3–4 cr.

527. Forest Ecology
Application of general ecological principles to the study of forests; examination of the forest from the level of the individual tree to the forest community; consideration of the impact of forest management on ecosystem structure and function. Prereq: BOT 412 or equivalent with permission. Special fee. Lab. 4 cr.

542. Forestland Measurement and Mapping
Elementary measuring equipment and techniques; preparation of maps; public land survey; courthouse deed search. Two-week field session following spring semester. (Forest resources and wildlife majors only.) Special fee. 2 cr.

544. Forest Biometrics
Sampling techniques basic to forest inventory, regression estimation used in deriving volume equations and predicting forest growth and yield. Analyses made using microcomputers. Lab. 2 cr.

546. Forest Mensuration
Field experience in forest inventory and predicting forest growth and yield. Data analyses made using microcomputers. Prereq: FORS 544. Special fee. Lab. 2 cr.

581. Methods in Land Surveying
Principles and field methods of land surveying for the natural resource manager; measurement of distance, direction, and elevation; instrumentation and computation; legal aspects of land description and boundary. Prereq: FORS 542 or permission. Lab. 4 cr. (Not offered every year.)

629. Silviculture
Application of ecological knowledge to the control, establishment, composition, and growth of forest stands for economic purposes. Prereq: FORS 423 and 527. Special fee. Lab. 3 cr.

630. Forest Harvesting and Silviculture
Harvesting and silvicultural practices. Prereq: FORS 629 or permission. Limited enrollment. 2 cr. Cr/F.

643. Economics of Forestry
Supply and demand for forest products and services; forestry and the general economy; economics of the firm; microeconomics; taxation. Prereq: a course in microeconomics. 4 cr.

652. Forest Resources Measurements and Mapping
Aerial photo type mapping and forest resources inventory: type identification and delineation, map construction, cruise design, and forest resources inventory. Two-week field session following spring semester. (Forest resources majors, others by permission.) Prereq: FORS 527 and 544. Special fee. 2 cr.

660. Forest Fire Protection
Forest fire prevention, behavior, and effective control; weather phenomena; other aspects of forest damage; fire effects and use. Prereq: FORS 527 or 629; SOIL 501. Special fee. Lab. 2 cr.

695. Investigations in Forestry
A) Forest Ecology; B) Remote Sensing; C) Wood Products; D) Mensuration; E) Forest Economics; F) Forest Management; G) Operations; H) Recreation; I) Policy; J) Forest Genetics; K) Watershed Management; L) Natural Resource Education. Prereq: permission. 1–4 cr.

706. Terrestrial Arthropods
Biology, ecology, and systematics of the principal terrestrial arthropods, with emphasis on forest and grassland communities. Role of arthropods in decomposition and nutrient cycling; effects of forestry and agricultural practices on fauna. Collection, extraction, identification, and experimental procedures. 2 lectures, 1 lab fieldwork, and discussions. Prereq: permission. (Also offered as ENTO 706.) 4 cr. (Not offered every year.)

711. Statistical Methods II
Intermediate course; basic concepts of sampling, linear models and analyses for one-way and multiway classification, factorial arrangement of treatments, multiple regression, and covariance. Computer programs used in analyzing data. Examples from environmental sciences. Prereq: RECO 528 or equivalent. 4 cr.

712. Sampling Techniques
Techniques of sampling finite populations in environmental sciences; choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Prereq: RECO 528 or equivalent. 2–4 cr. (Not offered every year.)

713. Quantitative Ecology
Applied quantitative techniques: basic concepts in probability and statistics applied to ecological systems; population dynamics; spatial patterns; species abundance and diversity; classification and ordination; production; and energy and nutrient flow. Additional credit for in-depth mathematical analysis of a particular topic. Prereq: intro courses in calculus, statistics, and ecology. 3 or 4 cr. (Not offered every year.)

720. Forest Genetics
Genetics of forest tree improvement; variation in natural populations, breeding methods, physiological characters, quantitative data analysis. Prereq: BIOL 604; FORS 629; statistics;/or permission. Special fee. Lab. 3 cr. (Not offered every year.)

722. Advanced Silviculture
Intensive silviculture of forest stands. Regeneration (e.g., alternative regeneration methods and site preparation); stand management (e.g., thinning schedules and fertilization). Prereq: FORS 629 or equivalent; permission. Special fee. 3 cr. (Not offered every year.)

730. Terrestrial Ecosystems
Processes controling the energy, water, and nutrient dynamics of terrestrial ecosystems; concepts of study at the ecosystem level, controls on primary production, transportation, decomposition, herbivory; links to earth system science, acid deposition, agriculture. Prereq: FORS 527, intro BOT/BIOL course, or permission. 4 cr.

734. Forest Protection Seminar
Discussion and special problems based on principles and techniques of forest protection. Prereq: permission. 3 cr. (Not offered every year.)

745. Forest Management
Forest land ownership; management objectives; forest inventory regulation and policy; forest administration; professional responsibilities and opportunities. Prereq: completion of junior year in forestry curriculum. Special fee. Lab. 4 cr.

753. Decision Sciences in Natural Resource Management
Application of operations research techniques and capital investment analysis to natural resource situations. Linear, goal, and dynamic programming, simulation and decision theory. Prereq: calculus; intermediate microeconomics. Lab. 4 cr.

754. Wood Products Manufacture and Marketing
Wood products from harvesting and procurement of raw material to finished product processes, management decisions, marketing, and promotion problems. Case study approach backed up by weekly all-day field trips to wood products manufacturing plants in the region. Prereq: FORS 426 or permission. Special fee. Lab. 4 cr.

755. Regional Silviculture and Forest Management
Extended field trip to another forest region. Prereq: senior standing; FORS 745;/or permission. Limited enrollment. 2 cr. Cr/F.

757. Basics of Remote Sensing
Fundamentals for application of photographic and nonphotographic sensors to information gathering in natural resource fields; emphasis on the interpretation of aerial photographs. Applications to forestry, wildlife, land-use planning, earth sciences, soils, hydrology, and engineering. Special fee. Lab. 2 cr.

758. Aerial Terrain Analysis
Visual interpretation of aerial and satellite imagery for study of landforms, geology, hydrology, vegetation, and cultural patterns; applications in U.S. geography. Prereq: FORS 757 or equivalent; binocular vision an advantage. Special fee. Lab. 2 cr.

759. Digital Geoimage Analysis
Computer enhancement and classification of remotely sensed images; integration of remotely sensed data into computer-based geographic information systems. Prereq: FORS 757 or equivalent. Lab. 2 cr.

760. Geographic Information Systems
Fundamentals of computer-assisted systems for the capture, storage, retrieval, analysis, and display of spatial data. Emphasis on spatial analysis, cartographic modeling, and data base management as applied to natural resources and land-use planning. 2 cr.

764. Forest Industry Economics
Business methods and economics in the forest industry; planning for minimum cost operations and profitable use of capital in a forest enterprise. Individual projects. Prereq: senior standing; permission. 4 cr. (Not offered every year).

French (FREN)

Department of French and Italian
(For program description, see page 27; see also course listings under Italian.)

Chairperson: Barbara T. Cooper
Associate Professors: Rose T. Antosiewicz, Barbara T. Cooper, Jack A. Yeager
Assistant Professors: Claire-Lise Malarte, Grover E. Marshall, Ann H. Willeford
Faculty in Residence, Assistant Professors: Joan Elizabeth Howard, Margherita DeBonfils Templer
Lecturer: Henry Smith

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. All courses are conducted in French unless otherwise noted. FREN 631 is the first course counting toward a major. Students educated in French-speaking countries may not register for courses below the 700 level without permission. No UNH or transfer credit will be given for elementary-level college courses in French if the student has had two or more years of French in secondary school.

401-402. Elementary French
For students without previous training in French. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of French in secondary school; however, any such students whose studies of French have been interrupted for 7 years or more should consult the depart-

ment chairperson about possibly receiving credit.) 4 cr.

501. Review of French
Emphasis on active use of spoken French. Review of basic grammar. Labs and films. Designed primarily for those whose study of French has been interrupted and for those who have had only two years of high school French. 4 cr.

503, 504. Intermediate French
Review of grammar with emphasis on the development of reading, writing, speaking, and listening skills, and on culture. Discussion in French of literary and cultural readings. Labs and films. 4 cr.

525. Introduction to French Civilization
French civilization from a variety of perspectives and topics. Includes historical, geographical, and artistic expressions of French culture. Readings, discussion, and papers in English. Not for major credit. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

526. Introduction to Francophone Civilization
Civilization of French-speaking countries other than France. Includes historical, geographical, and artistic expressions of these cultures. Not for major credit. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

621. French Prose in Translation
Works affecting French thought from the Renaissance to the modern period. Readings, discussion, papers in English. Not for major credit. 4 cr. (Not offered every year.)

622. French Drama in Translation
Major works of comedy, tragedy, and drama. Molière and Racine to the present day. Readings, discussions, papers in English. Not for major credit. 4 cr. (Not offered every year.)

631. French Grammar and Speech
Thorough review of grammar and practice in oral and written expression. Labs and films. Prereq: C or better in FREN 504. Required for majors. 4 cr.

632. French Conversation
Readings from current French periodicals and from material illustrating various aspects of life in contemporary France. Emphasis on increasing oral skills through class discussions and reports. Prereq: FREN 631. Labs. 4 cr. (Spring semester only.)

635. Topics in French Civilization
Topics drawn from all aspects and periods of French civilization. Prereq: FREN 631. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

636. Topics in Francophone Civilization
Topics drawn from all aspects and periods of Francophone civilizations. Prereq: FREN 631. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

651, 652. Readings in French Literature
Reading and rigorous oral and written analysis of texts selected to illustrate important themes/genres in French literature. May be taken in any order. Pre- or coreq: FREN 631. Required for majors. 4 cr.

653. Readings in Francophone Literature
Readings in French literatures from outside of France (e.g., Quebec, Africa, the Caribbean). Taught in French. Prereq: FREN 631. 4 cr. (Not offered every year.)

685-686. Junior Year at the University of Burgundy
Studies at the University of Burgundy (in Dijon, France) for juniors who have completed their sophomore year at UNH and have passed with a grade of B or better FREN 631, FREN 651, and FREN 652. Students are expected to take French courses in each semester of their freshman and sophomore years. Attendance required at orientation sessions during the second semester of sophomore year. Interested students should consult the director of the program. Prereq: permission. (Not for graduate credit.) 32 cr. Cr/F.

758. French Literature of the Middle Ages and Renaissance
Prereq: FREN 651 and 652 or equivalent. 4 cr. (Not offered every year.)

762. 17th-Century French Literature
Prereq: FREN 651 and 652 or equivalent. 4 cr. (Offered fall sem. in alternate years.)

765. 18th-Century French Literature
Prereq: FREN 651 and 652 or equivalent. 4 cr. (Offered spring sem. in alternate years.)

775. 19th-Century French Literature
Prereq: FREN 651 and 652 or equivalent. 4 cr. (Offered fall sem. in alternate years.)

782. 20th-Century French Literature
Prereq: FREN 651 and 652 or equivalent. 4 cr. (Offered spring sem. in alternate years.)

790. Advanced Language and Style
Translation of literary texts, intensive study of principal techniques of style, explication de textes. Required for major. Prereq: at least two literature courses in French numbered above 652. 4 cr. (Fall semester only.)

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. Not for major credit. 4 cr. (Fall semester only.)

795, 796. Special Studies in French Language and Literature
Individual guided study of the work of a major author, a genre, or specific topics in literature. Training in bibliography and organization of material. Prereq: permission. 1-4 cr. (Not offered every year.)

798. Seminar in French Literature
Topics chosen by the instructor. May be repeated for credit barring duplication of material. Prereq: FREN 651, 652; permission. 4 cr. (Not offered every year.)

799. Honors Senior Thesis
Year-long course leading to an honors senior thesis. Open only to seniors seeking "honors in major" whose individually designed research projects have been approved by the dept. honors committee and who have been assigned an adviser. Students must enroll for both fall and spring semesters. Students defend the resulting written thesis in an oral presentation before dept. members and others. Prereq: permission. 2 cr/sem.

Genetics (GEN)

(For program description, see page 36.)

Chairperson: Robert M. Zsigray
Professors: Thomas P. Fairchild, Donald M. Green, Yun-Tzu Kiang, J. Brent Loy, Subhash C. Minocha, Lincoln C. Peirce, Owen M. Rogers, Willard E. Urban, Jr., Robert M. Zsigray
Associate Professors: Roger A. Cady, Clyde L. Denis, Robert T. Eckert
Assistant Professors: John J. Collins, Thomas Medford Davis, Anita S. Klein, Robert L. Taylor, Jr.
Adjunct Assistant Professor: Peter W. Garrett

704. Microbial Genetics
Expression and transfer of genetic elements (chromosomal and nonchromosomal) in prokaryotic and eukaryotic microorganisms; consideration of factors influencing public health, industry, the environment, and society. Prereq: MICR 503; BCHM 656. Lab. (Also offered as MICR 704.)

705. Population Genetics
Population growth and regulation; genetic variation; factors affecting gene frequency; ecological genetics. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

706. Genetics Laboratory
Advanced experiments in yeast genetics, including research techniques in biochemical, transmission, and molecular genetics. Prereq: BIOL 604 or equivalent; a course in biochemistry is recommended. (Also offered as BCHM 706.) 3 cr. (Not offered every year.)

740. Evolutionary Biology
Origin of life; source of genetic variation; population structure, mechanisms of evolution; molecular evolution; ecological adaptation in animals, plants, and man; community structure and evolution. 4 cr. (Not offered every year.)

771. Biochemical Genetics
Mechanisms of storage, replication, transmission, transcription, recombination, mutation,

and expression of genetic information by cells and viruses. Prereq: BCHM 752 or permission. (Also offered as BCHM 771.) 3 cr. (Not offered every year.)

772. Introductory Laboratory in Molecular Genetic Techniques
Modern biochemical gene manipulation techniques including the genetic, physical, and enzymatic characterization of gene vectors, gene cloning, construction of genetic probes, and sequencing of nucleic acids. Prereq: BCHM 752; either BCHM 771 or MICR 704. (Also offered as BCHM 772.) Special fee. Lab. 3 cr.

774. Plant Cell Culture and Genetic Engineering
Theory and techniques of cell/tissue culture and genetic manipulation in plants, transformation vectors, somatic cell genetics, regulation of foreign gene expression, molecular basis of agriculturally important traits, environmental and social implications of genetic engineering in plants. Prereq: BIOL 604 or permission. Coreq: GEN 775. (Also offered as BOT 774 and PLSC 774.) 3 cr.

775. Plant Cell Culture and Genetic Engineering Lab
Techniques of plant cell and tissue culture, protoplast fusion, and genetic transformation. Mutant cell selection, analysis of foreign gene expression. Coreq: GEN 774. (Also offered as BOT 775 and PLSC 775.) Special fee. 2 cr.

Geography (GEOG)

(For program description, see page 28.)

Chairperson: William H. Wallace
Professor: William H. Wallace
Associate Professors: Robert L. A. Adams, Alasdair D. Drysdale, Robert G. LeBlanc
Adjunct Associate Professor: James W. Cerny

401. Regional Geography of the Western World
Major culture areas of the Western world and the unique interaction of human and physical phenomena that produces the distinctive character of these areas. Emphasis on the manner in which people of different cultures have made use of the opportunities and solved the problems existing in the major regions occupied by Western culture: Europe, the Soviet Union, the Americas, and Australia and New Zealand. 4 cr.

402. Regional Geography of the Non-Western World
Major culture areas of the non-Western world and the unique interaction of human and physical phenomena that produces the distinctive character of these areas. Emphasis on the manner in which people of different cultures have made use of opportunities and solved problems existing in the major regions occupied by non-Western cultures: the Middle East and North Africa, Africa south of the Sahara, Oriental Asia and the Pacific Islands. 4 cr.

473. The Weather
Introductory treatment of weather phenomena and the physical processes underlying those phenomena. Emphasis on the nature and variability of New England weather. 4 cr.

512. Geography of Canada
Historical and regional geography of Canada. Historical growth; development of its distinctive regions; contemporary prospects and problems. Resource base, exploration, settlement, population growth, cultural contrasts, economic development, and special relationship with the U.S. Required 5-day field trip to Canada. 4 cr. Prereq: permission.

513. Geography of the United States
Geographical diversity of the U.S.: its physical setting, historical development, and contemporary spatial organization. Distinctive character and problems of major American regions; recent changes in economic, demographic, and social conditions. 4 cr. (Not offered every year.)

531. Geography of Western Europe and the Mediterranean
Regional and topical analysis of Western Europe and the Mediterranean. The geographical diversity of Europe in the context of physical setting and historical development. Present-day problems. 4 cr. (Not offered every year.)

540. Geography of the Middle East
Environmental, cultural, political-geographic, and ecological foundations of the Middle East. Selected regional problems and issues; e.g., geographical dimensions of the Arab-Israeli conflict, oil, urbanization, population growth, and nomadism. 4 cr.

570. Introductory Climatology
Characteristics and world distribution of present climates. Climates of the past and theories of climatic change. Selected topics in applied climatology. 4 cr.

572. Physical Geography
Factors in the formation and distribution of landforms, soils, and vegetation. Human significance of natural systems. Lab. 4 cr. (Not offered every year.)

581. Human Geography
Differentiation of the world in terms of population, race, language, religion, political territory, and economic life. Collection and critical use of empirical data; emphasis on spatial and ecological analysis. 4 cr.

582. Economic Geography
Investigation of the manner in which resources and space have been organized for the production of goods and services: agriculture, the extractive industries, manufacturing, and the tertiary sector. Empirical studies, theories of location, and location models. Major contemporary problems and issues in agriculture and food supply, energy sources, industrial readjustment, and transportation. 4 cr. (Not offered every year.)

583. Urban Geography
Spatial structure of cities and the city system. Emphasis on the North American city and its problems: land use, transportation, political fragmentation, physical environment, and residential patterns. 4 cr. (Not offered every year.)

584. Political Geography
Interactions between geographic and political phenomena at the sub-national, national, and international levels. Emphasis on geographical aspects of current political problems within and between states. 4 cr. (Not offered every year.)

590. Introductory Cartography
Map usage, design, and production; emphasis on special-purpose thematic maps as used in scholarly papers, theses, journals, and books. 4 cr.

610. The Geography of New England
The distinctive physical setting of New England, its settlement and development during the past three centuries, and the present-day problems and opportunities of the region. Three required weekend field excursions near end of term. Prereq: permission. 4 cr. (Not offered every year.)

683. Historical Geography of the United States
Spatial analysis of Amerindian culture in 1492. European exploration, colonization, population change, economy, urbanization, and ethnicity to 1900. Geographic illusions and their significance. 4 cr. (Not offered every year.)

690. Advanced Cartography
Organized in seminar fashion to study a selected major cartographic topic in detail. Current topic is contour mapping, including trend surface analysis and kriging. Emphasis on use of computers as cartographic tools. Includes learning the effective use of programs such as SAS/GRAPH, SYMAP, and SURFACE-II. Prereq: GEOG 590 or permission. 4 cr. (Not offered every year.)

795. Special Project in Geography
Readings, library, archival, and field work. Primarily for geography seniors. Prereq: permission. 2 or 4 cr.

797. Seminar in Geography
Exploration of geography as a research discipline. Techniques of geographic analysis. Definition and investigation of research problems. Primarily for geography seniors. 4 cr. Cr/F.

Geology

(See Earth Sciences.)

German (GERM)

Department of German and Russian
(For program description, see page 28; see also course listings under Japanese and Russian.)

Chairperson: Nancy Lukens
Associate Professors: Roger S. Brown, Nancy Lukens
Assistant Professors: Edward T. Larkin, Mary E. Rhiel, James L. Sherman
Visiting Assistant Professor: Masaru Toda

New students are encouraged to present scores on the German Advanced Placement (AP) Test for UNH course credit and for placement at an advanced level. College Board Achievement Test scores should also be presented for placement purposes. No transfer or UNH credit can be given for elementary German (401-402) if the student has had two or more years of that language in secondary school unless a significant amount of time has elapsed since completion of the last course. Students may petition the German program to be admitted to the 400-level courses for credit. Individual cases will be decided by the program on the basis of a proficiency test in conjunction with a review of the student's secondary school record. Students considering a major or minor in German should consult with the program as early as possible to plan a meaningful sequence of study and to discuss options for studying abroad. All courses are conducted in German unless otherwise indicated.

401-402. Elementary German
For students without previous training in German. Aural comprehension, speaking, writing, reading, language labs. No credit for those with two or more years of German in secondary school. 4 cr.

403-404. German for Reading Knowledge
Reading in the natural, physical, and social sciences and the humanities for students without previous training in German. No credit for those with two or more years of German in secondary school. 4 cr.

407. Accelerated German
401-402 in one semester. Intensive practice in all four skills for students without previous training in German. Labs. No credit for those with two or more years of German in secondary school. 8 cr.

501. Review of German
Refresher course for those whose study of German has been interrupted or who have had no more than two years of high school German. Emphasis on oral-aural practice; review of basic structures; reading and writing to develop active command of the language. Labs. 4 cr.

503-504. Intermediate German
Review of grammar; practice in oral and written expression; readings and cultural material. Prereq: GERM 401-402 or equivalent. Labs. 4 cr.

520. Images of Women in German Literature (in Translation)
Reading and analysis of classic German texts by both male and female authors from the Middle Ages to the present with a view toward the changing representation and self-concept of women. Cannot be used to fulfill German major requirements; German majors should see GERM 720. 4 cr.

521. Major German Authors in English
Selected masterpieces of the 19th and 20th centuries by authors such as Goethe, Heine, Mann, Kafka, Hesse, Brecht, Aichinger, Frisch, and Dürrenmatt. Readings and discussions in English. Cannot be used toward the German major, but is recommended as an elective for both majors and nonmajors. 4 cr.

525. Introduction to German Culture and Civilization
Aspects of the political, social, and cultural life of the two Germanys (FRG and GDR), Austria, and Switzerland. Conducted in English. Required of German majors; strongly recommended for any students planning study abroad in a German-speaking country. 4 cr.

526. Introduction to German Literature
Reading and analysis of poems, dramas, and short prose; introduction to theory of literary forms and methods of analysis. Required of all German majors; prerequisite to upper-level literature courses. 4 cr.

630. German Narrative Forms
Textual studies based on works from one of the following prose genres: novel; novella; autobiography; fairy tale; short prose (short story, parable, documentary prose, feuilleton). Focus on the nature and characteristics of the genre, thematic and stylistic features of each text, and the diverse cultural, political, gender, or national perspectives that generate these forms. 4 cr.

631. Advanced Communication Skills I
Intensive practice in vocabulary building and developing a sense of appropriate style for various contexts of oral and written communication. Special emphasis on conversational and expository speaking. Discussion of topics of current interest, oral reports, role play, and simulation of everyday situations, reinforced by written work. Required for the German major and minor. 4 cr.

632. Advanced Communication Skills II
Intensive practice in vocabulary building and coherent expression in a variety of stylistic contexts. Special emphasis on writing skills, from expository prose to letter and resume writing, essays, journalistic reports, and creative writing, focusing on topics of current interest. Required for the German major. 4 cr.

640. German Drama
Selected masterpieces of the German theater from the 18th century to the present, including reception and performance history. Course may vary in emphasis from classical German tragedy and comedy to more modern forms such as didactic and documentary plays, tragicomedy, and farce. 4 cr.

645. Contemporary German Literature
Literary trends in the German-speaking countries since 1945. Analysis and interpretation of works by major authors. 4 cr.

685, 686. Study Abroad
A summer, semester, or year of study in one or a combination of the departmentally recognized programs at the Institute of European Studies in Freiburg, West Germany, or Vienna, Austria, or with the University of Cincinnati in Hamburg, West Germany, or other appropriate programs. Open to students of any major with GERM 504 or equivalent training. Financial aid applies to all approved programs. Interested students should inquire at department for program brochures and specific requirements and should apply in consultation with a German adviser. For information on other study abroad programs, students should contact the Center for International Perspectives. Variable to 16 cr. Cr/F. An "IA" grade will be assigned until official transcript is received from the foreign institution.

720. Images of Women in German Literature
Reading and analysis of original texts by both male and female authors from the Middle Ages to the present with a view toward the changing representation and self-concept of women. Critical approaches to the literary canon. Prereq: GERM 504; 526;/or equivalent experience. 4 cr.

721. German Culture and Civilization
Historical, social, artistic, and folkloristic developments in German-speaking countries from the beginning to the present. Prereq: GERM 525 or permission of instructor. 4 cr.

723. Survey of Preclassical German Literature
Lecture and readings in German literature from its Germanic beginnings to the Enlightenment. Prereq: GERM 526. 4 cr.

724. The Age of Goethe
Major literary movements between 1770 and 1832. Reading and analysis of selected works. Prereq: GERM 526. 4 cr.

727. German Literature of the 19th Century
Major literary movements from Goethe's death to the unification of Germany by Bismarck (1832–1872). Reading and analysis of selected works. Prereq: GERM 526. 4 cr.

728. Modern German Literature
Major literary movements from 1872 to 1945. Reading and analysis of selected works. Prereq: GERM 526. 4 cr.

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills, including developments in computer-assisted instruction. Prereq: permission of instructor. 4 cr.

795, 796. Independent Study
Open to highly qualified juniors and seniors.

To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

797, 798. Special Studies in German Language and Literature
A) Cultural Comparison of the U.S. and Germany; B) North Germany: Land and People; C) Masterworks of German Cinema; D) German and Austrian Exile Literature 1933-1945; E) German for Graduate Students; F) Berlin and the Berliners; G) Translation of German Poetry. Barring duplication of subject, may be repeated for credit. 2 cr.

Gerontology (GERO)

(For program description, see page 70.)

Coordinator: R. Shippee-Rice

600. Introduction to Gerontology
Primarily for minors but open to o hter students, this course introduces students to the study of normal aging and to the applied practice of service to the aging. 4 cr.

795. Independent Study
Practical experience with elderly under supervision of designated faculty. 4 cr.

(See Nursing 670 for Issues in Health Care of the Aged.)

Greek (GREK)

Department of Spanish and Classics
(For program description, see page 28; see also course listings under Latin and Classics; for faculty listing, see page 98.)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if a student has had two or more years of the foreign language in secondary school.

401-402. Elementary Greek
Grammar, simple composition, and translation. (No credit for students who have had two or more years of Greek in secondary school; however, any such students whose studies of Greek have been interrupted for a significant period of time should consult the section supervisor about possibly receiving credit.) 4 cr.

403-404. Elementary Modern Greek
Aural-oral practice and the study of fundamental speech patterns, reading, and writing to achieve a firm basis for an active command of the language. Lab. 4 cr.

503-504. Intermediate Greek
Readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prereq: GREK 402. 4 cr.

505-506. Intermediate Modern Greek
Short selections from modern Greek literature with grammar review and oral practice. Readings from such authors as Solomos, Cavafy, Palamas, Kazantzakis, Venezis, Myrivilis, Seferis, and Elytis. Prereq: GREK 404 or equivalent. Lab. 4 cr.

631-632. Greek Prose Composition
Review of Attic Greek grammar; study of Greek prose style; English to Greek translation. Prereq: permission. 4 cr.

751, 752. Homer and the Archaic Period
Readings from the Iliad, the Odyssey, the Homeric hymns, Hesiod, Pindar, and the lyric poets. Prereq: permission. 4 cr.

753, 754. Advanced Studies in Athenian Literature
A) Aeschylus; B) Sophocles; C) Euripides; D) Aristophanes; E) Herodotus; F) Thucydides; G) Xenophon; H) Plato; I) Aristotle; J) Lysias; K) Demosthenes; L) Isocrates. Major Attic authors from the Battle of Marathon to the death of Alexander the Great. Prereq: permission. 4 cr.

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. Special Studies in Greek
A) Pre-Socratic Philosophers; B) Hellenistic Greek Authors; C) Menander; D) Callimachus; E) Apollonius of Rhodes; F) Theocritus; G) Polybius; H) Greek Authors of the Roman Empire; I) Plutarch; J) Septuagint; K) New Testament; L) Greek Church Fathers; M) Byzantine Authors; N) Spoken Greek; O) Advanced Greek Composition; P) Introduction to Classical Scholarship; Q) Greek Epigraphy; R) Greek Dialects; S) Comparative Grammar of Greek and Latin; T) Homer: A Linguistic Analysis; U) Greek Institutions; V) Palaeography and Textual Criticism. Topics selected by instructor and student in conference. Prereq: permission. 4 cr.

Health Management and Policy (HMP)

(For program description, see page 61.)

Chairperson: Richard J. A. Lewis
Professors: Basil J. F. Mott, Roger A. Ritvo
Associate Professors: Marc D. Hiller, Richard J. A. Lewis, Jeffrey Colman Salloway, John W. Seavey, Lee F. Seidel
Adjunct Associate Professors: Francis F. Cronin, Sylvio L. Dupuis, Martin D. Merry, Marc E. Voyvodich, William T. Wallace
Assistant Professors: Robin Gorsky, Eileen A. O'Neil
Adjunct Assistant Professors: Andrew F. Coburn, Richard G. Warner

401. U.S. Health Care Systems
Nature and functions of health care services and health professionals; impact of social, political, economic, legal, and technological forces. Current health problems. 4 cr.

403. Seminar on Health and Medical Care Systems
Focuses on health and how interactions between physical and social environment affect health; nature and function of medical care and public health services including impact of social, political, economic, legal, and technical forces. (Not open to students who have completed either HMP 401 or 501.) 8 cr.

501. Epidemiology and Community Medicine
Fundamental concepts and determinants of disease, illness, and health in the community. Community health and illness measures, status, and data. Development of hypotheses and study designs regarding community health problems using epidemiological reasoning, methods, and analyses. Lab. 4 cr.

600. Special Topics
A) Hospital Administration; B) Long-term Care Administration; C) Ambulatory Care Administration; D) Clinical Services Administration; E) Home Care Administration; F) Mental Health Administration; G–Z) Interdisciplinary. Prereq: junior major or permission. May repeat, but not duplicate subject areas. 1–4 cr.

621. Prepracticum Seminar
Preparation for field practicum experience, orientation to experiential learning and competency development. Prereq: major. 2 cr.

622. Field Practicum
Experiential learning in a health organization; application of theories to practice. Planned learning objectives are accomplished through three distinct components. Supervision by agency personnel. Prereq: junior major; permission.
622A, Field Practicum Organizational Analysis: analysis of assigned health care agency, from external and internal viewpoints. Coreq: 622B; 622C. 4 cr.
622B, Field Practicum Management Skills Development: development of the basic quantitative and interpersonal skills required of a health services manager. Coreq: 622A; 622C. 4 cr.
622C, Field Practicum Project Analysis: demonstration of knowledge and analysis of specific problem-solving skills required during internship. Coreq: 622A; 622B. 8 cr.

623. Health Management and Policy: Internship
Professional experience in health administration and planning with evaluation to determine competency. Prereq: senior major and permission. An instructor may assign an "IA" grade (continuing course) at end of one semester. 10–16 cr. Cr/F.

695. Independent Study
In-depth study with faculty supervision. Pre-

req: permission of major adviser and faculty of the area concerned. 2–4 cr.

700. Health Management and Policy: Competency Assessment
Examination and/or evaluation to determine level of competency within the five program competency areas. Prereq: major and permission, not open to students who have had HMP 622 or HMP 623. An instructor may assign an "IA" grade (continuing course) at the end of one semester. 16–64 cr. Cr/F.

721. Hospital and Health Services Administration
Theories and practices of administration in health care institutions; application and analysis of various administrative processes and techniques in a health context. Prereq: major or permission. 4 cr.

723. Health Planning
Theoretical and historical foundations of health planning; the relationship of health planning and regulation; the application of planning methods; and the utilization of strategic planning and its relationships to marketing. Prereq: major or permission. 4 cr.

732. Organization of Health Services: An Inventory and Analysis
Identification and examination of institutions that are part of the health care system. Analysis of interaction of health organization with political, economic, and other social systems. Prereq: permission. 4 cr.

734. Health Law
Concepts and principles of law as these affect medical and administrative decision making in health care institutions and the ability to discern issues that warrant the advice and/or assistance of legal counsel. Topics covered include corporations and antitrust, property law, patients' rights under law, and malpractice. 4 cr.

740. Management Accounting for Health Care Organizations
Cost accounting, cost analysis, and budgeting in planning and controlling health care operations. Techniques of variance analysis, cost allocation, ratio analysis and management of working capital, concepts of capital investment decision analysis, rate setting, and reimbursement. Prereq: major or permission. 4 cr.

741. Quantitative Methods for Health Care Organizations
Methods to increase efficiency of health care organizations, including decision analysis, cost-benefit analysis, linear programming, queueing, regression, as well as descriptive analysis and projection methodologies. Prereq: major or permission. 4 cr.

742. Strategic Management for Health Care Organizations
Application of managerial methods involving financial, marketing, and operational analysis to health management. Case studies. Prereq: HMP 740. 4 cr.

744. Ethical Issues in Health Management and Medicine
Ethical theories and decision-making models; patients' rights and professional responsibilities; social justice and resource allocation; and managerial versus health care conflicts. Prereq: major or permission. 4 cr.

746. Health Policy
Analysis of the public policy process, the development of health policies in the United States, and a discussion of specific health policy issues. Prereq: major or permission. 4 cr.

750. Comparative Health Care Systems
Analysis and comparison of world health problems and delivery systems using nations with different cultures, political and economic systems, and stages of economic development. Methods for developing and evaluating health care systems. 4 cr.

755. Long-Term Care
Public policy and managerial issues in long-term care, including home-based, community-based, and institution-based services. Addresses core areas of knowledge for nursing home administrators. Prereq: major or permission. 4 cr.

795. Senior Integrating Paper
Preparation of a research paper on a topic of significance to health management and policy. Prereq: senior major; permission. 2 cr.

Health Studies

(See School of Health Studies.)

History (HIST)

(For program description, see page 29.)

Chairperson: John O. Voll
Professors: Charles E. Clark, Robert C. Gilmore, Hans Heilbronner, Charles A. Jellison, Jr., William R. Jones, David F. Long, Francis D. McCann, Jr., Robert M. Mennel, Harvard Sitkoff, John O. Voll, Douglas L. Wheeler, Donald J. Wilcox
Associate Professors: Jeffry M. Diefendorf, Allen B. Linden, Janet L. Polasky, Marc L. Schwarz, Laurel Ulrich
Adjunct Associate Professor: John J. Cerullo
Assistant Professors: J. William Harris, Jr., Shigehisa Kuriyama, J. Gregory McMahon
Adjunct Assistant Professor: Jane C. Nylander
Lecturers: Richard Hamm, Lawrence R. Hartenian

425. Foreign Cultures
Introduction to the culture of a particular nation or region; preparation for experiencing a foreign culture. Consult department for listing of topics. 4 cr.

497. Explorations in Historical Perspectives
Seminar for freshmen and sophomores. In-depth exploration of a particular historical question or topic: for example, the French Revolution, Chaucer's England, or the New Deal. Students should consult with the Department of History for a list of topics and instructors. 4 cr.

500. Introduction to Historical Thinking
Basic skills essential to the study of history: critical reading of historical literature, improvement of written and oral analysis of historical material, and use of library resources. Intensive study of books and documents from varying historical fields and periods. Required of history majors; open to other interested students. 4 cr.

Group I. American History

405. History of Early America
America from the early age of European discovery to the mid-nineteenth century. Emphasis on the interaction of European, Native American, and African peoples, on the separation of the English colonies from Great Britain, and on the establishment and early history of the United States. 4 cr.

406. History of the Modern United States
History of the United States since the mid-nineteenth century. Political, social, and economic developments as well as relationships of the modern U.S. with other countries. 4 cr.

410. Historical Survey of American Civilization
Topical survey, within broad chronological divisions, of the development of American civilization since 1600. Not open to students who elected HIST 403 or 404. 4 cr.

505, 506. Afro-American History
Experiences, aspirations, and contributions of Black Americans from their ethnic origins in Africa to the present American crisis in race relations; comparative study of cultures and institutions. 4 cr.

507. Native Peoples of the Americas
Indian societies of the American continents, their reactions to and interactions with the Europeans who invaded and conquered them. Emphasis on North America. 4 cr.

511. History of New Hampshire
From presettlement times to the present, emphasizing the use of locally available materials and sources. 4 cr. (Not offered every year.)

520. The Vietnam War
Intensive, full-scale examination of how and why the United States went to war in Vietnam, how and why it failed, and the consequences and legacies of American involvement. 4 cr.

566. Women in American History
Key changes in women's roles in the past three centuries with an emphasis upon the peculiarities of the American setting. How, for example, were women's lives affected by the frontier; the intersection of European, African, and native American cultures; religious diversity; the problem of defining citizenship in a democratic republic? Students will sample recent scholarship in women's history and study a

wide variety of documents produced by women. 4 cr.

603. The European Conquest of America
Study of the social consequences of colonization, migration, and war in America, 1500–1775. Emphasis on the interaction of British colonies with competing European cultures (French, Dutch, Portuguese, and Spanish), with native Americans, and with African and Afro-American slaves. 4 cr.

605, 606. America in the 18th Century and the Revolution
American colonial and revolutionary history from 1740 through the adoption of the constitution and the establishment of Washington's first administration. 4 cr.

608. Arts and American Society: Women Writers and Artists, 1850–Present
Team-taught course studying the impact of gender definitions on the lives and works of selected American artists. Considers lesser-known figures such as Fannie Fern, Lilly Martin Spencer, and Mary Hallock Foote as well as better-known artists such as Willa Cather and Georgia O'Keeffe. Prereq: permission or one of the following: WS 401, HIST 566, ENGL 585 or 586, ENGL 685 or 785, or a 600-level art history course. (Also offered as ARTS 608, ENGL 608, and HUMA 608.) 4 cr.

610. American Studies: New England Culture in Changing Times
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as ARTS 610, ENGL 610, and HUMA 610.) Not for art studio major credit. 4 cr.

611, 612. 19th-Century America
Domestic and international factors in the development of the American republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. 4 cr.

615, 616. 20th-Century America
U.S. after 1900; cultural, political, and social factors causing major changes in American life. Semester I: Progressivism through the New Deal. Semester II: World War II to the present. 4 cr.

619, 620. The Foreign Relations of the United States
Primarily the history of American diplomacy, with attention given to the nondiplomatic aspects. Semester I: American Revolution to 1890. Semester II: 1890 to date. 4 cr.

621, 622. History of American Thought
Significant American thinkers considered in their social context. Semester I: 1600 to 1860. Semester II: 1860 to present. 4 cr. (Not offered every year.)

623. Anglo-American Social History
Study of everyday life in British America and the early United States, 1600–1820, with an emphasis on gender, class, and race. Consideration of childbearing, labor systems, religious observance, crime, and other themes in the light of recent social theory. Readings in both primary and secondary literature, with an emphasis on local records and on material culture. 4 cr.

624. Modern American Social History
Major social developments since 1820: industrialization and the history of labor, immigration, urban growth, race relations, history of women and of the family. 4 cr.

625. Southern History and Literature since 1850
Equal focus on the history and literature of the South. Topics include slavery, the Civil War, Reconstruction, the age of segregation, and the civil rights movement. Literary focus on the "Southern Renaissance" of the 1930s and after, including works by William Faulkner, Robert Penn Warren, Flannery O'Connor, and Richard Wright. 4 cr.

Group II. European History

435, 436. Western Civilization
The classical origins and evolution of European civilization through the Renaissance, Reformation, and voyages of discovery. The rise of Europe to global supremacy in the 19th century and its transformation in the 20th century. 4 cr.

521. History of Science: Space, Time, and Motion
Historical evolution of conceptions of space, time, and motion, with emphasis on the interrelations of scientific theories and their cultural contexts. Topics include Greek, Chinese, and Indian approaches to the mystery of change; God and Western cosmology; modernism and the theory of relativity. No special science background required. 4 cr.

522. History of Science: Biology and Medicine
History of the life sciences, particularly as they relate to the understanding of human beings. Topics include Greek, Indian, and Chinese conceptions of the body; the vitalist-materialist debate; the development of concepts of health and disease; Darwin and Darwinism. No special science background required. 4 cr.

559, 560. History of Great Britain
History of Great Britain from the earliest times to the present; from social, constitutional, economic, political, and intellectual perspectives. Designed for history students as well as those interested in literature, western political and social systems, American studies, education, and prelaw. 4 cr.

563. Introduction to Russian Culture and Civilization
A survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as RUSS 525.) 4 cr.

565. Women in Modern Europe
A social history of women in Europe from 1700 to the present. Examines the development of the "modern nuclear family," transformations in women's work during the industrial revolution, and women's political evolution from bread rioters to hearth tenders to petitioners. Sources include published diaries, historiographical studies, and novels. 4 cr.

639, 640. Three Medieval Civilizations
Demise of classical antiquity in the lands bordering the Mediterranean, and the genesis and fruition of three new cultural traditions: Latin Christian, Islamic, and Byzantine. Religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. 4 cr.

641. Age of the Renaissance
The birth of the Renaissance, its economic, social, and political roots, and the flowering of Renaissance culture. Covers period from 1300 to 1600, with stress on Italy. 4 cr.

642. The Age of Reformation
The reformation of church, society, and human values that shook Europe in the 16th century, and its roots in the 14th and 15th centuries. 4 cr.

647. France from Louis XIV through the French Revolution
Pressures and influences that led to the French Revolution. 4 cr.

648. Modern France
French society from Napoleon to Mitterand. Topics include the Revolution of 1848 and the Paris Commune; World Wars and the Vichy regime; Existentialism, DeGaulle, and the Revolt of May–June 1968. 4 cr.

651, 652. European Intellectual History
European intellectual tradition from the Greek philosophers to the end of World War II. How basic ideas have developed out of previous modes of thought in response to new challenges. 4 cr.

656. 20th-Century Europe
World War I, European totalitarianisms, World War II, the loss of European primacy, and the search for a new Europe. 4 cr.

659. History of Modern Spain and Portugal
Iberian states and their peoples from the coming of liberalism to the present. Failure of Iberian liberalism and liberal government. Political and social change, imperial and intellectual movements, influence of Western European thought and activity. 4 cr.

661, 662. England in the Tudor and Stuart Periods
Political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the revolution of 1688–89. 4 cr.

663. Russia: Origins to Modernization
Russia from its foundation to emancipation and reform. Political developments, foreign relations, intellectual and ideological currents. 4 cr.

664. Russia: From Tsarist to Soviet Empire
The cost of modernization; Leninist and Stalinist revolutions; Soviet consolidation. 4 cr.

667. Early Modern Germany: Reformation to the Revolution of 1848
Conflict between Holy Roman Empire and petty states; rise of Prussia; religious conflict and Enlightenment. 4 cr.

668. Modern Germany since 1848
Bismarck and Imperial Germany; Weimar and the rise of Hitler; post–World War II-divided Germany. 4 cr.

Group III. Non-Western History

421. World History
Major world civilizations; interrelationships in time and space among the different human societies. Social, cultural, and political factors of the human experience. 4 cr.

531, 532. Latin American History
Semester I: Amerindian America and the European conquest and domination to the last half of the 18th century. Semester II: problems of identity, integration, and nationalism, with analysis directed at selected national areas (e.g., Brazil, Mexico, Argentina, and Cuba), plus attempts at generalization. 4 cr.

575. The Ancient Near East
From the neolithic revolution to the time of Alexander the Great. Rise of civilization; nature of human artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt; Judaism in its historical setting. 4 cr.

576. The Ancient Greek World
Greek history from the Mycenaean period and the Homeric epics through the Classical period, the Persian and Peloponnesian wars, and the Hellenistic period. Emphasis on original sources including Homer, Herodotus, Thucydides, and Greek playwrights. Special attention to an analysis of the contrasts between Spartan and Athenian political systems, the arts in Athens, and the effects of the development of the Athenian thalassocracy. 4 cr.

579. History of China: From Empire to People's Republic
The origins and development of Chinese civilization and its revolutionary transformation in modern times. Institutional and cultural changes will be stressed. 4 cr.

580. History of Japan: From Yamato to Tokyo
The development of Japanese civilization from its origins to the present. Special attention will be paid to the transformation of Japan from an agrarian to an industrial society. 4 cr.

585, 586. The History of the Middle East
From the time of Muhammad to the present. Semester I: origins and expansion of Islam and the nature of medieval Islamic civilization. Semester II: Ottoman history, relations with European powers, and emergence of modern nations in the Middle East. 4 cr.

587, 588. History of Africa South of the Sahara
From ancient times to the present. Semester I: from prehistoric times to 1870. Semester II: from 1870 to the present. African migrations, kingdoms, and societies; African responses to the slave trade; Islam; European imperialism, colonialism, and industrialization; African nationalism, independence, and postindependence problems. 4 cr.

590. The City in History
The preindustrial and modern city as a philosophical and cultural institution, with emphasis on city design and architecture. Certain great cities, such as Athens, Florence, Paris of 1900, and Berlin of the 1920s, dealt with in detail. 4 cr.

631. Latin American History: Regional or Country Studies
Seminar; readings and discussions of literature relative to region or country being studied. See department listing for the current semester's topics. Students are guided through preparation of a research proposal. HIST 531, 532 recommended. 4 cr.

632. Latin American History: Topical Studies
Thematic seminar; reading and discussions of literature relative to selected topics. See the department listing for the current semester. Students are guided through preparation of a research proposal. HIST 531, 532 recommended. 4 cr.

677. The Greek and Roman Near East
The later history of the Ancient Near East, after it had been colonized or conquered by the Greeks and later the Romans. Greek trading colonies in Anatolia, the Levant, and Egypt, and Roman domination of the East, including North Africa. Primary sources include Sallust's *Jugurthine War*, Josephus, and the *Alexandrian and African Wars of Caesar*. Particular attention to such questions as the Roman conflicts with the Parthians and the struggle to secure the eastern frontier, the administration of Roman Palestine, and the removal of the Roman capital to Constantinople.

681. Modern China Topics
Issues in modern Chinese history, 1800 to present. Students will read and discuss major works concerning the semester's topic and write several book reports and a term paper. The topic for a given semester will be posted in the history department office. HIST 579 is recommended. 4 cr.

683. Religion in World History
The religious experience of man from the perspective of world history. The major modes of religion; development of the major religious traditions and institutions. 4 cr.

684. History of Southern Africa since 1820
Struggle for political and economic control in the only region of Africa where European groups remain in power. Impact of European imperialism, European-settler nationalism, racial conflict, economic competition and industrialization, apartheid, and assimilation with special attention to development of European hegemony. Official American policy. 4 cr.

685. The Modern Middle East
From 18th century to the present. Problems created by modernization and reform of the traditional society; conservative reaction to reform, impact of nationalism, and appearance of new ideologies. 4 cr.

Group IV. Special Courses

595, 596. Explorations in History
See department listings for semester topic. 1–4 cr.

600. Advanced Explorations in History
See department listings for semester topic. Barring duplication of subject, may be repeated for credit. 1–4 cr.

695, 696. Independent Study
A) Early American History; B) American National History; C) Canada; D) Latin America; E) Medieval History; F) Early Modern Europe; G) Modern European History; H) Ancient History; I) Far East and India; J) Near East and Africa; K) European Historiography; L) American Historiography; M) Russia; N) World History; O) English History; P) New Hampshire History; Q) Historical Methodology; R) Irish History. For students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered. Prereq: permission. 4 or 8 cr.

772. Studies in Regional Material Culture
Designed to acquaint students with artifacts commonly used in New England homes during the period 1750–1860 and to present these artifacts in their contemporary cultural context, including their relationships with designers, clients, patrons, manufacturers, craftsmen, and consumers. 4 cr.

774. Historiography
Analysis of ancient and modern historians. Required of all entering Ph.D. candidates; open to undergraduates with permission. 4 cr. (Not offered every year.)

775. Historical Methods
Contemporary historical methods. Required of all entering Ph.D. candidates; open to undergraduates with permission. 4 cr. (Not offered every year.)

789. Seminar in the History of Science
In-depth examination of a selected topic in the history of science. Subject varies. Open to undergraduates with permission of the instructor. No special background in science required. 4 cr.

790. Quantitative Methods and Computers for Historians
The historian's use of computers and statistics: opportunities and problems in using and analyzing quantitative sources; elementary statistical techniques; practical applications involving microcomputers and applications programs. No previous knowledge of computers or college mathematics is assumed or required. Prereq: admission as an undergraduate major or graduate student in history; or permission of the instructor. 4 cr.

797. Colloquium in History
Selected topics in American, European, and non-Western history. Required of history majors. Students must select section in the department office at the time of registration. 4 cr.

799. Senior Thesis
Supervised research leading to the presentation of a major research paper. Open only to history majors. Permission of department chairperson required. May not be used as a substitute for the required senior colloquium. 4 cr.

Hotel Administration (HOTL)

(For program description, see page 69.)

Program Director: Raymond J. Goodman, Jr.
Associate Professors: Joseph F. Durocher, Jr., Raymond J. Goodman, Jr., Peter D. Keim, Melvin Sandler
Lecturer: Sylvia H. Marple

401. Distinguished Lecture Series in Hotel Administration
Designed to introduce students to leading hospitality industry executives, those who have achieved significant praise for their leadership. The speakers represent all phases of the hospitality industry and selected allied industries. They address topics in management, history, strategic planning, organizing, leadership, finance, development, marketing, operations, and current and future challenges facing the industry. 1 cr.

403. Introduction to Food and Beverage Management
Food service management. Application of classroom principles through lectures, field trips, food labs, catering for on-campus functions, and participation in gourmet dinner productions. 4 cr.

518. Managerial Accounting for the Hospitality Industry
Practical application of financial accounting principles and procedures to situations in the hospitality and service industries. Students gain a working knowledge of the form and content of financial statements, their interrelationships, and the various uniform systems of accounts in hotels and restaurants. Prereq: ADMN 502. 4 cr.

654. Management of Rooms Division and Hospitality Properties
Focus on management history, planning, organizing, leadership, and current and future management issues. A class project requires students to compare rooms division management in a large hotel with that of a small hotel, including reservations, front office operations and accounting, housekeeping, and auxiliary functions. The complexities and the terminology of the design, management, and maintenance of physical structures used by civil engineers and architects are integral to the course. Guest lectures include hotel general managers and department heads who highlight student projects. Prereq: HOTL 403. 4 cr.

655. Hotel and Restaurant Development
Principles and practices followed in the hotel and real estate development process. Emphasis on market and financial planning and evaluation. Group project involving the preparation of a complete economic feasibility study for a proposed hotel development, from both the developer's and a consultant's perspective. Prereq: HOTL 518; HOTL 654; ADMN 653. 4 cr.

667. Advanced Food and Beverage Management
Integration of management principles and techniques. Presentation of large-scale theme gourmet dinners; act as managerial consultants to on-campus food service facilities. Prereq: HOTL 403; HOTL 518. 4 cr.

685-686. Study Abroad
Open to students studying abroad in the discipline as approved by the hotel administration program director. 1–16 cr. Cr/F.

695. Independent Analysis
Study and research project for honor students to advance knowledge in lodging and food services fields. Prereq: senior standing and permission. 2–16 cr.

696. Supervised Student Teaching Experience
Participants are expected to perform such functions as leading discussion groups, assisting faculty in undergraduate courses that they have successfully completed, or working as peer advisers in the Advising Center. Enrollment is limited to juniors and seniors who have above average G.P.A.s. Reflective final paper is required. Prereq: permission of instructor, program director, and director of advising. 1–4 cr. May be repeated to a maximum of 8 cr. Cr/F.

698. Topics in Hotel Administration
Special topics and developments in lodging and food services industries. Prereq: senior standing and permission. 4 cr.

700. Hospitality Marketing Management
Provides opportunity to apply to lodging and food service industries the principles learned in basic marketing course. Lectures, guest speakers, and student project teams focus on regional hotels, restaurants, and allied institutional settings. Prereq: ADMN 651. 4 cr.

703. Strategic Management in the Hospitality Industry
Capstone course, interrelating and applying strategic management concepts to hospitality organizations. Cases from hotel companies, restaurant chains, and other hospitality-related businesses, supplemented by economic and other published information from the industry, are used as departure points for class discussion. Prereq: HOTL 654. 4 cr.

771. Beverage Management
Examination of purchasing, evaluation, storage, service, and control of alcoholic beverages. Emphasis on wines, although beer, ale, distilled spirits, liqueurs, and mixed drinks are examined. Prereq: HOTL 667 or permission. 4 cr.

795. Internship
Fieldwork in an organization for on-the-job skill development. Normally supervision is provided by a qualified individual in the organization with frequent consultation by a faculty sponsor. A written report is required of the student. Internships may be part-time or full-time, with course credits assigned accordingly. 1–16 cr. Cr/F.

798. Seminar
Special topics in hotel administration covering material not normally covered in the regular curriculum. Prereq: permission. 1–4 cr.

799. Honors Thesis/Project
Supervised research leading to the completion of an honors thesis or project; required for graduation from the honors program in hotel administration. 4–8 cr.

Humanities (HUMA)

(For program description, see page 29.)

Coordinator, Humanities Program: Warren R. Brown
Core Faculty: David S. Andrew, Arts; Rose T. Antosiewicz, French and Italian; Donna B. Brown, Humanities; Warren R. Brown, Political Science; Richard J. Callan, Spanish and Classics; Thomas A. Carnicelli, English; Charles E. Clark, History; Patricia Emison, Arts; Michael K. Ferber, English; Christopher Hoile, Humanities; Shigehisa Kuriyama, History; David E. Leary, Psychology; Charles H. Leighton, Spanish and Classics; Barbara S. Tovey, Philosophy; Charlotte E. Witt, Philosophy.

401. Introduction to the Humanities
A modular course introducing students to themes and texts taught by faculty members from art, music, literature, philosophy, and history. Students select three of nine minicourses that focus on such themes as "Fate and Freedom," "Innocence and Experience," "Work and Play," "Humanity and Divinity," and "War and Peace." 4 cr.

480. What a Text Can Teach
Students examine selected classic texts in the humanities with faculty members representing the arts, music, literature, and philosophy.

Through four modules and a team-taught symposium, students investigate how each of these forms of expression contributes to human knowledge and to an understanding of the human being. 4 cr.

501. Humanities: The Ancient World
Students develop an appreciation of the roots of Western civilization through the study of ancient art, literature, and philosophy, including Homer, Greek tragedy, Plato, Aristotle, the Bible, Vergil. Weekly lecture series, slides, films. 4 cr.

502. Humanities: The Modern World
Contributions to human knowledge and culture from the Early Renaissance through the Enlightenment examined through literature, philosophy, and art. Students study Dante, Castiglione, Machiavelli, Montaigne, Racine, Molière, Pope, Goethe, Wordsworth, Zola, Tolstoy, and examples of art and architecture. Weekly lecture series, slides, films. 4 cr.

503. Humanities: The 20th Century
Students gain insight into the nature of contemporary Western civilization through selected examples of literature, philosophy, psycholoy, and art. Students may read and discuss works by Kafka, Mann, Hesse, D. H. Lawrence, Sartre, C. G. Jung, Picasso, Chagall, di Chirico, Beckett, Mishima, Lillian Smith, Weizenbaum, Weil. 4 cr.

Students enrolling in HUMA 510, 511, 512, or 513 must designate a discussion section in only one of four fields—arts, English, history, or philosophy—corresponding to and satisfying one of four general education categories. To satisfy the general education requirement in fine arts, students should register for 510A, 511A, 512A, or 513A; in works of literature and ideas, 510B, 511B, 512B, or 513B; in historical perspectives, 510C, 511C, 512C, or 513C; in philosophical perspectives, 510D, 511D, 512D, or 513D. For students who complete the entire sequence of HUMA 510, 511, 512, and 513, enrolling in different discussion sections each time, a fifth general education requirement (in foreign culture) will be waived, although additional credit hours will not be granted.

510. Chance, Necessity, and Reason: The Search for the Good Life
What is a human being? How should we explain or understand what happens to us? How ought we to live? This team-taught course examines these important questions by focusing on the literature, art, philosophy, and science of ancient Greece. 4 cr.

511. Fortune, Sin, and Faith: The Search for the Spiritual Life
What is the soul and how is its health related to temptation and also to specifically Christian virtues? How closely does the medieval definition of an eternal God determine good and evil in daily life? To what extent does the hope of immortality affect the practice of writing literature, making art, studying philosophy, and investigating science? This team-taught course examines these important questions by focusing on the literature, art, philosophy, and science from the collapse of the classical world to the rise of capitalism. 4 cr.

512. Reason, Doubt, and Experience: The Search for the Enlightened Life
Exploration of the interrelationships of art, literature, philosophy, and science from the High Renaissance into the eighteenth century. Study of the works and ideas of such influential figures as Shakespeare and Milton, Raphael and Rembrandt, Galileo, Descartes, Newton, and Hume. Special attention to the following: (1) classical roots of modern imagination; (2) God in the world of the scientific revolution; (3) the uncertain relationship between experience and reality. 4 cr.

513. History, Mind, and the Absurd: The Search for the Meaningful Life
Explores the central paradoxes of our culture in the modern age. Is there such a thing as "progress" and if so what is its nature? What is the relation of conscious and unconscious? Is the contemporary world devoid of meaning? These three questions are examined in literature from Goethe's *Faust* to Samuel Beckett, in the history of science from Darwin to Freud and contemporary chaos theory, in philosophy from Hegel and Marx to Nietzsche and Foucault, and in art from Picasso to Le Corbusier and post-modern architecture. 4 cr.

595. Special Studies in the Humanities
Selected topics not covered by existing courses, with subjects to vary. May be repeated for credit. 2 or 4 cr.

600. Seminar in the Humanities
Provides an opportunity for in-depth reading, viewing, and/or listening to texts and artifacts. Emphasis on the multiple perspectives and methodologies that can be brought to bear upon these works from several humanistic disciplines. 4 cr.

608. Arts and American Society: Women Writers and Artists, 1850–Present
Team-taught course studying the impact of gender definitions on the lives and works of selected American artists. Considers lesser-known figures such as Fannie Fern, Lilly Martin Spencer, and Mary Hallock Foote as well as better-known artists such as Willa Cather and Georgia O'Keeffe. Prereq: permission or one of the following: WS 401, HIST 566, ENGL 585 or 586, ENGL 685 or 785, or a 600-level art history course. (Also offered as ARTS 608, ENGL 608, and HIST 608.) 4 cr.

609. Ethnicity in America: The Black Experience in the Twentieth Century
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as ENGL 609 and MUSI 609.) 4 cr.

610. Regional Studies in America: New England Culture in Changing Times
Team-taught course investigating some of the major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as HIST 610, ENGL 610, and ARTS 610.) Not for art studio major credit. 4 cr.

650. Humanities and the Law: The Problem of Justice in Western Civilization
Interdisciplinary modular course examines interpretations of the nature of justice, its origins, the role of the professional judiciary, and the relationship of law and ethics. Students take three successive 5-week modules during the semester. 4 cr. (Not offered every year.)

651. Humanities and Science: The Nature of Scientific Creativity
Interdisciplinary modular course examines the historical and intellectual foundations of the physical, biological, and human sciences. Students take three successive 5-week modules during the semester. 4 cr. (Not offered every year.)

652. Humanities and Economics: The Moral Implications of Economic Life
Interdisciplinary modular course examines morality and economics from antiquity to modern society. Special attention to the moral implications of commerce, exchange, profit, usury, etc. Students take three successive 5-week modules during the semester. 4 cr. (Not offered every year.)

653. Humanities and Education: Society and the Formation of Character
Interdisciplinary modular course examines the manner in which society forms character through custom, laws, and formal institutions. Works by Plato, Rousseau, and Dewey explore if and how we can become educated. Students take three successive 5-week modules during the semester. (Also offered as EDUC 653.) 4 cr. (Not offered every year.)

699. Senior Project in Humanities
Independent study open only to senior humanities majors with individual project approved and supervised by faculty. 2–6 cr.

700. Research Seminar in the Humanities
Provides a context within which students may discuss and receive direction in the course of completing a major research paper. At the end of the seminar, students present their research to the faculty and their fellow students. Restricted to majors. 4 cr.

Hydrology

(For program description, see pages 47, 53; For courses, see earth sciences.)

Coordinator: S. Lawrence Dingman, Dept. of Earth Sciences

Institute for the Study of Earth, Oceans, and Space (EOS)

(For program description, see page 70.)

Director: Berrien Moore III
Associate Director: Roger L. Arnoldy
Professors: Roger L. Arnoldy, Wendell S. Brown, Edward L. Chupp, Robert W. Corell, Lennard A. Fisk, Henri E. Gaudette, Robert C. Harris, John A. Lockwood, Paul A. Mayewski, Berrien Moore III, William R. Webber
Research Professors: Joseph V. Hollweg, Martin A. Lee
Associate Professors: John D. Aber, Wm. Berry Lyons, Theodore C. Loder, Barrett N. Rock
Research Associate Professors: Terrence G. Forbes, David J. Forrest, James D. Irish, Neal R. Pettigrew, James M. Ryan
Research Assistant Professors: Patrick Crill, Mark E. Hines, George A. Simpson, Mary Jo Spencer, Judith A. Spiller, Robert W. Talbot, W. Thomas Vestrand, James E. Vogelmann

707. Global Ecosystem Policy
Scientific and institutional issues pertinent to global change; scientific basis for the global Earth and biogeochemical cycles that maintain Earth's thermostasis; long-term effects of major human perturbations (greenhouse warming of the atmosphere, ozone depletion, deforestation, desertification, and biotic and soil impoverishment) and human-environment feedback mechanisms on the viability of the Earth versus the survival of the human species; effectiveness of existing and alternative national, regional, and international institutions in responding to global change. Prereq: permission. 3 cr.

713. Biogeochemical Dynamics
Examines the influence of biological processes on geochemical transformations and elemental cycles from the molecular to the global scale involving both microorganisms and higher plants and animals; factors that regulate cycles; interactions among biosphere, hydrosphere, lithosphere, and atmosphere; transformations of C, N, S, and trace elements. Prereq: one semester each biol. and chem. 3 cr.

715. Atmospheric and Precipitation Chemistry
Interdisciplinary course concerned with understanding the physical and chemical processes that affect the composition of the atmosphere and precipitation and that are of fundamental importance to the atmosphere-biosphere-cryosphere-hydrosphere-lithosphere-anthrosphere systematics of planet Earth. Topics include tropospheric chemistry; stratospheric chemistry; chemistry of rain, snow, and fog; the ozone problem; and the acid rain problem. Prereq: one year chem. or permission. 3 cr.

717. Global Biogeochemical Modeling
Modeling the global system and the interactive processes of its components (atmosphere, hydrosphere, cryosphere, pedosphere, lithosphere, biosphere, and anthrosphere); sensitivity analyses of models to identify incompatibilities and interactive instabilities and comparison with observation from field studies and remote sensing; applying techniques involving large data base management to estimate global productivity, simulate biogeochemical cycling, and detect vegetative stress in terrestrial ecosystems. Prereq: MATH 745-746; permission. 3 cr.

754. Ocean Waves and Tides
Introduction to waves: small amplitude, linear wave theory, standing and propagating waves, transformation in shallow water, energy and forces on structures, generation by wind and specification of a random sea, long waves with rotation, and internal waves. Introduction to tides: description of tides in ocean tidal generation forces, equilibrium tide, and tidal analysis. Lab/project: field and lab measurements with computer analysis. Prereq: PHYS 407-408; MATH 527;/or permission. (Also offered as OE 754.) Lab. 4 cr.

Intercollege Courses (INCO)

401. Nuclear War
Physics of nuclear weapons; delivery systems; defense concepts and issues; effects of nuclear war; military, political, historical, economic, and psychological aspects of the arms race; ethical concerns; peace movement. 4 cr.

404. Honors: Freshman Seminar
Introductory course required of all honors program students. A general education course with sections offered in all general education groups except groups 1 and 2. 4 cr.

480. Art in Society
Brings students into relationship with "classical" visual and performing arts. Students attend lectures about the arts and live performances of music, theater, and dance, and take trips to visit museums and view architecture. Students read relevant materials and write about each art work experienced. Lab fee: $50. 4 cr.

491. Computer Literacy
Provides a basic understanding of computer hardware and software. Emphasis on word processing, electronic spreadsheets, and data base management. Not open to students who have completed INCO 495, ADMN 526, or DCE 491. Seven weeks; lab fee $10; enrollment limit of 50 per section. 2 cr. Cr/F.

495. Computer Applications
Use of computers to manage and analyze information across a variety of settings and disciplines. Introduction to major categories of software for large and small computer systems and discussion of the computer's role in today's society. No prior computer experience required. Not open to students who have completed INCO 491, ADMN 526, or DCE 491. Lab fee: $15. 4 cr.

604, 605. Honors: Senior Thesis/Project
Final requirement for graduation with University Honors. Intended for honors students in majors that do not offer honors work. Open by special permission to other honors students. 8 cr.

655-656. London Program
Enables students to pursue a semester or academic year of study in UNH's program in London, England. Students must be admitted into the London program before enrolling in the course. For information and application forms, consult Carol Demeritt, program secretary, Hamilton Smith Hall, Rm. 52. Variable to 18 cr. Cr/F. (IA grade will be assigned until official transcript is received.)

685, 686. Study Abroad
Enables students to pursue a semester, summer, or an academic year of foreign study in programs other than those offered by UNH. Students must provide the University Committee on Foreign Study with detailed information about the curriculum and must receive approval from that committee before registration. Credit awarded only upon successful completion of the course of study and after receipt by the committee of an official transcript. Interested students should consult the Center for International Perspectives. Prereq: permission. (Financial aid requires a minimum of 6 credits.) Variable to 16 credits. Cr/F.

698. Summer Research Project
Guided independent research or student/faculty collaborative research. Open to recipients of summer undergraduate research fellowships or by permission of the Undergraduate Research Opportunities Program. 0–8 cr. (Summer only.)

International Perspectives Program

(See Program for International Perspectives.)

Italian (ITAL)

Department of French and Italian
(See also course listings under French; for faculty listing, see page 119.)

New students will be assigned to the proper course upon consultation with the section coordinator. Students educated in Italian-speaking countries may not register for courses below the 700 level. No UNH or transfer credit will be given for elementary-level college courses in Italian if students have had two or more years of Italian in secondary school.

401-402. Elementary Italian
For students without previous training in Italian. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for five years should consult the section coordinator about possibly receiving credit.) 4 cr.

407. Accelerated Italian
ITAL 401-402 in one semester. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for five years should consult the section coordinator about possibly receiving credit.) 8 cr. (Not offered every year.)

503-504. Intermediate Italian
A complete review of the fundamentals of grammar and syntax. Selected readings as a general introduction to Italian civilization and culture. Labs and films. 4 cr.

621. Italian Literature in Translation, 13th–16th Centuries
Major works of fiction and nonfiction, reflecting ideas and taste during the first three centuries of Italian history. Readings, discussions, papers in English. No more than one course in English may be counted toward the minor. 4 cr. (Not offered every year.)

622. Italian Literature in Translation, 18th–20th Centuries
Major trends in post-Renaissance thought and culture in Italy. Readings, discussions, papers in English. No more than one course in English may be counted toward the minor. 4 cr. (Not offered every year.)

631. Advanced Written and Spoken Italian
Critical reading, oral and written analysis of texts illustrating different styles and important themes of Italian writers. Prereq: ITAL 504 or permission. 4 cr.

651. Introduction to Italian Culture and Civilization I: Middle Ages, Renaissance, Baroque
Survey of major representative writers and artists, studied against the backdrop of social and cultural history. Dante, Petrarch, Boccaccio, Machiavelli, Marino. Pre- or coreq: ITAL 631 or permission. 4 cr.

652. Introduction to Italian Culture and Civilization II: Age of Enlightenment, Romanticism, Modernism
Survey of major representative writers and artists, studied against the backdrop of social and cultural history. Parini, Goldoni, Leopardi, Manzoni, Pavese, Calvino. Pre- or coreq: ITAL 631 or permission. 4 cr.

795, 796. Independent Study in Italian Language and Literature
Individual guided study. Prereq: permission. 1–4 cr. (Not offered every semester.)

Japanese (JPN)

Department of German and Russian
(For faculty listing, see page 122; see also course listings under German and Russian.)

New students will be assigned to the proper course on the basis of an achievement test. Transfer credit will not be given for elementary-level college courses in foreign language if a student has had two or more years of the foreign language in secondary school.

401-402. Elementary Japanese
Elements of Japanese grammar. Oral practice and written drills designed to achieve a mastery of basic grammatical patterns. Reading of graded exercises introducing the student to written Japanese (Hiragana and Katakana) and Chinese characters used in contemporary Japan. Labs. (No credit for students who have had two or more years of Japanese in secondary school; however, any such students whose studies of Japanese have been interrupted for a significant period of time should consult the department chairperson about possibly receiving credit.) 4 cr.

503-504. Intermediate Japanese
Review of Japanese grammar. Reading of prose and practice in oral and written expression. Emphasis upon contemporary Japanese. Labs. Prereq: JPN 402 with a grade of C (2.00) or better or permission of instructor. 4 cr.

631-632. Advanced Japanese
Advanced spoken and written Japanese to maintain aural-oral fluency. Advanced reading and composition. Prereq: JPN 504 or permission of instructor. 4 cr.

695, 696. Independent Study in Japanese
Open to highly qualified juniors and seniors. To be elected only with the permission of department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

Justice Studies (JUST)

(For program description, see page 22.)

601. Field Experience in Justice Studies
Placement by the justice studies coordinator in a position related to the justice system (e.g., criminal courts, corrections, civil courts, law firms, policy-making agencies, law enforcement agencies); weekly seminar meetings. Prereq: permission. 4 or 8 cr. Cr/F.

797. Special Topics in Justice Studies
One course is offered each year by cooperating faculty on a topic of special interest to the justice studies program but not normally offered on a regular basis in any department; intended to provide a common experience at an advanced level for students minoring in justice studies. 4 cr.

Latin (LATN)

Department of Spanish and Classics
(For program description, see page 29; for faculty listing, see page 98; see also course listings under Classics and Greek.)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level courses in foreign languages if a student has had two or more years of the foreign language in secondary school.

401-402. Elementary Latin
Elements of grammar, reading of simple prose. Course cannot be counted for major credits. (No credit for students who have had two or more years of Latin in secondary school; however, any such students whose studies of Latin have been interrupted for a significant period of time should consult the section supervisor about possibly receiving credit.) 4 cr.

501. Review of Latin
Intensive review of Latin grammar and vocabulary. Designed primarily for those whose study of Latin has been interrupted for a year or more and for those who have had only two years of high school Latin. 4 cr.

503-504. Intermediate Latin
Review. Readings from Cicero, Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prereq: LATN 402 or equivalent. 4 cr.

631-632. Latin Prose Composition
Grammar review; study of Latin prose style; English to Latin translation. Prereq: permission. 4 cr.

751, 752. Cicero and the Roman Republic
Prereq: permission. 4 cr.

753, 754. Advanced Studies in the Literature of the Golden Age
A) Lucretius; B) Catullus; C) Caesar; D) Sallust; E) Vergil; F) Horace; G) Tibullus; H) Propertius; I) Ovid; J) Livy. Major Roman authors from the dictatorship of Sulla to the death of Augustus. Prereq: permission. 4 cr.

755, 756. Advanced Studies in the Literature of the Silver Age
A) Seneca the Younger; B) Persius; C) Petronius; D) Lucan; E) Statius; F) Quintilian; G) Martial; H) Juvenal; I) Tacitus; J) Pliny the Younger. Major Roman authors from the reign of Nero to the death of Trajan. Prereq: permission. 4 cr.

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. Special Studies in Latin
A) Minor Authors of the Republic; B) Plautus; C) Terence; D) Minor Authors of the Empire; E) Suetonius; F) Latin Church Fathers; G) Medieval Latin; H) Advanced Latin Composition; I) Introduction to Classical Scholarship; J) Latin Epigraphy; K) Italic Dialects; L) Comparative Grammar of Greek and Latin; M) Roman Law. Topics selected by instructor and student in conference. Prereq: permission. 4 cr.

Leisure Management and Tourism (LMT)

(For program description, see page 61.)

Chairperson: Gus C. Zaso
Adjunct Professor: Wilbur F. LaPage
Associate Professors: Albert Luloff, Ann L. Morgan, Lou G. Powell, Gus C. Zaso
Research Associate Professor: Jerry J. Vaske
Adjunct Associate Professors: Herbert L. Echelberger, Bernard E. Thorn
Assistant Professors: Maureen Donnelly, Larry Gustke
Adjunct Assistant Professors: Brian E. Doyle, Julia Steed Mawson
Adjunct Instructor: Mary E. Rulison

400. Impact of Leisure
Issues that contribute to the emergence of a leisure-oriented society and significant problems that accompany the expansion of leisure opportunities. 4 cr.

455. Introduction to Recreation and Park Services
The role of recreation and parks in contemporary society. Focus on concepts, theories, history, and professionalism in the management and provision of leisure services. 4 cr.

501. Leisure Services for the Handicapped
Practical aspects of leisure service delivery for handicapped individuals who are in the mainstream of society. Lab. 4 cr.

502. Introduction to Therapeutic Recreation
History and professional concepts of therapeutic recreation and the roles and functions of the therapeutic recreator. 4 cr.

544. Outdoor Education
Elements of programming as they relate to the school curriculum and school camping. 4 cr.

554. Recreation Business Management
Principles of business management and managerial problem solving as applied to the operation of recreation facilities, parks, and tourist attractions. Emphasizes knowledge in both the public and private sectors: personnel and financial management, market analysis, promotion, and the protection and maintenance of facilities and resources. Prereq: majors only with LMT 455 or permission. Lab. 4 cr.

557. Leisure Service Program Design
Introduces the student to a systems approach to program design. Course topics include needs assessment techniques, goal setting and objectives writing, process of group planning, public relations, program evaluation, and leisure education. Applied projects are required. Prereq: LMT 455 or permission. Lab. 4 cr.

558. Program Supervision and Leadership
Emphasis on specific knowledge of leisure activity categories with related organization and leadership techniques. Other topics include facilitation of activity throughout the lifespan and planning for instruction, safety, and crisis confrontation. Applied projects are required. Prereq: LMT 557 or permission. 4 cr.

560. Campus Recreation Services
Management of college unions and campus recreation resources in higher education. 4 cr.

561. Introduction to Outdoor Recreation
The history, delivery system, social and economic impacts, and management tools for outdoor recreation. Includes identification of contemporary issues, problems, and opportunities in recreation resource management. Lab. 4 cr.

593. Special Topics
A) Camping and Outdoor Education for the Handicapped; B) State Parks: Their Management and Role; C) Music in Recreation; D) Social Psychology of Leisure; E) Literary Approach to Values, Ethics, and Morals in the Professions; F) Community Systems Planning and Development. Specialized courses covering information not presented in regular course offerings. Description of topics available in department office during preregistration. Prereq: LMT majors or permission. May be repeated but not in duplicate areas. 2–4 cr.

603. Principles of Therapeutic Recreation
Addresses the principles of activity analysis, client leisure assessment, individualized program planning, and evaluation. Prereq: LMT 455; 502. 4 cr.

604. Clinical Aspects & Techniques in Therapeutic Recreation
Addresses specific clinical knowledge and skills essential to therapeutic recreation service delivery including clinical interviewing, adaptive devices, assistive technologies, charting, and record keeping. Prereq: LMT 455; 502. 4 cr.

620. Community Conflict and Consensus
Topics drawn from the literature on community stratification, conflict resolution, leadership, power, and development. Emphasis on historical and contemporary theory and research. May include class field research project. Prereq: ADMN 424; SOC 502; RECO 528; LMT 593F;/or permission. 4 cr. (Offered every other year.)

661. Introduction to Tourism Management
Tourist attraction management techniques and principles are discussed to highlight the dynamic and pluralistic nature of the industry. The influence of economic, political, and social factors and the tourist industry are examined. Prereq: LMT 554 or permission. 4 cr.

663. Recreation and Park Administration
A comparative analysis of administrative processes within various organizations as well as the political and policy-making roles of managers in the public and private sector. Emphasis on organizational development, fiscal management, and budgeting as tools used in formulating and implementing policy. Prereq: LMT 455 and 557 or permission. Lab. 4 cr.

664. Internship
A) Internship in Program Administration; B) Internship in Therapeutic Recreation; C) Internship in Tourism and Park Management. Students enroll in the section corresponding to their major option after receiving approval from the academic adviser. Supervised work experience in an approved park, recreation, tourism, or health service agency. An "IA" grade (year-long course) may be assigned at the end of the first semester or summer session. Prereq: majors only. 4–8 cr. Cr/F.

665. Information Retrieval and Communication in Leisure Services
Prepares students to respond effectively to an information-based society. Course topics are applied to the leisure service delivery systems and include microcomputer systems and applications; standardized information systems; networking; understanding and disseminating descriptive research; and dissemination of information through audio-visual and mass media. Prereq: LMT 557 or permission. 4 cr.

667. Tourism and Park Planning
Overview of planning for parks, recreation, and tourism, as currently practiced, from national planning to individual site planning. Relationships of planning to management, policy, and practice; current trends in planning and likely future directions. Extensive use of field trips, especially coastal parkland resources, for students to learn how to "read" landscapes in order to use natural features in design as well as to enhance visitor experiences. Because of the field trips, students should schedule no other classes on the afternoon of this class meeting. Prereq: LMT 554; LMT major or permission. 4 cr.

700. Planned Change in Nonmetropolitan Communities
Discussion and application of community development theory and principles using appropriate research methodologies. Areas of study chosen from population growth, community planning and development, provision and distribution of services, rural-urban differences and system management. Emphasis on empirical research studies. Students may participate in community-development activities. May include placement in field agency. Prereq: ADMN 424; RECO 701; SOC 502;/ or permission. 4 cr. (Offered in even-numbered years.)

711. Recreation Resource Management
Examines the supply and demand of natural resources for outdoor recreation uses, with emphasis on relationships between public and private roles and responsibilities. Social, environmental, and economic impacts of outdoor recreation use are discussed. Current principles and techniques of recreation resource planning and management are outlined. Prereq: seniors or permission. 4 cr.

743. Environmental Education
Blend of environmental education/interpretation theory, process, and practical application. Includes seminars, workshops, and practical experience in an environmental education program. Prereq: permission. 4 cr.

766. Impacts of Tourism
Social, economic, environmental, political, and psychological consequences of tourism exam-

ined through use of case studies. The scope is domestic and international. Focus on the "attraction" segment of the tourist industry as opposed to the travel and accommodation segments. Required course for students in the tourism and park management option; others admitted if space permits. Prereq: junior/senior LMT major or permission. 4 cr.

772. Law of Recreation Resources and Leisure Services
Topics including the law of torts, contracts, property, civil rights, risk management, and legal research are addressed in the context of recreation resources and leisure services. Application of professional advocacy techniques related to legislative process is required. Prereq: senior LMT major or permission. 4 cr.

793. Advanced Topics
A) Area and Site Planning. Topics presented by instructors with specialized knowledge gained through professional practice, research, and study. Description of topics available in department office during preregistration. May be repeated but not in duplicate areas. 4 cr.

794. Measurement and Evaluation in Recreation
Examines research methodologies and evaluation processes as applied to recreation, allied health, and tourism settings. Emphasis on research techniques, data analysis, and research report writing. Critical assessment of uses and limitations of research for recreation. 4 cr.

796. Independent Study
Individual study and/or research relating to leisure-oriented topics. 1–4 cr.

Linguistics (LING)

(For program description, see page 29.)

See also the list of courses approved for the major or minor at the linguistics entry in the front of this catalog.

505. Introduction to Linguistics
Overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes an introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as ENGL 505.) 4 cr.

506. Introduction to Comparative and Historical Linguistics
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and LING 505 desirable. (Also offered as CLAS 506.) 4 cr.

695. Senior Honors
Open to senior LING majors who, in the opinion of the dept., have demonstrated the capacity to do superior work. Prereq: permission. 4 cr.

790. Special Topics in Linguistic Theory
Advanced course on a topic chosen by the instructor. Inquire at the English department office for a full course description each time the course is offered. Topics such as word formation, dialectology, linguistic theory and language acquisition, history of linguistics, language and culture, cross-disciplinary studies relating to linguistics. Barring duplication of subject, may be repeated for credit. (Also offered as ENGL 790.) 4 cr.

793. Phonetics and Phonology
Sound system of English and of other languages viewed from the standpoint of modern linguistic theory, including the following topics: the acoustic and articulatory properties of speech sounds, the phonemic repertoires of particular languages, phonological derivations, and prosodic phenomena such as stress and intonation. Prereq: a basic linguistics course or permission. (Also offered as ENGL 793.) 4 cr.

794. Syntax and Semantic Theory
Relationship of grammar and meaning viewed from the standpoint of modern linguistic theory. Emphasis on the syntax and semantics of English, with special attention to the construction of arguments for or against particular analyses. Prereq: a basic linguistics course or permission. (Also offered as ENGL 794.) 4 cr.

795, 796. Independent Study
A) Synchronic Linguistics; B) Diachronic Linguistics; C) Linguistic Theory. For students showing a special aptitude for linguistics who desire to pursue a line of inquiry for which no appropriate course is offered. All requests must be forwarded by the faculty sponsor to the director of the Interdepartmental Linguistics Committee. 1–4 cr.

Mathematics (MATH)

(For program description, see page 55.)

Chairperson: Donovan H. Van Osdol
Professors: Homer Bechtell, Albert B. Bennett, Jr., David M. Burton, Arthur H. Copeland, Jr., Donald W. Hadwin, A. Robb Jacoby, Loren D. Meeker, Eric A. Nordgren, Shepley L. Ross, Donovan H. Van Osdol
Adjunct Professor: Fernand J. Prevost
Associate Professors: William E. Bonnice, Joan Ferrini-Mundy, Marie A. Gaudard, William E. Geeslin, Berrien Moore III, Samuel D. Shore
Assistant Professors: David V. Feldman, Karen J. Graham, Rita Hibschweiler, Edward K. Hinson, Ernst Linder, R. Scott McIntire, Siu-Keung Tse, Lee L. Zia
Instructor: Ellen M. O'Keefe

401. Elementary Math I
Beginning algebra including integer operations, solving linear equations, graphing linear functions, solving linear inequalities, systems of linear equations, polynomials, rational expressions and equations, and exponents and radicals. Students with one or more years of college preparatory mathematics are not eligible for credit. 0 or 4 cr.

402. Elementary Math II
Review of elementary algebra, exponents, polynomials, factoring, rational exponents, and absolute value. Solving linear and quadratic equations and inequalities; systems of equations; radical equations. Linear functions and related notions (slope, distance, midpoint); quadratic functions. Students with two or more years of college preparatory mathematics are not eligible for credit. Prereq: MATH 401 or one year of high school algebra. 0 or 4 cr.

405. Elementary Functions
Properties of elementary functions, including exponential and logarithmic, trigonometric and inverse trigonometric functions. Students with three or more years of college preparatory mathematics are not eligible for credit. Prereq: MATH 402 or two years of high school algebra. 0 or 4 cr.

419. Evolution of Mathematics
Mathematics from antiquity to the present; origins of the various methods and branches. How and why such concepts as number and geometry evolved. Prereq: two college preparatory mathematics units. Credit offered only to nonmathematics majors and to mathematics education majors. 4 cr.

420. Finite Mathematics
Topics selected from logic, set theory, probability, linear algebra, linear programming, game theory, and graph theory. Not a preparation for calculus. Prereq: two college preparatory math units. Not offered for credit to math majors. 4 cr.

Note for calculus students: Students enrolling in MATH 425 are given a test on algebra and trigonometry during the first week of the semester. Those doing unsatisfactory work will be required to take MATH 405 before enrolling in calculus or to complete remedial assignments in the Mathematics Center (MaC) concurrently with MATH 425.

425. Calculus I
Calculus of one variable covering limits; differentiation and integration using algebraic, trigonometric, exponential, and logarithmic functions; applications include curve sketching, optimization problems, and related rates. Prereq: three college preparatory math units including trigonometry. 4 cr.

426. Calculus II
Second course in calculus of one argument, techniques of integration, polar coordinates, and series. Includes an individual assignment in numerical integration. Prereq: MATH 425. 4 cr.

527. Differential Equations with Linear Algebra
Fundamental methods of solving first order equations, essentials of matrix algebra; higher order linear equations, and linear systems;

series solutions; Laplace transforms; selected applications. Prereq: MATH 426. 4 cr.

528. Multidimensional Calculus
Partial differentiation; composite functions and chain rules; maximum and minimum; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; divergence, Green's and Stokes's theorems. Prereq: MATH 426. 4 cr.

531. Mathematical Proof
Introduction to reading and writing proofs in mathematics. Specific content varies from section to section: A) Set Theory; B) Linear Algebra; C) Discrete Math Structures (restricted to CS and MATH/CS option majors); D) Calculus. Prereq: MATH 426. 4 cr.

536. Introductory Statistical Inference
Elementary probability, samples, populations, estimators, sampling distributions, confidence, intervals, hypothesis testing, analysis of variance, simple linear regression, correlation, contingency tables, tests of goodness-of-fit and independence. Prereq: two years of high school algebra. No credit for students who have completed ADMN 424, MATH 644, MATH 735, PSYC 402, RECO 528, or SOC 502. 4 cr.

621. Number Systems for Elementary School Teachers
Counting and set concepts, whole numbers, fractions, negative numbers, real numbers, numeration systems, inductive and deductive reasoning. Mathematical laboratory approach. Prereq: permission. Credit offered only to nonmathematics majors and to mathematics education majors (elementary option). 4 cr.

622. Geometry for Elementary School Teachers
Deductive systems, metric geometry, congruence, symmetry, similarity, transformation, measurement, polygons and circles, polyhedra. Mathematical laboratory approach. Prereq: MATH 621. Credit offered only to nonmathematics majors and to mathematics education majors (elementary option). 4 cr. (Offered in alternate years.)

623. Topics for Elementary School Teachers
Logic, mathematical systems, permutations, combinations, probability, and introduction to statistics. Mathematical laboratory approach. Prereq: MATH 621. Credit offered only to nonmathematics majors and to mathematics education majors (elementary option). 4 cr. (Offered in alternate years.)

644. Probability and Statistics for Applications
Probability concepts, random variables, parameter estimation, hypothesis testing, quality control, and quality assurance. Prereq: MATH 426. Not offered for credit if credit is received for MATH 735. 4 cr.

645. Linear Algebra for Applications
Fundamental notions of vector space theory, linear independence, basis, span, scalar product, orthogonal bases. Matrix algebra, solution of systems of linear equations, rank, kernel, eigenvalues and eigenvectors, the LU- and QR-factorizations, and least squares approximation. Prereq: MATH 426. Not offered for credit if credit received for MATH 762. 4 cr.

646. Analysis for Applications
Initial-boundary-value problems of mathematical physics; Sturm-Liouville problems; series expansions by orthogonal functions; Green's functions; numerical methods. Prereq: CS 410; MATH 527; 528 or equivalent computer experience. 4 cr.

647. Complex Analysis for Applications
Complex numbers, analytic functions, Cauchy-Riemann equations, conformal mapping, contour integration, Cauchy's integral formula, infinite series, residue calculus, Fourier and Laplace transforms. Prereq: MATH 528. Not offered for credit if credit received for MATH 788. 4 cr.

651. Combinatorics
Arrangements and selections, generating functions, recurrence relations, inclusion-exclusion formulas, and elementary graph theory. Prereq: MATH 531 or PHIL 550. 4 cr.

656. Introduction to Number Theory
Unique factorization, arithmetic functions, linear and quadratic congruences, quadratic reciprocity law, quadratic forms, introduction to algebraic numbers. Prereq: MATH 531. 4 cr. (Offered in alternate years.)

657. Geometry
Advanced approach to fundamental properties of Euclidean and other geometries. Prereq: MATH 531. 4 cr.

658. Topics in Geometry
Topics selected from among projective geometry, finite geometrics, convexity, transformational geometry, non-Euclidean geometry, and other areas of elementary geometry within the framework of modern mathematics. Prereq: MATH 657. 4 cr. (Offered in alternate years.)

682. Nonlinear Differential Equations
Phase plane analysis of linear and nonlinear autonomous systems; solutions, paths, and critical points; nonlinear conservative systems; limit cycles; periodic solutions; approximate methods; stability of solutions; applications. Prereq: MATH 527. 4 cr. (Offered in alternate years.)

696. Independent Study
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1–6 cr.

698. Senior Seminar
Exploration of mathematical topics outside the standard undergraduate curricula. Focus on problem solving, generation of problems, and explaining mathematical concepts. Prereq: Senior standing in mathematics or mathematics education. 4 cr.

703. Mathematics Education, K-6
Methods of teaching geometry and the basic operations; mathematics objectives; introduction to research in mathematics education; elementary curriculum projects. Prereq: MATH 621. 2–4 cr.

735. Probability
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prereq: MATH 528. Not offered for credit if credit is received for MATH 644. 4 cr.

736. Statistics
Sampling theory, parameter estimation, hypothesis testing, regression, analysis of variance, nonparametric methods. Prereq: MATH 735. 4 cr.

739. Linear Statistical Models
Estimation, testing, and diagnostic methods for linear regression; analysis of variance; and analysis of covariance. Some use of packaged statistical computer programs. Prereq: MATH 644 or MATH 736; and MATH 645 or MATH 762. 4 cr.

740. Experimental Design
Randomized blocks, Latin square designs, factorial designs, fixed effects and random effects models, fractional factorial designs, response surface methodology. Applications to physical, engineering, and agricultural sciences. Prereq: MATH 739. 4 cr.

742. Applied Statistical Methods
Control charts, acceptance sampling, reliability, nonparimetric methods, categorical data analysis. Applications to industrial problems. Prereq: MATH 735-736 or MATH 644. 4 cr.

745-746. Foundations of Applied Mathematics
Basic concepts and techniques of applied mathematics intended for graduate students in mathematics, engineering, and the sciences. Fourier series and transforms, Laplace transforms, optimization, linear spaces, eigenvalues, Sturm-Liouville systems, numerical methods, conformal mapping, residue theory. Prereq: MATH 527; 528, or equivalent. 4 cr.

753. Numerical Methods and Computers I
Use of scientific subroutine and plotter routine packages, floating point arithmetic, polynomial and cubic spline interpolation, implementation problems for linear and nonlinear equations, random numbers and Monte Carlo method, Romberg's method, optimization techniques. Selected algorithms programmed for computer solution. Prereq: MATH 426; CS 410C, 410F, or 416. (Also offered as CS 753.) 4 cr.

754. Numerical Methods and Computers II
Mathematical software. Computer solutions of differential equations; eigenvalues and eigenvectors. Prereq: MATH 527; CS 410C, 410F, or 416. (Also offered as CS 754.) 4 cr.

761. Abstract Algebra
Basic properties of groups, rings, fields, and their homomorphisms. Prereq: MATH 531. 4 cr.

762. Linear Algebra
Abstract vector spaces, linear transformations and matrices, determinants, eigenvalues and eigenvectors. Prereq: MATH 761. Not offered for credit if credit received for MATH 645. 4 cr.

764. Advanced Algebra
Topics selected from rings, modules, algebraic fields, and group theory. Prereq: MATH 761. 4 cr. (Offered in alternate years.)

767. One-Dimensional Real Analysis
Theory of limits, continuity, differentiability, integrability. Prereq: MATH 531. 4 cr.

768. Advanced Analysis
Metric spaces; sequences and series of real functions; uniform convergence; Fourier Series; differentiability of mappings from n-spaces to m-spaces. Prereq: MATH 767. 4 cr. (Offered in alternate years.)

776. Logic
Induction and recursion; sentential logic; first-order logic; completeness, consistency, and decidability; recursive function. Prereq: MATH 531 (preferably section A). 4 cr. (Offered in alternate years.)

783. Set Theory
Axiomatic set theory, including its history, Zermelo-Fraenkel axioms, ordinal and cardinal numbers, consistency, independence, and undecidability. Prereq: MATH 531. 4 cr. (Offered in alternate years.)

784. Topology
Open sets, closure, base, and continuous functions. Connectedness, compactness, separation axioms and metrizability. Prereq: MATH 531. 4 cr.

788. Complex Analysis
Complex functions, sequences, limits, differentiation and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Prereq: MATH 767. Not offered for credit if credit received for MATH 647. 4 cr.

791. Mathematics Education
Methods of teaching secondary school mathematics with particular attention to curricula and instructional materials; teaching reading in mathematics; problem solving; theories of learning mathematics; computers and calculators; and professional organizations and publications. Prereq: EDUC 500; MATH 426; and permission. 4 cr.

796. Topics in Mathematics
New or specialized courses not covered in regular course offerings. Prereq: permission. May be repeated up to 8 cr. 4 cr.

Mechanical Engineering (ME)

(For program description, see page 57.)

Chairperson: Charles K. Taft
Professors: Robert W. Corell, David E. Limbert, Godfrey H. Savage, Charles K. Taft, Russell L. Valentine
Associate Professors: Kenneth C. Baldwin, Barbaros Celikkol, Robert B. Jerard, William Mosberg, M. Robinson Swift, John A. Wilson
Assistant Professors: Barry K. Fussell, Todd Stuart Gross, James E. Krzanowski, John Philip McHugh, James A. Sherwood, David W. Watt
Adjunct Assistant Professor: Robert E. Phillips

401. Introduction to Mechanical Engineering
Goals and interactions of mechanical engineering in contemporary society. Basic concepts presented and developed as background for future coursework. Lectures, case studies, and labs. 4 cr.

441. Engineering Graphics
Fundamentals of engineering drawing and descriptive geometry developed for graphical communication of technical information and solution of spatial problems. 4 cr.

503. Thermodynamics
Laws of thermodynamics and their relation to working substances. Prereq: MATH 426. 3 cr.

508. Fluid Dynamics
Dynamics and thermodynamics of compressible and incompressible fluid flow; behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prereq: ME 503; ME 527. 3 cr.

523. Introduction to Statics and Dynamics
Overview of statics and dynamics; two- and three-dimensional force systems; laws of equilibrium; moments of area; volume; inertia; stresses and strains; particle and rigid body dynamics; fixed and moving reference frames; impulse-momentum principles; work-energy relationships. Prereq: MATH 426; PHYS 407. Not for ME majors. 3 cr.

525. Mechanics I
Introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and stress-strain relationships. Prereq: MATH 425 and 426; PHYS 407. 3 cr.

526. Mechanics II
Introduction to strength of materials. Analysis of members under torsion, axial, shear and bending stresses, superposition of stresses, stability of columns. Prereq: ME 525. 3 cr.

527. Mechanics III
Introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: ME 525 or permission. 3 cr.

541. Manufacturing Processes and Design
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. Lab. 4 cr.

543. Microcomputer Laboratory
Computer solution to mechanics problems involving vector operations, equilibrium equations, and numerical integration. Coreq or prereq: ME 525. Lab. 1 cr.

545. Materials Laboratory
Laboratory experiments on the structure and engineering properties of metals, plastics, and ceramics. Coreq or prereq: ME 561. Lab. 1 cr.

546. Mechanics Laboratory
Experimental determination of mechanical properties of structural materials under various loading configurations. Coreq or prereq: ME 526. Lab. 1 cr.

547. Thermal Science Laboratory
Experimental studies and performance testing of thermal/fluid devices and systems. Prereq or coreq: ME 503; ME 508. 2 cr.

561. Introduction to Materials Science
Theoretical and experimental studies of the structure and properties of solids. Prereq: CHEM 405 or equivalent. 3 cr.

564. Materials II
Relationship of atomic, micro, and macro structures of materials to their mechanical properties, processing for structure; materials use in an evolving technology. Prereq: ME 561. 3 cr.

603. Heat Transfer
Analysis of phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Co- or prereq: ME 508. 3 cr.

605. Thermal System Analysis and Design
Engineering design of thermal systems that involve real problems and analysis of performance of the design. Design criteria include function, performance, optimization, economy, safety, and others as appropriate for the system. Required for ME seniors. Prereq: ME 503; 508; 547; 603. Coreq: ME 655. Lab. 3 cr.

629. Kinematics and Dynamics of Machines
Kinematic and dynamic analysis of mechanisms and their synthesis. Applications to reciprocating engines; balancing and cam dynamics are developed. 3 cr.

643. Elements of Design
Analysis, synthesis, and design of machine elements and systems. Development of engineering judgment; selection of materials stress and failure analysis; kinematic arrangements; design for finite and infinite life. Open-ended design problems unify course topics. Prereq: ME 526; ME 564. 3 cr.

648. Systems Modeling and Experimentation I
Lumped parameter models for mechanical, electrical, and mixed systems. Matrix represen-

tations, eigenvalues, eigenvectors, time domain solutions, and frequency response plots are used to explore system response. Use and analysis of instrumentation; data acquisition and signal filtering. Prereq: ME 629. Coreq: EE 536. Lab. 3 cr.

655. Design Process
Introduction to basic approaches to technical innovation and managing the necessary accompanying activities from identification of need through initial funding and generation of alternative solutions, to final product or project completion. Requirements and some of the techniques for responsible technical/economic decision making. Prereq: Senior in engineering or permission of instructor. 2 cr.

656. Senior Design Experience
Open-ended design experience required for all mechanical engineering seniors. Undertaken individually or in teams under faculty guidance. 3 cr.

695. Special Topics in Mechanical Engineering
Course topics not offered in other courses. May be repeated for credit. 2–4 cr.

696. Mechanical Engineering Projects
Analytical, experimental, or design projects undertaken individually or in teams under faculty guidance. May be repeated for credit. 1–4 cr.

697. Mechanical Engineering Seminar
Study and discussion of engineering topics, with student-faculty participation. May be repeated for credit. 1 cr.

701. Macroscopic Thermodynamics
Thermodynamic principles using an analytic, postulational approach and Legendre transformations to obtain thermodynamic potentials. 4 cr.

702. Statistical Thermodynamics
Macroscopic thermodynamic principles developed by means of microscopic analysis. Prereq: ME 503. 4 cr.

707. Analytical Fluid Dynamics
Kinematics of flow; constitutive relationships; development of the Navier-Stokes equations; vorticity theorems; potential flow. Prereq: ME 508. 4 cr.

708. Gas Dynamics
Study of one-dimensional subsonic and supersonic flows of compressible ideal and real fluids. Wave phenomena; linear approach to two-dimensional problems; applications in propulsion systems. Prereq: ME 503. 4 cr.

709. Computational Fluid Dynamics
Solution of basic finite-difference methods for incompressible and compressible flows, with practical examples. Treatment of boundary/initial conditions, analysis of stability, and convergence of the numerical schemes. Prereq: ME 508; ME 603 or permission. 4 cr.

710. Solar Heating Systems
Analysis and computer modeling of solar radiation as an energy source for heating. Phenomena, availability, collection, performance, and economy of solar energy for heating systems. Prereq: ME 603. 3 cr.

717. Cryogenics
Phenomena and processes at very low temperatures. Basic engineering sciences applied to problems of low temperature refrigeration, liquefaction, separation, and storage; transport of cryogenic fluids; measurement systems; vacuum technology. Prereq: ME 503. 4 cr.

723. Advanced Dynamics
Classical dynamics oriented to contemporary engineering applications. Review of particle dynamics. Hamilton's principle and the Lagrange equations. Kinematics and dynamics of rigid bodies, gyroscopic effects in machinery and space structures. 4 cr.

724. Vibration Theory and Applications
Discrete vibrating systems. Linear system concepts; single-degree-of-freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods; introduction to continuous systems; applications to structural and mechanical systems. 4 cr.

726. Experimental Mechanics
Experimental methods and theoretical bases applied to measurement of stress, strain, and motion. Transmitted and scattered-light photoelasticity, strain gage applications, brittle coating and grid techniques, dynamic measurements, and associated instrumentation. 4 cr.

727. Advanced Mechanics of Solids
Stress, strain, stress-strain relations, anisotropic behavior, introduction to elasticity, plane stress/strain, bending and torsion of members with general cross-sections introduction to thin plates and shells, energy methods. 4 cr.

730. Mechanical Behavior of Materials
Elastic and inelastic behavior of materials in terms of micro- and macromechanics. Stress, strain, and constitutive relations related to recent developments in dislocation theory and other phenomena on the atomic scale and to the continuum mechanics on the macroscopic scale. Elasticity, plasticity, viscoelasticity, creep, fracture, and damping. Anisotropic and heterogeneous materials. 4 cr.

741. Nonlinear Systems Modeling
Modeling of hydraulic, pneumatic, and electromechanical systems. Solution methods including linearization and computer simulation of nonlinear equations. Development of methods of generalizing the nonlinear models for design purposes. (Also offered as EE 741.) 4 cr.

749. Systems Modeling & Experimentation II
Lumped parameter models for thermal, fluid, and mixed systems. Matrix representations and response evaluation techniques. Design of systems for desired responses. Use and analysis of instrumentation. Minicomputer data acquisition, curve fitting, and error analysis. Introduction to feedback control, continuous and digital; stability, root locus, and z-transform. Prereq: ME 648. Lab. 3 cr.

751. Naval Architecture in Ocean Engineering
Selected topics in the fundamentals of naval architecture pertinent to ocean engineering, including hydrostatic characteristics, basics of resistance and propulsion and rules and regulations for surface, semisubmersible, and submersible marine vehicles. Computer applications. Prereq: ME 508; ME 525; /or permission. (Also offered as OE 751.) 4 cr.

752. Submersible Vehicle Systems Design
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra/extravehicle systems, operating considerations. predesign and design procedures. Design projects selected and completed by student teams. Prereq: permission. (Also offered as OE 752.) 4 cr.

757. Coastal Engineering and Processes
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. Prereq: ME 508 or permission. (Also offered as CIE 757 and OE 757.) 3 cr.

760. Physical Metallurgy I
Introduction to physical metallurgy: dislocations, thermodynamics of materials, diffusion, phase transformations, and strengthening mechanisms in solids. Prereq: ME 561 or permission. Lab. 4 cr.

761. Diffraction and Imaging Methods in Materials Science
Introduction to x-ray diffraction and electron microscopy. Basic crystallography; reciprocal lattice; x-ray and electron diffraction; x-ray methods; transmission and scanning electron microscopy. Prereq: ME 561 or CIE 622 or ESCI 512. Lab. 4 cr.

766. Physical Ceramics
Characteristics of crystalline and noncrystalline ceramic solids; defect structures; diffusion in ceramic materials; nucleation and crystal growth, spinodal decomposition, and solid-state reactions; kinetics of grain growth; sintering, and vitrification. Prereq: permission. 4 cr.

771. Linear Systems and Control
Fundamentals of linear system analysis and design in both continuous and discrete time. Design of feedback control systems. Topics include modeling; time and frequency analysis; Laplace and Z transforms; state variables; root locus; digital and analog servomechanisms; proportional, integral, and derivative controllers. Includes demonstrations and

computer simulations. Prereq: senior standing in EE or ME or permission. (Also offered as EE 771.) 3 cr.

772. Control Systems
Extension of ME 771 to include more advanced control system design concepts such as Nyquist analysis; lead-lag compensation; multi-input/multi-output systems; state feedback; parameter sensitivity; controllability; observability; decoupling; introduction to nonlinear and modern control. Includes interactive computer-aided design and real-time digital control. Prereq: ME 771 or permission. (Also offered as EE 772.) Lab. 4 cr.

774. Computer-Aided Engineering
Data acquisition and experiment control, multivariable data curve fitting, computer simulation of lumped systems based on analytical and data-based models, graphical display of data and simulation results. Interactive graphics and 3-D line drawing of objects for finite element analysis. Introduction to finite element analysis and survey of other software available. Prereq: ME 749 or permission. 3 cr.

781. Mathematical Methods in Engineering Science I
Solution of discrete and continuous systems. Review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 cr.

786. Introduction to Finite Element Analysis
Topics include basic matrix theory, Galerkin method, direct stiffness method, calculus of variations, development of finite element theory, and modeling techniques. Applications in solid mechanics, heat transfer, fluids, dynamics, and electromagnetic devices, via both commercially available codes and student-written codes. Prereq: CS 410F; ME 603;/or permission. (Also offered as CIE 786 in alternate years.) 3 cr.

795. Special Topics in Mechanical Engineering
New or specialized courses and/or independent study. May be repeated for credit. 2–4 cr.

797. Honors Seminar
Course enrichment and/or additional independent study in subject matter pertaining to a 600- or 700-level ME course other than ME 695, 696, 697, or 795. 1 cr.

Medical Technology (MEDT)

(For program description, see page 62.)

Chairperson: Karol A. LaCroix
Adjunct Professor: Truls Brinck-Johnsen
Associate Professor: Karol A. LaCroix
Adjunct Associate Professor: Walter Noll, M.D.
Adjunct Assistant Professors: Michael Brown, Darlys M. Schott, Elizabeth Ward
Instructor: Joyce Stone

401. Introduction to Medical Technology
Functions and responsibilities of medical technology as a unit of the health team. Lectures, films, demonstrations, and field trips. Prereq: second-semester freshman or sophomore major standing. 0 cr.

600. Pathophysiology
Pathophysiology, diagnosis, and treatment of disease including disorders of the endocrine, cardiovascular, hematological, and immunologic systems. 4 cr.

610. Laboratory Management
Introduction to laboratory management, supervision, and education. Lectures, discussions, and student projects cover financial concerns, personnel management, and teaching skills. Prereq: senior MEDT majors or permission. 4 cr.

651. Clinical Microbiology
Routine methodologies in clinical microbiology. Culture planting techniques, bacterial identifications, antibiotic sensitivity testing. Junior MEDT majors only. 4 cr.

652. Clinical Hematology
Routine hematological procedures, both manual and automated. Analysis of white blood cells, red blood cells, and platelets; hemostasis techniques. Junior MEDT majors only. 4 cr.

653. Clinical Immunohematology
Routine blood-banking procedures, including blood typing, antibody screening, cross-matching, and confirmatory testing on blood units. Junior MEDT majors only. 4 cr.

654. Clinical Chemistry
Laboratory safety, mathematics, introduction to instrumentation, and quality control. Clinical significance, evaluation, and performance of manual procedures for urine and plasma. Includes macro- and microscopic analysis of urine, plasma glucose, BUN, creatinine, electrolytes, enzymes, cholesterol, bilirubin, and uric acid determination. Prereq: CHEM 403-404. 4 cr.

656. Research Laboratory Methods I
Laboratory safety, calculations, quality control, overview of instrumentation, and troubleshooting as applied to introductory research techniques. Students with credit for MEDT 654 cannot receive credit for MEDT 656. Prereq: CHEM 403-404. (Also offered as ANSC 656.) 4 cr.

696. Independent Study
In-depth studies under faculty supervision. Staff. Prereq: junior standing; approval of the major adviser and the faculty of the area concerned. 2–4 cr.

720. Clinical Mycology-Parasitology
Clinical laboratory identification and pathology of human mycology and parasitology infections. Classification and diagnosis of clinically significant viruses. Prereq: MICR 702. Lab. 4 cr.

751. Advanced Clinical Microbiology
Advanced clinical bacteriological procedures, fluorescent techniques, and special procedures. Mycology and parasitology identification and testing. Senior MEDT majors only. 4 cr.

752. Advanced Hematology
Special hematology procedures including diagnostic staining, advanced hemostasis studies, and evaluation of blood cells in disease states. Senior MEDT majors only. 4 cr.

753. Advanced Immunohematology
Advanced blood-banking procedures, including antibody identification, and component therapy. Principles and procedures for detecting disorders of cellular and humoral immunity. Senior MEDT majors only. 4 cr.

754. Advanced Clinical Chemistry
Theory, operation, evaluation, and maintenance of automated chemistry systems. Advanced laboratory analysis of body fluid chemistries including enzymology, isotopes, hormones, blood gases, and toxicology. Data analysis, computerization. Senior MEDT majors only. 4 cr.

Microbiology (MICR)

(For program description, see page 40.)

Chairperson: Thomas G. Pistole
Professors: Richard P Blakemore, William R. Chesbro, D. Jay Grimes, Galen E. Jones, Thomas G. Pistole, Robert M. Zsigray
Associate Professor: Frank G. Rodgers
Assistant Professor: Aaron B. Margolin

501. Public Health Microbiology
Medical microbiology with emphasis on immunology, pathogenic bacteriology, parasitology, animal virology, and the incidence and control of human communicable diseases. Laboratory techniques for identification of important pathogenic microorganisms and disease diagnosis. Special fee. Lab. 4 cr.

503. General Microbiology
Principles of microbiology; morphology, physiology, genetics, culture, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Prereq: CHEM 401-402 or equivalent. Special fee. Lab. 5 cr.

600. Environmental Microbiology
Detection, identification, and regulation of microorganisms that enhance or deteriorate the immediate human environment. Prereq: MICR 503. Special fee. Lab. 4 cr.

602. Pathogenic Microbiology
Morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Discussion of clinical presentation in

host and laboratory diagnoses. Prereq: MICR 503. Special fee. Lab. 5 cr.

701. Taxonomy and Ecology
Isolation, identification, and classification of prokaryotic microorganisms by classical and newer techniques; analysis of the interplay between organism and environment; uses of taxonomic and ecological information. Prereq: MICR 503; BCHM 656. Special fee. Lab. 4 cr.

704. Microbial Genetics
Expression and transfer of genetic elements (chromosomal and nonchromosomal) in prokaryotic and eukaryotic microorganisms; consideration of factors influencing public health, industry, the environment, and society. Prereq: MICR 503; BCHM 656. Special fee. Lab. 4 cr.

705. Immunology
Examination of the immune response in vertebrates. Characterization of the major components of the immune system; study of host defense mechanisms and immunopathology. Serological and animal laboratory studies. Prereq: MICR 503; permission. Special fee. Lab. 4 cr.

706. Virology
Principles of animal and, in selected instances, plant and bacterial virology in relation to infection and disease. Emphasis on the molecular biology of viruses, viral replication, isolation, propagation, assay, pathogenesis, diagnosis, epidemiology, and control. Virus-host interactions, especially the role of viruses in malignant transformation. Prereq: MICR 602; permission. Special fee. Lab. 4 cr.

707. Marine Microbiology
Characterization of microorganisms in the sea including taxonomy, physiology, and ecology; sampling, enumeration, distribution; and effects of marine environment upon microbial populations. Prereq: MICR 503 and organic chemistry. Special fee. Lab. 4 cr.

708. Microbial Biogeochemistry
Geochemical processes influenced by biochemical processes catalyzed by marine and terrestrial microorganisms; transformations of carbon, nitrogen, and other elements. Petroleum microbiology, natural gas production, sulfur formation, manganese nodules, corrosion, and fossil microorganisms. Prereq: MICR 503 and organic chemistry. Special fee. Lab. 4 cr.

710. Electron Microscopy and Microbial Cytology
Ultrastructure in eukaryotes, prokaryotes, and viruses. Practical operation of transmission and scanning electron microscopes including manipulation of instrumentation and specimens. Application of shadowing, negative staining, embedding and thin-sectioning, labeling and freeze-fracture/etching to biological specimens; photographic techniques and the interpretation of micrographs. Discussion of the role of bacterial appendages, cell membranes and cell walls, cytoplasmic inclusions, cell division and sporulation along with virus ultrastructure. Project work. Prereq: MICR 503; permission. Special fee. Lab. 5 cr.

714. Water Pollution Microbiology
Application of general principles of microbial ecology, disease, genetics, and physiology, and of organic and inorganic chemistry to water pollution and its abatement. Prereq: MICR 503. 3 cr.

712. Host-Microbe Interactions
Biochemical, ultrastructural, and ecological analysis of stable nonpathologic host-microbe interactions, principally of symbioses between prokaryotes and eukaryotes. Focus on several systems including animal digestive tracts and nutritive and luminous organs. Considerable attention given to plant-microbe interactions, especially those involving *Rhizobium* and *Agrobacterium*. Prereq: MICR 503; gen biochem; permission. Special fee. Lab. 4 cr.

795, 796. Problems in Microbiology
Prereq: permission. 1–8 cr.

Military Science (MILT)

Reserve Officers Training Corps
(For program description, see page 75.)

Professor of Military Science: Lt. Col. Charles E. Adkins
Associate Professor: Col. John D. Kraus, Jr.
Assistant Professors: Major Douglas R. Wilkinson, Captain Angel Berrios, Captain Timothy D. Bond, Captain Donald Glenn Payne

413. The Defense Establishment and National Security
Elements of the U.S. defense establishment and their roles in national security. Functional interrelationships: service branches, tactical maneuver elements, major commands, operating agencies, other uniformed services, and civilian agencies. The principle of civilian control. Current world events of significance to the Army officer. Leadership laboratory required for cadets. 1 cr.

414. Military Skills I
Expedient medical care, casualty processing, and cardiopulmonary resuscitation. Leadership lab required for cadets. 1 cr.

501. Military Skills II
Standard military map interpretation and use, principles of effective marksmanship, development of a well-being program, leadership, individual and squad movement techniques, and selected skills. Lab (required only of cadets). 2 cr.

502. American Military History
Development of American military institutions, civil-military relations, and use of military forces as an instrument of national policy from the Civil War period to the present. Emphasis on battle campaign analysis. Lab (required only of cadets). 2 cr.

601. Military Leadership & Management I
Studies in human relations, interpersonal communications, and group interaction. Authoritarian vs. participative leadership and management, motivation and self-actualization. Emphasis on interrelationship between supervision, management, and leadership, and application of theory to practice. Lab. 2 cr.

602. Military Leadership & Management II
Further studies in human relations, interpersonal communication, and group interaction. Authoritarian vs. participative leadership and management. Emphasis on theory of training methods and functions of management. Prereq: MILT 601. Lab. 2 cr.

611. Seminar on Leadership & Management I
Examination of fundamentals of military law to develop the students' understanding of military-specific offenses and disposition procedures. Law of war and professional ethics also discussed. Lab. 2 cr.

612. Seminar on Leadership & Management II
Examination of the military skills and professional knowledge needed for a second lieutenant. Emphasis on various Army management systems and the new lieutenant's responsibilities to the Army and to his/her superiors and subordinates. Prereq: MILT 611. Lab. 2 cr.

695. Officer Internship
Experiential learning through field work in a military-type unit. Written analysis required. Prereq: MILT 611 (may be taken concurrently). By permission only. May be taken up to a total of 8 credits. 1–4 cr.

Music (MUSI)

(For program description, see page 30; see also course listings under Music Education)

Chairperson: John E. Rogers
Professors: Keith Polk, Mary H. Rasmussen, John E. Rogers, David E. Seiler, John D. Wicks
Adjunct Professor: Clark Terry
Associate Professors: Ruth S. Edwards, Stanley D. Hettinger, Cleveland L. Howard, Christopher Kies, W. Niel Sir, Robert Stibler, Peggy A. Vagts, Larry J. Veal, Paul F. Verrette, Henry J. Wing, Jr.
Assistant Professors: Mark S. DeTurk, Robert W. Eschbach, Nicholas N. Orovich, Kathleen Wilson Spillane
Instructor: William J. Reeve
Lecturers: Janet E. Atherton, Christopher Humphrey, John B. Hunter, Charles Jennison, Linda Seiler, John B. Skelton

History, Literature, and Appreciation

401. Introduction to Music
Fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective, but main emphasis is on confronting significant works of musical art on their own terms. Some participation in musical life of the University required. Does not fulfill a major requirement. 4 cr.

402. Survey of Music History
Historical development of musical style in relation to the whole fabric of Western civilization. Not open to music majors. 4 cr.

501-502. History and Literature of Music
Styles, forms, and techniques of composition in Western music. Required of all music majors. 3 cr.

511. Survey of Music in America
From colonial times to the present, including the various European influences, the quest for an American style, and the emergence of such indigenous phenomena as jazz. 4 cr.

513. Introduction to the Music of Africa and Asia
Folk and classical music of various ethnic cultures, particularly those of Japan, India, and sub-Saharan Africa. 4 cr.

581. Harmony in Traditional Jazz and Popular Music
A practical course in the harmonization of popular songs and "blues." Typical chord progressions; their logic, extensions, and symbolic representations. Written exercises and instrumental improvization. Prereq: knowledge of notation and fundamental harmony; ability to perform on a musical instrument. Some keyboard skill highly desirable. Permission. 4 cr.

595. Special Topics in Music Literature
Open to music majors and nonmajors; topics in areas not easily covered in historical courses. May be repeated for credit. Prereq: permission. 1–4 cr.

609. Ethnicity in America: The Black Experience in the Twentieth Century
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as ENGL 609 and HUMA 609.) 4 cr.

701. Music of the Medieval Period
Nature of the beginnings of polyphony. The preeminent influence of the church in the 13th century and the rising secular movement in the 14th. Music as a dominant force in the political and social life of the Middle Ages. 3 cr.

703. Music of the Renaissance
Works of the 15th- and 16th-century composers from Dunstable to Palestrina. 3 cr.

705. Music of the Baroque
Music of Europe from de Rore to Bach. 3 cr.

707. Music of the Classical Period
Growth of musical styles and forms from early classicism through the high classicism of Haydn, Mozart, and the young Beethoven. 3 cr.

709. Music of the Romantic Period
A survey of romanticism in music from Beethoven's late period to the end of the 19th century. The works of Schubert, Berlioz, Schumann, Mendelssohn, Chopin, Wagner, Verdi, Brahms, Austrian symphonists, French pre-impressionists, and national styles in European music. 3 cr.

711. Music of the 20th Century
Styles and techniques of composers from Debussy to the present. Special emphasis on tonal music before World War I; neoclassical trends; the emergence of atonality and serial techniques; antirationalist music; electronic music. 3 cr.

721. The Life and Works of Beethoven
Detailed study of Beethoven, his times, and his art as exemplified by his symphonies, piano music, chamber music, sacred music, and works for the stage. 3 cr.

732. The Art Song
History and literature of the solo song with piano accompaniment. Survey of national styles of the 19th and 20th centuries and deeper study of the central core of the art song—the German Lied. 3 cr.

733. Survey of Opera
History of the genre from Monteverdi to the present. Representative masterpieces by Handel, Mozart, Beethoven, Weber, Wagner, Verdi, Mussorgsky, Debussy, Berg, and others. 3 cr.

735. Survey of Pianoforte Literature
Keyboard literature from the Baroque to the present. Analysis, discussion, and illustration of works by Bach, Haydn, Mozart, Beethoven, the romantic composers, and contemporary writers. 3 cr.

795. Special Studies in Music
A) J.S. Bach; B) Franz Schubert; C) Debussy and Ravel; D) The World of Jazz; E) The Iconography of Western European Musical Instruments; F) 19th-Century French Music; G) Advanced Analysis; H) Advanced Study in Electronic Music; I) Composition through Computer-generated Sound; J) Woodwind Literature; K) Brass Literature; L) String Literature; M) Medieval Performance Practice; N) Renaissance Performance Practice; O) Baroque Performance Practice; P) Classical Performance Practice; Q) 19th-Century Performance Practice; R) 20th-Century Performance Practice; S) Woodwind Repair; T) String Repair; U) Advanced Jazz Improvisation; V) Advanced Piano Pedagogy; W) Advanced Accompanying; X) Advanced Conducting; Y) Independent Study. Prereq: permission. May be repeated for credit with permission. 1–4 cr.

Performance

Registration for musical laboratory courses (441-461) should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.

441. Concert Choir
Study and performance of classical and modern choral literature. Recommended for voice majors. Open to all students. Prereq: permission. 1 cr.

442. Chamber Chorus
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present, participates with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental work. Prereq: permission. 1 cr.

443. Women's Chorus
Open to all students interested in singing the finest literature in this medium and who can fulfill the requirement of an audition. 1 cr.

444. The NewHampshiremen
The male chorus of the University. Recommended for all male voice majors. Prereq: permission and audition. 1 cr. Cr/F.

445. Summer Session Chorus and Basic Conducting
Study and performance of the best classical and modern choral literature. Basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. May be repeated. 1 cr.

448. Opera Workshop
Operatic singing, acting, and production techniques; performance of both complete operas and operatic excerpts. Prereq: permission. 1 cr.

450. Symphony
Presents several concerts during the year, of repertoire ranging from the great, standard symphonic literature to experimental, multimedia composition. Prereq: permission of conductor and audition. 1 cr.

451. UNH Training Orchestra
Designed for music education majors but open to all who wish to develop proficiency on major or secondary instruments. Ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for the UNH Symphony. 1 cr.

452. UNH Symphonic Wind Ensemble
Open to all students. Campus concerts and New England tour. Prereq: permission and audition. 1 cr.

453. Symphonic Band
Original band music, transcription, marches, etc. For students whose program does not permit music as a major interest, but who are interested in maintaining their playing proficiency and continuing their study of music. Prereq: permission. 1 cr.

454. UNH Marching Band
Open to all students; performs during home and away football games. Rehearsals conclude at the end of the football season. Prereq: permission. 1 cr. Cr/F.

455. Piano Ensemble
Drawing from available student instrumentalists and singers, pianists learn the art of performing in trios, duo sonatas, and two-piano works, and gain experience in Lieder accompaniment. 1 cr.

456. String Ensemble

457. Woodwind Ensemble

458. Brass Ensemble

459. Percussion Ensemble

460. Jazz Ensemble

In these five courses, groups of instrumentalists gain experience in the performance of literature for the smaller ensemble. Prereq: permission. 1 cr.

461. Vocal Ensemble
Singers perform in small ensembles such as trios, quartets, quintets, and octets. Prereq: permission. 1 cr.

467. Functional Piano
Basic instruction for music majors with no previous keyboard training. Pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sight-reading, transposition, and modulation. May involve both class instruction and periodic short individual lessons. Prereq: permission. 1 cr.

Private lessons are based on a half hour of individual instruction per week. One semester-hour credit may be earned with one lesson per week; two or four semester hours of credit may be earned with two lessons per week (only students in the bachelor of music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $35 per half-hour lesson (this fee applies for courses numbered 541 through 550). The fee includes the use of a practice room for the required preparation. In courses 541 through 551 (private instruction in performance) presentation and material used vary with pupil. The emphasis is on musical values and sound technique. As the student advances, repertory is broadened to include works of all periods. One solo performance each semester may be required.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Department of Music and the instructor. Enrollment is limited in these courses. Students may register for credit in successive semesters.

541. Voice
1, 2, or 4 cr.

542. Piano
1, 2, or 4 cr.

543. Harpsichord
1, 2, or 4 cr.

544. Organ
1, 2, or 4 cr.

545. Violin, Viola
1, 2, or 4 cr.

546. Violoncello, String Bass
1, 2, or 4 cr.

547. Woodwind
1, 2, or 4 cr.

548. Brass
1, 2, or 4 cr.

549. Percussion
1, 2, or 4 cr.

550. Harp (Offered by special arrangement with the department.)
1, 2, or 4 cr.

551. Early Wind Instruments
1, 2, or 4 cr.

751-752. Conducting Methods
Physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. Reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal. Prereq: MUSI 571-572 and junior standing. 2 cr.

754. Collegium Musicum
Instrumentalists and singers perform small ensemble music from all periods, with emphasis on Renaissance and Baroque music. Prereq: permission. 1 cr.

Theory and Composition

411-412. Fundamentals of Music Theory
Elements of music theory for the non-music major; principles of musical structure, analysis, elementary written counterpoint and harmony, and ear training. May not be counted for credit toward a music major. Prereq: Ability to read music and permission of instructor. 4 cr.

471-472. Theory I
Introduction to the tonal system; principles of voice leading and harmonic progression through the analysis, realization, and composition of one-, two-, and four-voiced textures. Concept of triad inversion and consonant diatonic harmonies of the major and minor modes. Students should register for 473-474 concurrently. Prereq: permission. 3 cr.

473-474. Ear Training I
Laboratory exercises to develop aural skills; sight-singing and dictation. Students should register for MUSI 471-472 concurrently. Prereq: permission. 1 cr.

571-572. Theory II
Continuation of MUSI 471-472. Compositional and analytic work stresses the treatment of dissonance within the tonal system; accessory tones, seventh chords, tonicization, modulation, basic principles of chromatic harmony, and harmonization of chorale melodies are covered. Students should register for 573-574 concurrently. Prereq: MUSI 472; MUSI 474; permission. 3 cr.

573-574. Ear Training II
Laboratory exercises to develop aural skills further. Students should register for MUSI 571-572 concurrently. Prereq: MUSI 472, 474; permission. 1 cr.

771-772. Counterpoint
Contrapuntal techniques of tonal music. Melodic construction and dissonance treatment through work in species counterpoint and studies in harmonic elaboration and prolongation. Analysis of selected compositions emphasizes the connection between fundamental contrapuntal techniques and the voice-leading of composition. Prereq: MUSI 572 or permission. 2 cr.

773. Advanced Counterpoint
Continuation of MUSI 772. Prereq: MUSI 772 or permission. 2 cr.

775-776. Composition
Construction of phrases, periods, and short compositions following classical models. Problems of text-setting. Prereq: MUSI 572 or permission. 3 cr.

777. Advanced Composition
Continuation of MUSI 776. Individual compositional projects. Prereq: MUSI 776 and permission. May be repeated for credit. 3 cr.

779. Orchestration
Characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students study scores, write arrangements, and have arrangements performed if at all possible. Some aspects of vocal writing. Prereq: MUSI 572 or permission. 3 cr.

781, 782. Analysis: Form and Structure
Introduction to analytical techniques through the study of representative masterworks: formal and structural elements and their interrelationships. Semester I: analysis of 18th- and 19th-century works; semester II: analysis of 20th-century works. Prereq: MUSI 572 or permission. 2 cr.

785. Electronic Sound Synthesis
Analog and digital synthesizers, methods of sound synthesis (e.g., fm synthesis), MIDI programming in BASIC, control programs for synthesizers (e.g., Personal Composer). Generally offered in the spring. 4 cr.

Music Education (MUED)

(For program description, see page 30; for faculty listing, see page 137; see also course listings under Music.)

500. Exploring Music Teaching
Introductory fieldwork course for students to explore music teaching as a career. Observation, teaching, research, examination of multimechanical aids for music curriculum development. Coreq: EDUC 500. 2 cr. Cr/F.

540. Beginning Techniques in Voice
Basic techniques of voice production. Individual work is emphasized. Working knowledge of an instrument required. This course is desirable for, but not restricted to, MUED majors. Prereq: permission. 2 cr.

545, 546. Beginning Techniques in String Instruments
Class and individual instruction. Four hours practice per week. Training on the violin, viola, and cello. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

595. Special Projects in Music Education
Individual investigation, research, or study. Creative projects may be included. A) Marching Band Methods and Techniques. Prereq: permission. 1–4 cr.

741-742. Techniques and Methods in Choral Music
Problems in the organization and performance of high school, college, and community choruses. Techniques of choral conducting and rehearsal, repertory, and materials. 2 cr.

743. Materials and Methods in Piano Music
Gives potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher. 2 cr.

745-746. Techniques and Methods in String Instruments
Class and individual instruction. Four hours of practice per week required. Intensive training on the violin, viola, cello, and double bass enables participants to perform in string ensembles. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

747-748. Techniques and Methods in Woodwind Instruments
Basic fundamentals of performance, class instruction, associated acoustical problems and study of woodwind literature. First semester: clarinet, flute, and saxophone. Second semester: double-reed instruments. 2 cr.

749. Techniques and Methods in Brass Instruments
Basic course in embouchure formation, tone, tonguing, fingering, flexibility, accuracy, and range development as applied to the trumpet or baritone horn, French horn, and trombone; methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high school players of brass instruments. 2 cr.

751. Techniques and Methods in Percussion Instruments
Basic performance skills on snare drum, timpani, mallet instruments, and other percussion instruments used in bands and orchestras. Materials and methods of instruction. 2 cr.

785. Music for the Elementary Classroom Teacher
Basic skills and techniques for the nonspecialist. Correlation and integration of music in the school curriculum. 4 cr.

787-788. The Teaching of Elementary and Middle School Music
Aims, scope, and organization of materials and activities in elementary and middle schools. Modern trends in educational philosophy; development of the child's voice; demonstration of materials and methods for the various grades. Observation and teaching in schools. 2 cr.

791-792. The Teaching of Secondary School Music
Educational principles applied to music teaching and learning; curriculum organization for junior and senior high school. Adolescent voice, voice classification, selection of vocal and instrumental materials, and building unified concert programs. Problems of administration; management; relationship of the teacher to school and community. Observation of secondary school music programs. 2 cr.

795. Special Studies in Music Education
Allows upper-level students to explore individually or in groups areas related to their specific professional interests. Prereq: permission. 1–4 cr.

796. Foundations & Perspectives of Music Education
Examines philosophical, sociological, and psychological foundations and principles of music education and the relationship of these principles to music learning and teaching. 4 cr.

Nursing (NURS)

(For program description, see page 63.)

Chairperson: Karen R. Johnson
Associate Professors: Evalyn P. Carruthers, Karen R. Johnson, Ann Kelley, Debra Livingston, Juliette D. Petillo, Raelene Shippee-Rice, Margaret W. Spears, Rosemary Y. Wang, Carol L. Williams
Assistant Professors: Cynthia D. Connelly, Denise D. Connors, Margaret A. Crowley, Elizabeth Ely, Maureen Giuffre, Gene E. Harkless, Anne Lacey, Margaret A. Lamb, Judith A. Metcalf, Carol A. Roberts, Linda Robinson, Adele M. Spegman, Mary Stanick, Alison H. Sweatt, Kathleen L. White

404. Suicidology
Introductory course in the study of self-destructive behaviors and suicide: epidemiologic and demographic variables, theories of death and dying, related research. Emphasis on prevention, assessment, intervention, and postvention in suicide risk. Open to all students. 4 cr.

405. Exploring Nursing
First course in the nursing curriculum. Explores the four domain concepts of concern to nursing: the diverse clients served by nurses, the complex environment within which nursing is practiced, health and its various definitions, and nursing as a profession. Through selected group work, field and laboratory activities, the student begins to identify the unique contributions that nursing can make to the health of society. 4 cr.

506B. Seminar on Professional Nursing
Health and how interactions between physical and social environments affect it. Nature and function of health care systems and role of health professionals from historical, social, political, economic, and technical viewpoints. Individual student examination of values, attitudes, and beliefs regarding professional role and personal goals, in relation to current nursing practice. Open to RN students only. 6 cr.

510. Foundations of Nursing Practice
Concepts and skills necessary for professional nursing practice. Interrelationships among individual, nursing, health, and environment examined in consideration of the individual's biopsychosocial needs. Through laboratory and clinical experiences, students learn to apply communication, physical assessment and basic nursing skills with individuals striving to maintain an optimal level of health. Prereq: NURS 405; major. 4 cr.

530. The Dynamics of Addiction
Reasons for treatments and implications of addiction to bodily stimuli. Cause and effect relationships involved in addiction examined from the perspectives of the individual and society. Role implications for health care providers in relation to prevention and treatment. Open to all students, sophomore and above. 4 cr.

535. Death and Dying
Significance of death and dying examined from perspective of the individual, the family, the professional, and society. Discussion of theories of death and dying, and grief and grieving. Exploration of legal and ethical concerns. Open to all students. Prereq: permission. 4 cr.

550. Nursing Management
Provides a base for understanding the concepts, principles, and skills needed to function as a nurse manager. Content includes the following functions of nursing management: planning, organizing, staffing, influencing, and controlling. 4 cr.

595. Women's Health
Examines women's health and women's health

care from historical, political, and social perspectives. Discussion of societal and health care constraints that hinder women from achieving their full health potential. Also presents information on women's health care practices, including the concept of self-care, and relates this to the development of educated consumerism in the health care system. 4 cr.

601. Nursing I
Concepts essential to the practice of nursing and awareness of the biopsychosocial needs of the individual. These concepts provide a foundation for interpreting responses to stress and the adaptive mechanisms utilized to restore wellness. Prereq: junior major. 4 cr.

601C. Nursing of Adults I
Assessment of nursing care needs of selected adult clients. In clinical practice the student uses the nursing process to help the individual meet basic biopsychosocial needs and maintain an optimal level of health. Focus on clients undergoing surgery and clients experiencing alterations in endocrine and gastrointestinal functioning. Prereq: junior major. 4 cr.

601D. Nursing of Children
Major health needs of children and current trends in meeting the biopsychosocial needs of the child. In clinical practice the student intervenes to meet the needs of the child and the family. Prereq: junior major. 4 cr.

601E. Nursing of the Childbearing Family
Family as focus for nursing care. Introduction to nursing care of women and their families during various phases of childbearing. Role of the nurse in assisting client and family in adaptation, thereby promoting and maintaining optimal health state and preventing or minimizing impact of illness. Influence of sociocultural patterns and legal/ethical concerns are discussed. Prereq: junior major. 4 cr.

610. Nursing II
Biopsychosocial alterations and their influence on the individual's ability to maintain an optimal level of functioning; implications for nursing practice. Prereq: junior major. 4 cr.

610C. Nursing of Adults II
Increases the student's ability to make nursing decisions. In clinical practice the student plans, implements, and evaluates care for selected adult clients experiencing physiological alterations. Prereq: junior major. 4 cr.

610D. Nursing in the Community
Role of the community health nurse in health maintenance and disease prevention for the individual, family, and community. Examination of concepts of community as client and of community health status as student learns to apply nursing process to the larger population. Discussion of relationships of culture and financing to provision of health care. Students apply epidemiological model to distribution of communicable and chronic disease and analyze an epidemiological study. Consideration of major environmental issues in light of their impact on the community. Prereq: junior major. 4 cr.

610E. Nursing in Mental Health
Concepts of mental health and major biopsychosocial factors affecting human behavior. Emphasis on furthering student's understanding and skill in nurse/client interactions. Use of specific theoretical concepts guiding nurse/client interactions to assist individual to strive for an optimal level of mental health. Through a designed clinical experience, students apply mental health concepts and principles of therapeutic communication skills in the mental health setting. Prereq: junior major. 4 cr.

621. Nursing III
Analysis of nursing needs of individuals with multi-system problems. Selected case studies to emphasize the interdependence of the adaptive mechanisms of the biopsychosocial being. 4 cr.

621C. Nursing of Adults III
Exploration and analysis of selected complex nursing problems in the care of ill adults. Clinical practice provides opportunity for synthesis of learning and develops ability to evaluate outcomes of nursing actions systematically. 4 cr.

629. Nursing Research
Role of nursing research in development of nursing knowledge and practice. Evaluation of nursing research reports in terms of quality and significance to nursing practice; assessment of impact of research on practice. Discussion of responsibility of the professional nurse to identify problems for research, to participate in research, and to act as advocate for the research subject. 2 cr.

630. Nursing Leadership
Leadership theories and process as they apply to nursing; leadership behaviors necessary to facilitate change. 2 cr.

630C. Senior Practicum
Clinical experience in an area of the student's interest. Working closely with clinical preceptors and faculty, the student integrates previously learned knowledge and skills and add to competency as a beginning professional practitioner. 4 cr. Cr/F.

632B. Professional Nursing: Competence Assessment
Examination and/or evaluation to determine level of competence within the seven program competence areas. Normally students will be granted from zero to the total number of credits that each competence is worth. The seven program competencies include (1) apply knowledge of principles common to professional nursing practice to meet basic needs of individuals of all ages in all conditions in any setting; (2) relate concepts from the physical and behavioral sciences to professional nursing practice; (3) demonstrate knowledge of alterations in biopsychosocial functioning throughout the life cycle and the care appropriate to clients with those alterations; (4) apply knowledge of basic teaching-learning theory to design and implement instructional programs for individuals and groups; (5) analyze, develop, and collaborate in beginning-level nursing research in an effort to develop sound theories for nursing practice; (6) utilize the nursing process to establish therapeutic relationships in all aspects of practice in order to provide individualized, prioritized, and comprehensive care to clients, families, and community groups; (7) demonstrate the ability to function independently and interdependently, applying theories of leadership and change, acting as a client advocate, and demonstrating accountability and responsibility as a professional nurse. Prereq: NURS 506B; all nursing major prerequisites; permission. An "IA" grade (continuing course) may be given at the end of one semester. 0–48 cr. Cr/F.

635. Operating Room Nursing: Nursing Process Dealing with Surgical Stresses
Competencies necessary for professional operating room nursing. Modules include preoperative, intraoperative, and postoperative nursing care. Prereq: RN with New Hampshire licensure; or, for baccalaureate nursing students who have completed junior year, permission. 4 cr.

636. Cardiac Arrhythmias
Theory and practice of basic single-lead arrhythmia interpretation, to provide a firm foundation of essential knowledge and procedures in the care of persons with cardiac arrhythmias. Prereq: anatomy and physiology or equivalent. Open to all students. 2 cr. (First half of semester)

637. Nursing Care of Clients with Cardiac Arrhythmias
Clinical application of nursing care to clients with cardiac arrhythmias. Prereq: NURS 636; junior/senior nursing majors, or permission. 2 cr. (Second half of semester)

642. Introduction to Health Assessment Techniques
Introduces the registered nurse to basic history taking and selected physical examination techniques for application in the adult health care setting. Practice provided under the guidance of an instructor in the laboratory setting. Learned skills are used in a clinical practice setting under the guidance of an instructor. Prereq: permission. 4 cr. Cr/F.

670. Issues in Health Care of the Aged
Current concepts and issues related to study of aging from biological and sociological perspectives. Multidisciplinary study of issues relevant to the development of social policies affecting health care and delivery of services to the elderly. Course divided into two parts: (1) study of the normal physiological and psychological processes of aging, and (2) impact of social, cultural, and economic forces on care of the elderly and delivery of health services. Open to all students. 4 cr.

690A–U. Professional Nursing Plan of Study
Open to students in the RN track of the nursing

major. Enables students to fulfill the terminal objectives of the nursing major that are not earned through competence assessment. 690A, Concepts I; 690B, Concepts II; 690C, Concepts III; 690D, Concepts IV; 690E, Adults I; 690F, Adults II; 690G, Adults III; 690H, Children; 690I, Childbearing; 690J, Mental Health; 690K, Community; 690L, Research; 690M, Community Assessment; 690N, Teaching/Learning; 690O, Change; 690P, Leadership; 690Q, Advocacy/Ethical; 690R, Practicum; 690S, Nursing Process; 690T, Advocacy; 690U, Professional Issues. Students may register for more than one topic per semester. Prereq: 506B. 1–12 cr. Cr/F.

694. Special Topics
Specialized courses covering information not normally presented in regular course offerings. Description of topics varies. May be repeated but not duplicate areas of content. Prereq: permission. 1–4 cr.

695. Independent Study
In-depth study with faculty supervision. Prereq: junior standing and approval of adviser and faculty of the area concerned. May be repeated for different topics. 2–4 cr.

697. Honors Project
Honors seminar designed to expand the knowledge and skills presented in previous honors courses. Major focus of course is a project relevant to the discipline of nursing under the direction of a faculty adviser. Pre- coreq: NURS 629; permission. 4 cr.

794. Special Topics
Specialized courses covering information not normally presented in regular course offerings. Description of topics varies. May be repeated but not duplicate areas of content. Prereq: permission. 1–4 cr.

Nutritional Sciences (NUTR)

(For program description, see page 41.)

Coordinator: Joanne Curran-Celentano
Professors: James B. Holter, Samuel C. Smith
Associate Professors: Colette H. Janson-Sand, Alan H. Parsons, Charles Schwab, Anthony R. Tagliaferro
Assistant Professor: Joanne Curran-Celentano
Lecturer: Carolyn Giles

400. Food and People
Nutrition and food science; biological, social, political, economic, and historical significance of food. Animal food products. (Also offered as ANSC 400.) Nonmajors only. 4 cr.

405. Food and Society
Consideration of the cultural significance of food, emphasizing historical, psychological, social, political, and economic aspects. (Also offered as ANSC 405.) 4 cr.

475. Nutrition in Health and Disease
Principles of human nutrition—normal and therapeutic. Focus on source of nutrients from food, digestion, absorption, and metabolism. Discussion of role of nutrients in maintenance of normal physiology, changes in nutrient requirements through the life cycle, and diet in the prevention and/or treatment of disease. 4 cr. (Fall semester only.)

476. Nutritional Assessment
Experimental techniques in anthropometric and biochemical assessment of nutritional status with emphasis on client interviewing and nutritional evaluation in a community setting. Prereq: NUTR 475 or permission. 3 cr.

478. Food Fundamentals
Principles and techniques of food selection, preparation, and preservation in relation to quality and acceptability. 2 cr.

503. Principles of Institutional Food Service Management
Practical experience in methods of purchasing, administering, and handling food, tools, and heavy equipment used in quantity food preparation; lab experience in selective settings. Prereq: basic food preparation. 4 cr. (Fall semester only.)

550. Food Science: Principle and Practice
Principles of food composition structure and properties and the chemical changes they undergo in preparation and processing. Study of the laws and regulations that are applied to marketing food systems; principle and practice in food preservation. Application of scientific principles and interpretations of laboratory findings. Prereq: NUTR 475; general chem.; organic chem. Special fee. Lab. 4 cr. (Spring semester only.)

605. Principles of Nutrition
Principles underlying nutrition of humans and animals; digestion, absorption, intermediate metabolism, and excretion of nutrients; function of nutrients in maintenance, growth, and production; metabolic disorders resulting from inappropriate intake of nutrients and from diseases. Prereq: 1 year of chemistry; 1 semester of physiology. (Also offered as ANSC 605.) Lab. 4 cr.

699. Independent Study
Scholarly project in an area of the nutritional sciences. Regular conferences with faculty adviser. Prereq: permission. 2–4 cr.

720. Community Nutrition
Focus on managerial processes of planning, leading, and evaluating nutrition programs and the skills and tools needed to develop and present such programs. (Also offered as ANSC 720.) 4 cr. (Not offered every year.)

750. Human Nutrition
Detailed analysis of the nutrient requirements throughout the life cycle. Nutrient needs are evaluated in the context of their physiological and biochemical functions. Prereq: basic nutrition. Coreq: NUTR 751. (Also offered as ANSC 750.) 4 cr. (Spring semester only.)

755. Disorders in Energy Balance
Etiology, pathophysiology, and treatment of obesity, anorexia nervosa, and bulemia. Role of hereditary, neurological, metabolic, and environmental mechanisms. Particular emphasis on obesity. Prereq: permission of instructor. 4 cr.

760. Geriatric Nutrition
Emphasis on the nutritional requirements and status of the elderly in view of psychological and physiological changes in aging. Approaches for nutrition intervention and support will be addressed. Prereq: NUTR 475 or permission. (Also offered as ANSC 760.) 3 cr. Cr/F.

773. Clinical Nutrition
Application of principles of normal nutrition and physiology to clinical problems; altered nutrient requirements in human disease. Prereq: basic nutrition and biochemistry or permission. Coreq: NUTR 775. (Also offered as ANSC 773.) 4 cr. (Fall semester only.)

775. Practical Applications in Therapeutic Nutrition
Supervised practical experience in therapeutic dietetics in one of several cooperating New Hampshire hospitals. Emphasis on nutritional counseling, assessment, and instruction of patients with nutrition-related disorders. Coreq: NUTR 773. (Also offered as ANSC 775.) 3 cr. (Fall semester only.)

780. Critical Issues in Nutrition
Critical reviews and analysis of controversial topics in nutrition; emphasis on developing analytical reasoning skills. Prereq: permission. (Also offered as ANSC 780.) 4 cr. (Spring semester only.)

795. Honors Thesis
A special project conducted under faculty supervision and resulting in a written honors thesis. Students must initiate discussion of the project with an appropriate faculty member. Prereq: Senior major with cumulative GPA of 3.50 (3.67 in major); permission. 4 cr.

Occupational Therapy (OT)

(For program description, see page 64.)

Chairperson: Barbara Sussenberger
Associate Professors: Alice Crow-Seidel, Barbara Sussenberger, Ann D. Ury, Judith D. Ward
Assistant Professors: Elizabeth L. Crepeau, Lou Ann Griswold, Ruth Smith, Beth Seybold Strassler
Medical Lecturers: Susan Emerson, OTR, Kenneth O'Neil, M.D.
Level II Fieldwork Coordinator: Elizabeth L. Crepeau
Level I Fieldwork Coordinator: Alice Crow-Seidel

The following courses are for occupational therapy students; elective for others by permission of the course instructor.

500. The Behavior and Development of Children
Introduction to the biological, psychosocial, and cultural aspects of human development from birth through adolescence. Emphasis on theories that help explain human behavior; discussion of implications of developmental research. 4 cr.

510. Occupational Therapy Theory I
Concepts and historical perspectives of the basic theories and techniques. Fundamentals of evaluation, testing, and problem solving; planning and administering treatment. Prereq: freshman OT major. 4 cr.

511. Introduction to Professional Literature and Communication
Literature related to the practice of occupational therapy and the communication skills required of therapists. Emphasis on research in professional literature, scholarly writing, and professional terminology. Oral reporting, clinical observation, and documentation techniques. Prereq: sophomore OT major. 4 cr.

514. The Meaning of Human Occupation
A major assumption of occupational therapy, the importance of activity or occupation in sustaining health, provides the framework for the course. The meaning of occupation to individuals, major theories of occupation, and methods of assessing an individual's self care, work, and leisure activities. Laboratory experiences enable the students to acquire skills in selected activity or occupation. Minimum lab fee: $12. Prereq: OT 510. 4 cr.

581. Medical Concepts for Occupational Therapists
Disease as a dynamic process affecting activity; medical and health models. Specific disease conditions addressed by a variety of health professionals. Prereq: ZOOL 507-508 or permission. 4 cr.

582. Occupational Therapy Theory II: Rehabilitation Techniques
Techniques used by occupational therapists in rehabilitation of physically disabled clients; includes practice. Prereq: PHED 652; OT 581. 4 cr.

583. Occupational Therapy: Psychiatric Foundations
Clinical psychiatric conditions presented by a psychiatrist through patient interviews. Recognition of psychiatric symptoms, their cause, and general treatment are emphasized in follow-up sessions. Transportation fee. Prereq: PSYC 401 or permission. 4 cr.

588. Level I Fieldwork: Two One-Week Fieldwork Experiences
During the freshman and junior years, students are required to spend one week in a clinical setting during school breaks or summers. Written evaluation is required for each. Prereq: admission to OT program; permission. 1 cr. Cr/F.

600. Developmental Tasks of Adulthood
Includes the biological and psychosocial context of development. Developmental tasks as they relate to the accomplishment of prior tasks, physiological change, socioeconomic status, and psychosocial development. Prereq: child development course or permission. 4 cr.

623. Group Process
Theories of group development and models of group treatment. Comparison of normal and therapeutic groups. Group process in practice; role development and leadership concepts. Prereq: OT 583 or permission. 2 cr.

624-624L. Occupational Therapy Treatment of Psychosocial Dysfunction
Current frames of reference for occupational therapy practice in psychiatric/mental health settings. Focuses on client evaluation and treatment methods as well as an overview of program development approaches in mental health systems. Lab. Prereq: OT 623; OT 583. 4 cr.

633. Treatment in Adult Neurodysfunction
Presents diseases of the adult central nervous system. Includes beginning skills in evaluation, setting of measurable treatment objectives, and selection of treatment techniques and activities for this population. Prereq: OT 582; PHED 652; PHED 706; OT 693. Lab. 4 cr.

634. Systems of Therapeutic Intervention in Physical Disabilities
Case observation and presentation of methods of delivery and factors related to delivery of occupational therapy services. Development of treatment plans for clients with physical disabilities. Prereq: OT 633; PHED 652; PHED 706; OT 693. 4 cr.

691. Senior Honors Thesis
Completion of a research proposal based on a topic of relevance to the occupational therapy profession. Development of knowledge and skills in receiving and critiquing research and professional literature; research design and methodology; and the development of a research proposal. Required for graduation with honors in the major. 4 cr.

693. Neuro-Developmental Evaluation and Treatment
Processes involved in treatment of neuro-developmental disabilities. With thorough understanding of normal child development as base, therapist learns to differentiate among behaviors and functional styles of clients that may be considered appropriate and anticipated, delayed, or pathological. Knowledge of unique characteristics of specific disabilities and choice of appropriate assessment tools and course of therapeutic intervention. 4 cr.

694. Community-Based Occupational Therapy Services for Adults with Mental Retardation
Roles and functions of the community-based therapist serving adults with mental retardation. Characteristics of the population, the environment, and related programs and agencies. Assessment and treatment approaches are directed toward the development of community living skills to facilitate independent living. Prereq: major or permission. 4 cr.

695. Independent Study
In-depth study with faculty supervision. Prereq: junior standing in OT major; approval of major adviser and faculty of area concerned. 2–4 cr.

697. Transitions: Student to Professional
Current professional issues related to the transition from academic to fieldwork student roles. Introduction to the knowledge and skills required for the administrative functions related to clinical practice. Content covers organization, planning, supervision, accountability, evaluation, and research. 4 cr.

711. Psychosocial Dysfunction Field Work
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

712. Physical Dysfunction Field Work
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

713. Special Area Field Work
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

Ocean Engineering (OE)

(For program description, see page 71.)

710. Ocean Measurements Lab
Measurements of fundamental ocean processes and parameters. Emphasis on understanding typical offshore measurements, their applications, and the use of the acquired data, in terms of the effects on structures and processes in the ocean. 4 cr.

751. Naval Architecture in Ocean Engineering
Selected topics in the fundamentals of naval architecture pertinent to ocean engineering, including hydrostatic characteristics, basics of resistance and propulsion and rules and regulations for surface, semisubmersible, and submersible marine vehicles. Computer applications. Prereq: ME 508; ME 525;/or permission. (Also offered as ME 751.) 4 cr.

752. Submersible Vehicle Systems Design
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra/extravehicle systems, operating considerations, predesign

and design procedures. Design projects selected and completed by student teams. Prereq: permission. (Also offered as ME 752). 4 cr.

753. Ocean Hydrodynamics
Fundamental concepts of fluid mechanics as applied to the ocean; continuity; Euler and Navier-Stokes equations; Bernoulli equation; stream function, potential function; momentum theorem; turbulence and boundary layers are developed with ocean applications. Prereq: permission. 3 cr.

754. Ocean Waves and Tides
Introduction to waves: small amplitude, linear wave theory, standing and propagating waves, transformation in shallow water, energy and forces on structures, generation by wind and specification of a random sea, long waves with rotation, and internal waves. Introduction to tides: description of tides in ocean tidal generation forces, equilibrium tide, and tidal analysis. Lab/project: field and lab measurements with computer analysis. Prereq: PHYS 407-408; MATH 527;/or permission. (Also offered as EOS 754.) Lab. 4 cr.

757. Coastal Engineering and Processes
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. (Also offered as CIE 757; ME 757.) Prereq: fluid dynamics or permission. 3 cr.

761. Materials in the Ocean
Introduction to mechanical properties of materials; ferrous metals; non-ferrous metals; concrete, plastic, wood, etc.; corrosion of metals; corrosion control; durability of cementitious materials; degradation of plastics, wood, etc. in marine environment; proper materials selection for a marine environment. Prereq: permission. 3 cr.

781. Physical Instrumentation
Analysis and design of instrumentation systems. Sensors, circuits, and devices for measurement and control. Elements of probability and statistics as applied to instrument design and data analysis. Transmission, display, storage, and processing of information. 4 cr.

785. Underwater Acoustics
Vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar systems, ray and mode theory, transducers and arrays, signal analysis. Prereq: permission. 4 cr.

795. Special Topics in Ocean Engineering
New or specialized courses and/or independent study. May be repeated for credit. 2–4 cr.

Oceanography

(For program description, see page 71.)

Philosophy (PHIL)

(For program description, see page 31.)

Chairperson: Yutaka Yamamoto
Professors: Paul T. Brockelman, Duane H. Whittier
Associate Professors: Andrew Christie, R. Valentine Dusek, Neil B. Lubow, Robert C. Scharff, Barbara S. Tovey, Timm A. Triplett, Yutaka Yamamoto
Assistant Professors: Willem deVries, Kenneth R. Westphal, Charlotte Witt

Introduction to Philosophy: The 400-level courses (except 495) listed below are all introductions to philosophy; students should select among them according to interest.

401. General Introduction to Philosophy
Depending upon the instructor, the emphasis will be on basic philosophic problems, recurrent types of philosophies, or selected readings from the history of philosophy. 4 cr.

412. Beginning Logic
Principles of reasoning and development of symbolic techniques for evaluating deductive and inductive arguments. 4 cr.

417. Philosophical Reflections on Religion
Introductory philosophy of religion. To help students become critically aware of philosophical issues involved in various forms of religious belief and some of the persisting philosophical understandings of those issues. 4 cr.

421. Philosophy and the Arts
Contemporary philosophic concerns and perspectives as reflected in one or more of the arts (literature, theater, film, music, plastic art). 4 cr.

424. Science, Technology, and Society
Consideration of the scientific endeavor and its social import from a philosophical perspective. 4 cr.

430. Society and Morals
Critical study of principles and arguments advanced in discussion of current moral and social issues. Possible topics: violence, rules of warfare, sexual morality, human rights, punishment, abortion. 4 cr.

435. The Human Animal
Philosophy of biology and the evolutionary process. Readings of scientists and philosophers' commentary on scientists. Examination of the differences between scientific debate and philosophic debate. Philosophical study of scientific theory stressing humans' place in the natural world and the ethical implication of humans as natural beings in the evolutionary process. 4 cr.

436. Social and Political Philosophy
Important concepts in social and political philosophy such as natural rights, revolution, law, freedom, justice. Variable content. 4 cr.

447. Computer Power and Human Reason
The historical origins of the science of computation. The implications of the nature of information-processing for understanding the mind-body relation. Examination of the possible social, economic, and educational consequences of the computer revolution. 4 cr.

495. Tutorial Reading
Basic introductory reading under faculty direction on topics of philosophical importance. Books offered for tutorial reading may be in any area the instructor chooses or on an independent study basis. Prereq: permission. Variable to 4 cr.

496. Philosophic Topics
Introductory-level seminar in specific topics or problems (e.g., death, love, friendship) considered from a philosophic point of view. 4 cr.

For special introductory courses in the area of applied philosophy, see Fundamentals of Applied Philosophy, page 145.

510. Philosophy and Feminism
Focus on the philosophical issues in feminism primarily through the work of historical and contemporary philosophers. Topics include the question of the nature of women, feminism as an ethical and political theory, feminism as an exploration and transformation of the self, feminism as a philosophical methodology, the institutions of marriage and motherhood. 4 cr.

520. Introduction to Eastern Philosophy
Major Eastern traditions of philosophy. Concentration on Indian, Chinese, and Japanese systems may vary from semester to semester. 4 cr.

530. Moral Philosophy
Critical examination of the development of philosophical thinking regarding human values, rights, and duties. 4 cr.

550. Logic
Principles and techniques of modern logic. Topics: propositional logic, truth tables, predicate logic, and, time permitting, basic metatheorems. Prereq: PHIL 412. 4 cr.

570. Ancient Philosophy
Development of Western philosophy from its beginnings in Greece to the Roman period, with particular emphasis on the thought of Plato and Aristotle. 4 cr.

571. Medieval Philosophy
Philosophical thought of the Middle Ages from inception in the late Roman period with thinkers such as Plotinus and Augustine through the late medieval speculative mysticism of such figures as Meister Eckhart. Writings of Augustine and Thomas Aquinas. 4 cr.

572. Modern Philosophy: Rationalism
Continental European philosophers of the 17th and 18th centuries including Descartes, Leibniz, Spinoza, and Kant. Not open to freshmen. 4 cr.

573. Modern Philosophy: Empiricism
British empiricists of the 17th and 18th centuries; e.g., Locke, Berkeley, and Hume; perhaps

concluding with Kant's reaction to empiricism. 4 cr.

577. 19th-Century Philosophy
Philosophical movements such as later German idealism, French positivism, utilitarianism, pragmatism, Marxism, existentialism, and vitalism. Prereq: PHIL 572 or 573;/or permission. 4 cr.

600. Philosophy through Literature
Philosophical implications of representative literary works; content variable. 4 cr.

618. Recent Anglo-American Philosophy
Philosophical movements such as analytic philosophy, pragmatism, and process philosophy. Typical readings: Russell, Wittgenstein, James, Dewey, Whitehead. Prereq: two courses in history of philosophy (one of which may be concurrent);/or permission. 4 cr.

620. Recent European Philosophy
Major developments and themes. Representative figures: Jaspers, Husserl, Heidegger, Bloch, Lukacs, Habermas, Bergson, Marcel, Sartre, Merleau-Ponty, Ricoeur, Kolakowski, etc. Prereq: two courses in history of philosophy (one of which may be concurrent);/or permission. 4 cr.

630. Philosophy of the Natural Sciences
Philosophical problems raised by the physical and biological sciences; role of mathematics in science, nature of scientific concepts of space and time, relations of science to common sense, relation of theory to observation, logic of scientific discovery, nature of historical changes in scientific world-view, relation of logic of science to the psychology and history of science. 4 cr.

635. Philosophy of Law
Systematic study of salient features of legal systems. Possible topics: nature of law; concept of legal validity; law and morality; individual liberty and the law; legal punishment; legal responsibility and related concepts (for example, legal cause, harm, mens rea, negligence, strict liability, legal insanity). 4 cr.

640. Kant and Hegel
Prereq: two courses in history of philosophy;/or permission. 4 cr.

650. Logic: Scope and Limits
Close examination of the scope and limits of formal systems. Variable content: consistency and completeness of predicate logic; Gödel's proof and the formalization of mathematics; modal and deontic logic; set theory; finite automata and computing machines; and formal semantics. Prereq: PHIL 550; MATH 531;/equivalents or permission. 4 cr.

699. Senior Thesis
Tutorial work for philosophy department candidates for "Commendation" and "Honors." Prereq: two courses in history of philosophy, senior standing, and permission. 4 cr. Cr/F.

701. Topics in Value Theory
Philosophical inquiry into the nature of value. Topics may include the grounds of right and wrong, various conceptions of morality, the nature of good and evil, theories about the meaning of life, the nature of the beautiful. Prereq: permission. 4 cr.

702. Topics in Metaphysics and Epistemology
Advanced study in one or more of the following topics: nature of reality, relationship of thought and reality, nature of knowledge and perception, theories of truth. Prereq: two courses in history of philosophy;/or permission. 4 cr.

710. Philosophy of Religion
Philosophic nature and significance of religious experience; historical and systematic analysis of such traditional issues as the nature of faith, relation of faith to reason, arguments concerning the existence and nature of God, the problem of evil, the relationship of religion and morality, and the relationship of religion and science. Prereq: two courses in history of philosophy;/or permission. 4 cr.

720. Philosophical Psychology
Philosophical perspectives and problems concerning human nature or the human condition; e.g., the nature of "self," human action, the body-mind problem, freedom of the will, the meaning of "person," the nature of behavior, etc. Prereq: two courses in history of philosophy;/or permission. 4 cr.

725. Philosophy of the Social Sciences
Nature of explanation and understanding in the social sciences. Similarities and differences between the social and physical sciences; claims of objectivity and of subjectivity in the social sciences; role of values in the social sciences. Prereq: two courses in history of philosophy;/or permission. 4 cr.

745. Philosophy of Language
Contemporary philosophical studies of the nature of meaning and structure of language. Prereq: two courses in history of philosophy;/or permission. 4 cr.

750. Philosophy of History
Nature of historical knowledge, efforts to discover patterns of meaning in the past. Prereq: two courses in history of philosophy;/or permission. 4 cr.

780. Special Topics in Philosophy
Advanced study of special topics: e.g., a problem, figure, or movement in the history of philosophy; or selected issues, thinkers, or developments in contemporary philosophy. Prereq: two courses in history of philosophy;/or permission. 4 cr.

795, 796. Independent Study
For students who are adequately prepared to do independent, advanced philosophical work; extensive reading and writing. Before registering, student must formulate a project and secure the consent of a department member who will supervise the work. Conferences and/or written work as required by the supervisor. 1–4 cr.

798-799. Honors Thesis
Open only to philosophy majors in the University Honors Program. Students writing an honors thesis must take both of these courses, in consecutive semesters, under the supervision of two faculty advisers. Students are required to give an oral defense of their thesis. Prereq. for 799: satisfactory grade on written work in 798. 4 cr.

Fundamentals of Applied Philosophy

The following are introductory courses on the fundamentals of philosophy in practice. Special emphasis is placed on identifying and reflecting on philosophical issues that arise in the context of one's professional as well as everyday life. They are designed to interest those who wish to examine the broader philosophical implications of their chosen professional activity and also those who share the awareness that, in today's world, a systematic value-orientation must complement one's scientific knowledge and skills.

447. Computer Power and Human Reason
(For program description, see page 144.)

660. Law, Medicine, and Morals
Critical examination of the diverse legal and moral issues facing the profession of health care. Variable topics. Possible topics: duty to provide care; nature of informed consent to treatment; problems of allocating limited health care resources (e.g., withdrawal of life-support systems, quality-of-life decisions, etc.); patient's right to confidentiality; problems relating to involuntary preventive care (e.g., involuntary sterilization, psycho-surgery, etc.). 4 cr.

683. Technology: Philosophical and Ethical Issues
The bases of modern technology in, and its impact upon, people's philosophic conceptions of themselves and their world. Ethical, social, political, and ecological implications of technology. Risk and benefit criteria. Technological and humanistic philosophies of life. 4 cr.

Physical Education (PHED)

(For program description, see page 65.)

Chairperson: Stephen H. Hardy
Professor: Robert Kertzer
Associate Professors: Katherine Amsden, Michael A. Gass, Stephen H. Hardy, Phyllis A. Hoff, Walter E. Weiland
Assistant Professors: Thomas R. Barstow, Ronald C. Croce, James L. DePaepe, B. Joyce Mills, Nancy C. Rupp, Neil B. Vroman, Sally A. White
Instructors: John A. Healy, Pamela Kerr, Steven Moreau, Daniel R. Sedory

Lecturer: Kenneth T. Hult

Faculty from the Departments of Intercollegiate Athletics

Assistant Professors: Lionel J. Carbonneau, Theodore W. Conner
Lecturers: James H. Boulanger, M. William Bowes, Edmund Datti, Marisa Didio, Gerald J. Friel, Richard F. Garber, Jr., Gail A. Goodspeed, Nancy L. Krueger, Kathleen A. Sanborn, James H. Urquhart

The Major Program

Prospective physical education majors should refer to page 65 for information regarding the major programs.

The Elective Program

The Department of Physical Education provides an opportunity for students to participate in an elective activity program in a wide variety of sports, aquatics, conditioning, gymnastics, and outdoor education courses. Courses offered are listed below under Elective Physical Education Activities.

Fees are charged for off-campus activities such as backpacking, canoeing, ice climbing, rock climbing, and skiing. Students with physical limitations are encouraged to participate in the program on a modified basis. PHED 410–468 may be repeated once for credit.

Elective Physical Education Activities

410–468. Elective Physical Education
Activity coursework open to all undergraduates. Cr/F.

Half-Semester Courses (.5 credits each)

411. Figure Skating—Beginning

412. Figure Skating—Elementary/Intermediate

413. Bicycling

414. Basic Skating

415. Golf—Beginning

416. Golf—Intermediate

417. Ice Hockey

418. Ski Conditioning

420. Skiing—Beginning*

421. Skiing—Intermediate*

422. Skiing—Advanced*

423. Skiing—Racing*

424. Ski Touring—Beginning

425. Tennis—Beginning

427. Tennis—Intermediate

429. Special Topic

431. Squash

432. Ski Touring—Intermediate

433. Racquetball—Beginning

434. Racquetball—Intermediate

435. Badminton

462. Basic Canoeing

463. Basic Rock Climbing

Half-Semester Courses (1 credit each)

464. Intermediate Rock Climbing

465. Basic Ice Climbing

466. Basic Backpacking

467. Intermediate Backpacking

468. Winter Wilderness Backpacking

Full-Semester Courses (1 credit each)

437. Court Games (Racquetball, Squash)

438. Fencing—Beginning

439. Fencing—Intermediate

441. Gymnastics

442. Hiking/Orienteering

447. Advanced Lifesaving

448. Swimming—Basic

451. Volleyball

452. Weight Training

453. Beginning Yoga

454. Special Topic

457. Aerobic Activities

Activities for Physical Education Majors

470–492. Major Activity Coursework

Performance skills and beginning teaching methods.

470. Gymnastics 1 cr.

471. Outdoor Adventure Activities 1 cr.

472. Educational Gymnastics 1 cr.
Gymnastics in movement education emphasizing the problem-solving method of teaching.

473. Track and Field 1 cr.

474. Folk, Square, and Social Dance .5 cr.

475. Conditioning 1 cr.

476. Volleyball .5 cr.

477. Tennis .5 cr.

478. Lead-Up Games .5 cr.

479. Activities for Elementary School .5 cr.

482. Men's Lacrosse .5 cr.

484. Softball .5 cr.

486. Women's Lacrosse .5 cr.

487. Field Hockey .5 cr.

490. Basketball .5 cr.

492. Soccer .5 cr.

Theory Courses

500. Perspectives in Physical Education
Introduction to the profession of physical education, including concentrations on the historical, sociological, and adapted perspectives. 4 cr.

501. Advanced First Aid and Emergency Care
American National Red Cross program in advanced first aid and emergency care. (May not repeat for credit.) 2 cr. Cr/F.

502. Basic Athletic Training
Etiology, pathology, acute care, and prognosis of sports injuries. Special fee: $15. Lab. 4 cr.

503. Athletic Training Applied Techniques
Theory and lab in preventive and safety techniques including taping, wrapping, and padding. Designed to fulfill clinical skill competencies proposed by the NATA. 2 cr.

520. Water Safety Instructors' Course
Analysis of aquatic techniques; methods of teaching swimming, diving, and lifesaving. A.R.C. instructor certification awarded to candidates with high caliber of personal skill, knowledge, and teaching ability. Prereq: current A.R.C. advanced lifesaving certificate. 2 cr.

521. Theory of Coaching Basketball
Individual and team offense and defense; rules of the game. Problems in team handling and conditioning. Prereq: permission. 2 cr.

522. Theory of Coaching Football
Systems of play; team and individual offensive and defensive fundamentals; theory and strategy of team play; coaching methods, physical conditioning; rules. 2 cr.

*Gunstock

523. Theory of Coaching Hockey
Basic hockey skills. Fundamentals of individual and team offense and defense; coaching methods; rules. 2 cr.

524. Theory of Coaching Baseball
Batting and fielding; fundamentals of each position; problems of team play; coaching methods; physical conditioning; rules. Prereq: permission. 2 cr.

525. Theory of Coaching Soccer
Fundamental and advanced skills and techniques; offensive and defensive principles of team play; tactical formations and strategy; methods of training and practicing; rules. Prereq: permission. 2 cr.

526. Theory of Coaching Wrestling
Theory, practical teaching methods, and the development of skills and techniques from basic maneuvers to the more advanced. 2 cr.

528. Theory of Coaching Track and Field
Starting, sprinting, middle-distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin. Methods of training and practicing. Prereq: PHED 473. 2 cr.

529. Theory of Coaching Gymnastics
Theory, practical teaching methods, and officiating. Construction of gymnastic routines, from elementary to international level. Prereq: PHED 470 or permission. 2 cr.

530. Theory of Coaching Swimming and Diving
Philosophy, historical development, and psychological theories of coaching. Mechanical and kinesiological aspects of the competitive strokes and required optional dives, low and high board. 2 cr.

531. Theory of Coaching Field Hockey
Analysis of field hockey coaching techniques. New systems of play; use of interval training for preseason conditioning and inseason practices. Prereq: PHED 487 or permission. 2 cr.

532. Theory of Coaching Racquet Sports
Thorough and in-depth knowledge of the administration and coaching of major racquet sports: badminton, racquetball, squash, and tennis. Prereq: permission. 2 cr.

533. Basic SCUBA
Pool and classroom instruction in SCUBA fundamentals, N.A.U.I. certification for successful completion of course and 3 open water dives. Strong swimming ability required. $125 fee. 2 cr.

548. High Altitude Mountaineering
Knowledge, skills, and attitudes of mountaineering at high altitudes. Focus on techniques used when leading adventure experiences with groups for extended periods of time and distances. Prereq: permission; previous backpacking and climbing experience. 2 cr. Cr/F.

549. Ropes Course Management
Management of ropes courses as an educational and therapeutic medium with a variety of populations. Focus on initiatives, construction of high and low ropes course elements, and variety of evaluation techniques used with ropes courses. Prereq: PHED 463 or permission. Fee: $20. 2 cr.

550. Outdoor Education Philosophy and Methods
The rationale and basic structure of effective teaching techniques and procedures for outdoor education; uses an interdisciplinary approach; 3 lecture hours and field experience required. 4 cr.

552. Camp Leadership
Introductory course for training future leaders in areas of camp counseling and outdoor living skills in a variety of settings and programs; 3 lecture hours and lab/field experiences. 4 cr.

561. History of American Sport and Physical Culture
Major individuals, organizations, and trends that influenced the development of an American industry in sports, active recreation, and physical fitness. Readings, discussions, and research projects provide experience in the craft and utility of history. 4 cr.

563. The Theory of Teaching Physical Education in the Secondary School
Teaching methods. Lab. Prereq: minimum of 6 credits from coursework numbered PHED 470–492; EDUC 500. 4 cr.

607. Biology of Aging
Biological mechanisms of the aging process, with special emphasis on human aging; changes due to chronic disease. Prereq: permission. 4 cr.

610. Adapted Physical Education
Common disorders of handicapped children; practical experience in the remediation of those disorders through the use of adapted physical education activities. Lab. Prereq: ZOOL 507-508. 4 cr.

620. Physiology of Exercise
Acute and chronic effects of exercise. Muscle physiology, respiration, cardiac function, circulation, energy metabolism, and application to training. Prereq: ZOOL 507-508. 4 cr.

621. Exercise Laboratory Techniques
Administration of graded exercise tests on treadmill, bicycle ergometer, and stepping bench. Monitoring physiological variables during the graded exercise test. Calculation of metabolic data resulting from the exercise test. Prereq: PHED 620. 3 cr.

625. Dynamics of Human Movement
Kinesiological consideration of factors that affect efficiency. Cinematographic and noncinematographic forms of analysis of selected movement events and sequences. Prereq: ZOOL 507-508. (Not open to students who have taken PHED 652). Lab. 4 cr.

635. Sport in Literature
Survey of sport as it is recorded in literature, both classical and contemporary, and the effect of sport on writing. 4 cr.

636. Introduction to Sports Information
Basic concepts of sports information related to preparation of material for public relations including radio, television, and publications. Includes guest lecturers and work in the UNH Sports Information Office. 2 cr.

650. Exercise Specialist Internship
A one-semester internship in an agency that offers physical activity programs of prevention, intervention, and rehabilitation. Activities include graded exercise testing, exercise prescription, and exercise session leadership. Prereq: open only to students who are enrolled in the exercise specialist option and have completed all requirements for the option. 8 cr. Cr/F.

652. Clinical Kinesiology
The science of human motion. Human muscular anatomy; actions of skeletal muscles using electromyographic evidence. Applications of concepts of muscle physiology and biomechanics to physical education activities. Lab. Prereq: ZOOL 507-508. (Not open to students who have taken PHED 625.) 4 cr.

668. Measurement Procedures in Physical Education
Essential elementary statistical methods; measurement data scientifically evaluated for application to the program. Lab. 4 cr.

675. Motor Development of the Young Child
Characteristics of motor behavior across time, and the role of movement in a child's total development. Growth processes, analysis of movement, variations in movement due to maturation, environment, and experiences. Prereq: PHED 472 or permission. Lab. 4 cr.

681. Theory of Adventure Education
Basic skills and theories necessary in developing adventure education activities. Prereq: 2 outdoor adventure activity classes and permission. Three hours of lecture and field experience. 4 cr.

682. Outdoor Leadership
Provides students with leadership experience and new skills in vigorous environments. Students must have previous outdoor skill experience. Three class hours per week plus two weekend field experiences. Offered both semesters—may be taken once in each semester. 2 cr.

683. Organization and Administration of Outdoor Education
Study of the administration of outdoor education programs using a variety of organizational models. Students develop and, through simulated exercises, manage a program. Field experience. Prereq: PHED 550; junior standing. 4 cr.

685. Emergency Medical Care: Principles and Practices
Basic emergency health care, including cardiopulmonary resuscitation (CPR), trauma patients, medical and environmental emergencies, and childbirth. Includes clinical experience with a local hospital and ambulance service. Prepares the student for the National Registry of EMTs Examination. Prereq: permission. Lab. Fee. 4 cr. Cr/F.

692. Theories of Teaching Physical Education in the Elementary School
Current theories and methods; consideration given to growth and developmental needs in curriculum planning. Prereq: 6 credits from PHED 470-492; EDUC 500; PHED 675. Lab. 4 cr.

693. Teaching Assistantship
A) Teacher Preparation; B) Exercise Leader; C) Outdoor Education; D) Science Labs; E) Cardiac Rehabilitation. Students serve as teaching assistants in assigned class activities. Assignments to be made by the class instructor may include teaching assistants' and administrative duties. May take two different sections. Prereq: junior standing; permission of adviser and instructor. (max. 4 cr.) 2 cr. Cr/F.

694. Internship
A) Outdoor Education; B) Teacher Preparation; C) Sports Communication. Students may apply for credit for internship experiences that are directly related to their option. Internships may be on or off campus. Prereq: PHED major; min. 64 accum. cr.; permission of adviser and department chairperson. (max. 4 cr.) 2–4 cr. Cr/F.

696. Independent Study
In-depth study. Prereq: PHED major with junior standing and approval of academic adviser and department chairperson. 2–4 cr. to a maximum of 4 cr.

699. Honors Project
Project first involves tutorial sessions to introduce the student to the experimental design, after which a research question is developed. After an appropriate literature review, the student collects and analyzes data, forms conclusions, and prepares a written report on the findings. 4 cr.

700. Applied Statistics
Statistical procedures and associated elements of basic research design with direct, practical application to areas within physical education and other health disciplines. Prereq: PHED 668 or equivalent. 4 cr.

702. Advanced Athletic Training
Assessment, rehabilitative treatment, preventive strapping, and protective equipment used in athletic training. Administration of a training room facility. Lab. Prereq: PHED 502. 4 cr.

703. Laboratory Practice in Athletic Training
150 hours of experience in UNH athletic training room under N.A.T.A. certified trainer. Prereq: PHED 502. May be repeated up to 8 cr. 2 cr.

706. Neurology
Morphology, physiology, and histology of the human nervous system. Lab. Prereq: ZOOL 507-508. 4 cr.

722. Graded Exercise Testing and Exercise Prescription
Graded exercise testing and its application to the prescription of exercise. Special emphasis on the patient with cardiovascular disease. Prereq: PHED 620. 4 cr.

725. Functional Kinesiological Analysis and Remediation
Normal and pathological movement patterns; important anatomical, physiological, and biomechanical variables constraining movement organization; and appropriate programs for ameliorating physical and motor dysfunction in special populations. Prereq: PHED 652 or equivalent; PHED 620. Lab. 4 cr.

732. Electrocardiography
Introduction to the reading and assessment of EKGs. Prereq: PHED 620 or equivalent. 4 cr.

733. Environmental Physiology
Human physiological response to both acute and chronic effects of various environmental conditions, such as heat, cold, altitude, and air pollution. Prereq: PHED 620 or permission. 4 cr.

740. Perceptual Motor Dysfunction
Theoretical rationale and clinical perceptual-motor training programs of Ayres, Kephart, Cratty, Barsch, and Getman, as they relate to sensory-motor integration and the remediation of learning disabilities. Prereq: PHED 775 or permission. 4 cr.

741. Sport in Society
Investigation of interrelationships among sport, culture, and society in an attempt to understand better the role and function of sport in contemporary society. Overview of selected sociocultural factors that influence and result from participation in sports. Prereq: SOC 400 or permission. 4 cr.

742. Diagnostic/Prescriptive Psychomotor Assessment
Overview of diagnostic and prescriptive procedures used in special physical education. Description, practice, and critical analysis of psychomotor assessment instruments used by practitioners. Provides a practical and philosophical understanding of psychomotor assessment for use in discerning level of performance in special needs children. Prereq: PHED 668. Lab. 3 cr.

744. Physical and Medical Aspects of Disabling Conditions
Study of disabilities caused by anomalies in the neurological, cardio-respiratory, sensory, and musculoskeletal systems. Programming techniques necessary for physical and motor development relative to present physiological and kinesiological functioning. Prereq: PHED 610. 3 cr.

760. Application of Research to Teaching and Coaching
Pertinent research findings in sport psychology, sport sociology, exercise physiology, biomechanics and kinesiology, and motor learning and development. Prereq: PHED 668 or equivalent; permission. 4 cr.

775. Perceptual Motor Learning
Variables affecting the learning and performance of skilled activity; ability and motivational characteristics of the learner; processes for skill acquisition. Prereq: PSYC 401. Lab. 4 cr.

780. Psychological Factors in Sport
Factors of outstanding athletic achievement; psychological variables in competition; the actions and interactions of sport, spectator, and athlete. Prereq: PSYC 401 or PHED 775. 4 cr.

791. History of Physical Education
From ancient Egypt to modern times. Influences of Greece, Rome, the Renaissance and Reformation periods, and modern European nationalism. Analysis of events and the beliefs of leaders in the development of systems of physical education. 4 cr.

795. Special Topics
New or specialized courses not normally covered in regular course offerings. Prereq: permission. May be repeated up to 8 cr. 2–4 cr.

Physics (PHYS)

(For program description, see page 58.)

Chairperson: Jochen Heisenberg
Professors: Roger L. Arnoldy, L. Christian Balling, John R. Calarco, Edward L. Chupp, John F. Dawson, Jochen Heisenberg, Robert E. Houston, Jr., Richard L. Kaufmann, Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., Harvey K. Shepard, Robert E. Simpson, William R. Webber, John J. Wright
Research Professors: Joseph Hollweg, Martin A. Lee
Associate Professor: F. William Hersman
Research Associate Professors: Terry Forbes, David J. Forrest, James M. Ryan
Assistant Professor: Dawn C. Meredith
Research Assistant Professors: George A. Simpson, W. T. Vestrand

401-402. Introduction to Physics I and II
Broad survey of classical and modern physics. Designed to enable students to appreciate the role of physics in today's society and technology. Emphasis on the fundamental laws of nature on which all science is based, with some examples of interest to biologists. Knowledge of high school algebra and trigonometric functions essential. Lab. 4 cr.

405. Concepts of Physics
Descriptive course investigating a limited number of important physical systems. Emphasis on how the system is to be investigated and the patterns in which the results fall. Intuitive concepts used in investigations traced into

their application in modern physics. Patterns of thought in physics related to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 cr.

406. Introduction to Modern Astronomy
Descriptive coverage of contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. Knowledge of high school algebra is assumed. Lab. 4 cr.

407-408. General Physics I and II
Introductory course emphasizing mechanics and electromagnetism. Recommended for the student specializing in science and engineering. Prereq: thorough knowledge of algebra and trigonometry; MATH 425 for 407, and MATH 426 for 408, or taken concurrently. Students may not receive credit for both 401 and 407 (or 402 and 408). Lab. 4 cr.

412. Technical Physics
Introductory course emphasizing the fundamentals of mechanics, heat, electricity, and other subjects underlying modern machinery and instruments. Recommended for Thompson School students. Prereq: algebra, trigonometry; permission. Lab. 4 cr.

505. General Physics III
Fluid dynamics, thermodynamics, kinetic theory, optics, and wave motion. Prereq: PHYS 407; MATH 425, 426. Lab. 4 cr.

506. General Physics IV
Introduction to modern physics including special relativity, quantum theory, and atomic and nuclear structure. Prereq: PHYS 407-408; MATH 425, 426. Lab. 4 cr.

602. Thermal Physics
Classical and statistical approach to thermodynamics, kinetic theory. Prereq: PHYS 505; MATH 528. 3 cr.

605-606. Experimental Physics I and II
Circuit design with passive and active elements; electrical measurements for experimental physics; digital electronics and interfacing techniques. Prereq: PHYS 408, 505; MATH 527 passed or taken concurrently. Lab. 4 cr.

607. Optics
Geometrical optics, electromagnetic theory of light, interference, diffraction, polarization, related phenomena and nonlinear optics, Prereq: MATH 527; MATH 528. Lab. 4 cr.

615. Introduction to Mathematical Physics
Application of mathematical analysis to physics, including complex numbers, multiple integrals, vector analysis, and Fourier series. Prereq: MATH 427-428; 527-528. 3 cr.

616. Physical Mechanics
Analytical treatment of classical mechanics covering the dynamics of particles and rigid bodies, at an intermediate level. Prereq: PHYS 407; MATH 527-528 (or taken concurrently). PHYS 615 recommended. 3 cr.

701-702. Introduction to Quantum Mechanics I and II
Nonrelativistic Schroedinger equation, the hydrogen atom, applications to atomic and nuclear structure. Prereq: PHYS 615; MATH 646 desirable. 4 cr.

703-704. Electricity and Magnetism I and II
Foundation of electromagnetic theory; electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory. Prereq: PHYS 615; MATH 646 desirable. 4 cr.

705-706. Experimental Physics III and IV
Modern physics experiments and special project problems assigned to individual students. Prereq: senior standing in physics. Lab. 3 cr.

710. Introduction to Modern Astrophysics
Review of the sun, stars, Milky Way, external galaxies, and expansion of the universe. Recent discoveries of radio galaxies, quasi-stellar objects, cosmic black-body radiation, X rays, and gamma rays precede a discussion of Newtonian and general relativistic cosmological models, steady-state/big-bang theories, and matter-antimatter models. Prereq: PHYS 616; MATH 527 or permission. 4 cr. (Offered if sufficient demand.)

718. Introduction to Solid State Physics
Theory underlying the behavior of solids. Transport theory and the interaction of radiation and matter. Operation of semiconducting and superconducting devices and lasers. Prereq: PHYS 615; 616; 701. 4 cr. (Offered if sufficient demand.)

791. Special Topics
Any selected topics not covered sufficiently in a general course may be studied. May be repeated to eight credits. 4 cr.

795. Independent Study
Individual project under direction of a faculty adviser. Prereq: department permission. 1–8 cr.

Plant Science (PLSC)

(For program description, see page 41.)

Chairperson: Owen M. Rogers
Professors: George O. Estes, Yun-Tzu Kiang, J. Brent Loy, Lincoln C. Peirce, Owen M. Rogers, Douglas G. Routley, Otho S. Wells
Associate Professors: James R. Mitchell, James E. Pollard, John M. Roberts
Assistant Professor: Thomas Medford Davis

401. Plant Science Orientation
Overview of plant science research and teaching facilities; introduction to research, extension, and educational functions within the department; career opportunities in plant science. Required of all first-year plant science majors. 1 cr. Cr/F.

421. Concepts of Plant Growth
Fundamentals underlying plant growth and response in natural and modified environments. Special fee. Lab. 4 cr.

427. Landscaping the Home Grounds
Design and maintenance of small properties; arrangement, plant use for the beautification of home surroundings. Lab. 4 cr.

445. Nursery Culture and Operation
Development of a nursery business from site selection to marketing the finished product, with emphasis on plant production. Prereq: permission. (Also offered as TSAS HT 245.) Lab. 3 cr.

457. Horticultural Facilities Management
Construction designs, management principles, and practical applications of horticultural techniques through participation in the operations of the Thompson School horticultural growth structures, including greenhouses, coldframes, lath houses, and nursery areas. Prereq: permission. (Also offered as TSAS HT 257.) Lab. 2 cr.

458. Bedding Plant Production
Bedding plant production, cultural requirements, crop timing, marketing principles. Includes common annuals, perennials, vegetables, and herbs of the Northeast. Field trips. 7-week module. Prereq: permission. (Also offered as TSAS HT 258.) Lab. 2 cr.

460. Flower Garden Design and Culture
Bedding plant identification, installation, and maintenance, and garden design. Includes annuals, perennials, herbs, and bulbs of common use in the Northeast. Field trips. 7-week module. Prereq: TSAS HT 248 and 251;/or permission. (Also offered as TSAS HT 260.) Lab. 2 cr.

463. Floricultural Crop Production
Leading cut flower crops, potted plants, and bulbous crops, including cultural requirements, crop timing, harvesting procedures, distribution systems, and marketing principles. Prereq: permission. (Also offered as TSAS HT 263.) Lab. 3 cr.

507. Weed Science
Identification of weeds, their biological characteristics, and principles of control. Prereq: PLSC 421. Lab. 2 cr.

535. Domestication and Use of Plants
Genetic process of plant domestication, origin of agriculturally based cultures, use of plant or plant-derived products in early and contemporary societies. Lab. 4 cr.

566. Turf Management
Adaptation and management of fine turf grasses for recreational, aesthetic, and functional use. Lab. 4 cr.

606. Plant Physiology
Structure-function relationship of plants, internal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral

nutrition. Prereq: BOT 412, BIOL 411-412, or PLSC 421; one year of chemistry; or permission. Lab. Coreq: PLSC 608. (Also offered as BOT 606.) 3 cr.

608. Plant Physiology Laboratory
Analytical techniques for plant physiology, effects of growth regulators on plant growth and development, cell and tissue culture, enzyme kinetics, and plant water relations. Coreq: PLSC 606. (Also offered as BOT 608.) Special fee. 2 cr.

612. Genetics of Domesticated Plants
Introduction to Mendelian inheritance, plant domestication, reproductive systems, crop improvement, and seed technology. Prereq: PLSC 421, BOT 412, or equivalent. Will not satisfy biology core requirement for genetics. 3 cr.

651. Fruit Crops
Tree fruits and small fruits of the temperate zone: culture, management, and marketing for the small enterprise. Lab. 4 cr.

652. Vegetable Crops
Technology and systems for producing and marketing vegetables locally and nationally; study of characteristics of specific crops and of their response to environment. Prereq: PLSC 421 or equivalent. 4 cr. (Not offered every year.)

653. Forage Crops
Selection, establishment, and management of crops grown for livestock utilization; field-oriented lab. Prereq: PLSC 421 or BOT 412 or permission. Lab. 4 cr.

654. Cereal Crops
Management practices related to the production and utilization of the world's grain crops. Term project required. Prereq: PLSC 421 or BOT 412, or permission. 4 cr. (Not offered every year.)

672. Plant Propagation
Sexual and asexual propagation of horticultural plants. Lab. 4 cr.

678. Ornamental Plants
Their identification, culture, and use. Prereq: BOT 566 or equivalent. Lab. 4 cr.

682. Sustainable Food Systems
Lectures, laboratories, and field trips covering resource use in the food chain. Historical perspective of traditional resource management and sustainability. Genetic and physiological basis for improved resource use in plant/animal systems. Resource depletion and opportunities for recovery/substitution. Comparative analysis of enterprises in terms of profitability. Socioeconomic and ethical issues associated with technological innovation. Lab. 4 cr.

684. Plant Science Practicum
Independent project based on concurrent employment in an approved area of plant science. Final report in the form of a term paper is required. Credits and requirements for the term paper will be negotiated by the student and a supervising faculty member chosen by the students. Prereq: permission. 1–4 cr. Cr/F.

705. Population Genetics
Population growth and regulation; genetic variation; factors affecting gene frequency; ecological genetics. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

740. Evolutionary Biology
Origin of life; source of genetic variation, population structure, mechanisms of evolution; molecular evolution; ecological adaptation in animals, plants, and man; community structure and evolution. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

750. Topics in Agricultural Applications of Statistics and Computing
A) Current Applications of Computers in Agriculture; B) Development of Computer Applications in Agriculture; C) Simulation of Crop Development; D) Agricultural Systems; E) Techniques for Field Experiments. Two-credit, 7-week modules offered in the middle of the spring semester. Consult plant science department for current offering. Prereq: permission. 2–10 cr.

773. Breeding Improved Varieties
Techniques for creating new varieties of crop and ornamental plants. Prereq: genetics. 3 cr.

774. Plant Cell Culture and Genetic Engineering
Theory and techniques of cell/tissue culture and genetic manipulation in plants, transformation vectors, somatic cell genetics, regulation of foreign gene expression, molecular basis of agriculturally important traits, environmental and social implications of genetic engineering in plants. Prereq: BIOL 604 or permission. Coreq: PLSC 775. (Also offered as BOT 774 and GEN 774.) 3 cr.

775. Plant Cell Culture and Genetic Engineering Lab
Techniques of plant cell and tissue culture, protoplast fusion, genetic transformation. Mutant cell selection, analysis of foreign gene expression. Coreq: PLSC 775. (Also offered as BOT 775 and GEN 775.) Special fee. 2 cr.

776. Radiation Biology
Nature, sources, and behavior of ionizing radiation and its interaction with biological systems. Detection, measurement, and dosimetry techniques. Radiation effects on cells, organs, and organisms. Radiotracer techniques in biological research and medicine. Terrestrial and marine radioecology; pathways through the food chain. Environmental radioactivity, nuclear power, weapons systems, and waste disposal. Lab. 4 cr.

795, 796. Advanced Topics in Plant Science
Independent research, study, or group discussion. A) Physiology; B) Genetics; C) Plant Utilization; D) Microscopy. Prereq: permission. 2 or 4 cr.

797. Senior Seminar
Library research, presentation, and discussion of current topics in plant science. Attendance of selected seminars in related subject areas. Required of all senior majors in plant science. 1 cr. Cr/F. (Fall semester only.)

799. Honors: Senior Thesis
Students work under the direction of a faculty sponsor to plan and carry out independent research resulting in a written thesis. Two-semester sequence; an "IA" grade (continuous course) will be given at the end of the first semester. 4–6 cr.

Political Science (POLT)

(For program description, see page 32.)

Chairperson: Robert E. Craig
Professors: Bernard K. Gordon, David L. Larson, David W. Moore, George K. Romoser, B. Thomas Trout
Associate Professors: Warren R. Brown, Robert E. Craig, John R. Kayser, Lawrence W. O'Connell, Susan O. White, Clifford J. Wirth
Assistant Professors: Joseph P. Ford, Judith A. Gentleman, Aline M. Kuntz, Susan J. Siggelakis
Visiting Lecturer: Andrzej Bryk

Introductory Courses

400. Contemporary Politics
Examination of varying domestic and international political issues such as censorship, electoral reform, terrorism, international security, corruption, and environmental pollution. 4 cr.

401. Politics and Society
Introduction to the nature of politics and political institutions. Emphasis on political behavior and continuing issues of modern politics, such as power, authority, legitimacy, freedom, and order. 4 cr.

402. American Government and Politics
Institutions and processes of national government in the United States; political culture of the American people. Structure of national government; role of general public in government; cultural influences on American politics. 4 cr.

403. United States in World Affairs
Major issues in world affairs since 1945 as they relate to United States foreign policy: U.S.-Soviet relations, third-world politics, regional and alliance politics, weapons technology and resource depletion, economic development, and population control. 4 cr.

405. Science of Politics
Introduces students to the quantitative analysis of political problems, using techniques common to all the social sciences. Scientific method as it applies to the social sciences; basic statistical techniques used in political research. 4 cr.

595, 596. Explorations in Politics
Designed to meet special interests of students and instructors in exploring selected issues in

political science. See departmental listings for semester offerings. 2–4 cr.

American Politics

500. American Public Policy
Political and economic factors that mold the processes by which American policymakers deal with such domestic issues as crime and violence, poverty and inequality, inflation and unemployment, urban blight and renewal, and energy and the environment. 4 cr.

502. State Government and Federalism
Powers, politics, and constitutional setting of American state governments: state legislatures, governorships, party systems, interest groups, taxation, welfare, environment, and education. 4 cr.

503. Local Government and Politics
Structure, politics, and legal setting of American local government, including towns, cities, counties, and special districts. Community power and decision making; town meetings and such issues as home rule, zoning, and the property tax. 4 cr.

504. American Presidency
Role and powers of the presidency in domestic and foreign affairs. The president as administrator, policymaker, and political leader. Executive-congressional relations. 4 cr.

505. American Congress
Role and powers of congress as national lawmaker and check on the executive branch: committee structure, concepts of representation, legislative oversight, and party cleavage, federal budget control and foreign policy involvement. 4 cr.

506. Parties, Interest Groups, and Voters
Role of political parties as organizers and managers of social conflict. Role of voters in controlling parties and government. Influence of interest groups in the electoral process and in governmental decision making. 4 cr.

507. Politics of Crime and Justice
Criminal justice in theory and practice; contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the administration of criminal justice. 4 cr.

508. Supreme Court and the Constitution
Supreme court treated as a political institution whose historic mission is to decide all controversies arising under the constitution between the nation and the states, the president and congress, governments generally and the people regarding their respective rights and duties. 4 cr.

509. Bureaucracy in America
Growth and development of the bureaucratic state. Roles and powers of administrative officials, decision making in bureaucratic settings, citizen participation, and the influence of interest groups on bureaucratic policy making. 4 cr.

510. Mass Media in American Politics
Contemporary review of media in politics; major roles of media today in providing news, setting public agenda, influencing public opinion; government regulation vs. media responsibility; future developments and consequences for American democracy. 4 cr.

511. Marine Policy
Legal and policy aspects of coastal zone, continental shelf, and ocean resource management including fish, oil, gas, pollution, offshore installations, and the deep seabed. 4 cr.

512. Public Opinion in American Politics
Relationship of mass and elite opinion within the context of American political culture. Impact of public opinion on American governmental policies, especially with respect to major issues facing the president and congress. Appraisal of responsiveness to influence and responsibility to lead. 4 cr.

513. Civil Rights and Liberties
Analysis of three major areas of constitutional rights and liberties—political freedom, equal protection of the laws, and due process—with particular attention to their impact on such problems as political protest, discrimination, school segregation and busing, and student rights. 4 cr.

514. Energy Policy and Politics
Focuses on resources, trends, risks, and futures of all energy forms; energy politics is examined at the federal, state, and local levels and includes the following topics as related to energy: public opinion, Congress, lobbying, the presidency, bureaucracy, regulation of utilities, intergovernmental relations, and the nuclear energy controversy. 4 cr.

600. Selected Topics in American Politics
Special topics such as politics and public affairs in New Hampshire, the press and the media in America, women in politics, and civil liberities. See department listings for semester offerings. 4 cr.

601. Election Practicum
Field work in political campaigns combined with analysis of the electoral process. Prereq: permission. 4 cr. (Not offered every year.)

701. The Courts and Public Policy
Impact of judicial decisions on public policy at federal, state, local, and regional levels. 4 cr.

702. Public Planning and Budgeting
Analysis, goal setting, and strategic planning in a governmental setting, with particular emphasis on budgetary processes as a means for controlling policy effectiveness. 4 cr.

703. Urban and Metropolitan Politics
Planning and management of the urban community, intergovernment relations, administrative functions, and general urban problems. 4 cr.

704. Policy and Program Evaluation
Policy and program evaluation of federal, state, and local governmental enterprise; focuses on the politics, practices, and methods of evaluative investigation. Evaluation as a technique for providing rational information for budgetary and policymaking decisions. 4 cr.

797, 798. Section B: Seminar in American Politics
Advanced analysis and individual research. Prereq: senior standing. 4 cr.

797, 798. Section F: Seminar in Public Administration
Advanced analysis and individual research, including opportunities for direct observation of governmental administration. Prereq: senior standing. 4 cr.

Comparative Politics

544. Dictatorship and Totalitarianism
Political systems of Nazi Germany, Fascist Italy, Stalinist Russia, and Maoist China; the movements that gave rise to them and their significance for understanding political behavior. 4 cr.

550. Major Foreign Governments
Concepts for comparing and contrasting modern political systems. Ideologies, political movements, and various forms of the modern state; different models of development and modernization. Examples from Western-style democracies, communist systems, and the developing countries of the Third World. 4 cr.

552. Contemporary European Politics
Politics and governments in Western Europe, with attention to both basic characteristics of political life in different countries and current issues of politics. 4 cr.

553. Developing Nations
Politics in selected developing states in Africa, Latin America, Asia, and the Middle East. Issues and concepts of political change. 4 cr.

555. Politics in the USSR
Background, structure, leadership, and underlying issues of the Soviet political system. Ideological bases, political history, and contemporary trends. 4 cr.

556. Politics in China
Historical development, structure, ideological bases, and underlying contemporary issues of the Chinese political system; influence of ideology and the role of Maoism. 4 cr.

557. Politics in Japan and Southeast Asia
Major noncommunist governments in East Asia; parties and policy making in Japan and other states such as Malaysia, Thailand, Indonesia, and the Philippines. 4 cr.

558. Government and Politics of Canada
Cultural background of party competition, role of ideology, structure of government, and contemporary issues in Canadian political system. 4 cr.

559. Latin American Politics
Analysis of selected political problems of specific countries. Focus varies from year to year. Emphasis on economic and social development, institutions, political change, and conflict. 4 cr.

651. Selected Topics in Comparative Politics
Specialized areas or issues such as regional politics, national politics, judicial systems, administrative law, constitutions, etc. See department listing for semester offerings. 4 cr.

741. Politics of Industrialized States
Impact of modern industrialism and its organization upon political life, social structure, and the conduct of government. 4 cr.

742. Communist Systems
Interests, demands, and decision making in communist governments. Ideological issues, political behavior within communist international organizations, intraparty relations, distinctions between ruling and nonruling communist parties. 4 cr.

797, 798. Section C: Seminar in Comparative Politics
Advanced analysis and individual research on foreign nations or regions, focusing on governmental institutions, foreign policy, political parties, or bureaucracy. Prereq: senior standing. 4 cr.

International Politics

560. World Politics
Issues and structures that shape contemporary international politics, including rise of the nation-state system, conflict and its resolution, and problems of national interest and choice between nations. 4 cr.

561. American Foreign Policy
Constitutional, institutional, political, and societal factors that influence the formulation and execution of U.S. foreign policy. 4 cr.

562. Strategy and National Security Policy
Defense and deterrence among the major powers, including the impact of modern weapons on war and arms limitations, the military as a profession, and the role of the armed forces in shaping defense policy. 4 cr.

563. Foreign Policies of Europe
East-West relations, security alliances, economics and political cooperation, and impact of domestic changes and superpower relationships upon the international politics of Europe. 4 cr.

564. Soviet Foreign Policy
Background and contemporary perspectives of the Soviet role in international politics. Particular emphasis on issues in international communism, Soviet-American relations, Soviet arms development, and Sino-Soviet relations. 4 cr.

565. Foreign Policies of Asia and the Pacific
Current foreign and defense policies as they affect the Pacific region. International politics of China, Japan, and selected Southeast Asian nations, including their efforts at cooperation. 4 cr.

660. Selected Topics in International Politics
Specialized areas or issues in international relations such as conflict resolution and disarmament, European perspectives on American politics, contemporary diplomatic practices, seapower, and defense. 4 cr.

760. Theories of International Politics and Integration
General explanations of the behavior of nations; theory and practice of supra-national integration; theories of peace and security and community building at the international level; concepts and experience in arms limitations and conflict resolution. 4 cr.

761. International Law
Formalized processes for regularizing state behavior; development of norms based on custom, precedent, and formal institutions, as in treaties and cases. Arms reduction and limitation arrangements; inspection, and other formal procedures designed to preserve peace. 4 cr.

762. Politics of International Trade and Development
Explores the postwar global trade system, against the background of calls for increased protectionism. Emphasis given both to domestic as well as to international political considerations. 4 cr.

778. International Organization
Collective security and other forms of cooperation among nations through international organizations such as the United Nations and its predecessors, and through regional bodies. 4 cr.

797, 798. Section E: Seminar in International Politics
Advanced analysis and individual research; emphasis on developments in theory. Prereq: senior standing. 4 cr.

Political Thought

520. Justice and the Political Community
Origin of the idea of justice, relationship between politics, justice, and morality; selections from Plato, Aristotle, Roman, Islamic, and Christian political philosophers. 4 cr.

521. Rights and the Political Community
Human rights and the quality of communities as expressed in Hobbes, Locke, Mandeville, Rousseau, and others. 4 cr.

522. Dissent and the Political Community
Current political ideologies and controversies in America and abroad; liberal democracy and its critics since the 19th century. 4 cr.

523. American Political Thought
American political thinkers and observers of American politics; the founding of the Republic; problems and tensions reflected in the writings of Calhoun, Thoreau, Lincoln, de Tocqueville, and others; relations between liberty and authority, democracy and stability, capitalism and alienation. 4 cr.

524. Politics and Literature
Classical and contemporary works of literature to illustrate perennial issues in political philosophy; among authors studied are Aristophanes, Sophocles, Shakespeare, Melville, Tolstoy, and Sartre. 4 cr.

620. Selected Topics in Political Thought
Selected issues in political theory, such as liberalism and conservatism, radical political thought, the American political character, and others. See department listings for semester offerings. 4 cr.

720. Perspectives on Political Science
Different views on the study and meaning of politics. Perspectives of political scientists, political philosophers, and political activists. 4 cr.

721. Politics and Economics: Political Economy and the Modern State
The modern state and issues of political economy. This relationship will be covered by treatments of Adam Smith, David Ricardo, Karl Marx, Max Weber, John Maynard Keynes, and Joseph Schumpeter. Final stages of course includes discussion of issues of "supply-side" economics, private and public planning priorities, and current criticism of the welfare state. 4 cr.

797, 798. Section I: Seminar in Political Thought
Advanced treatment and individual research. Prereq: senior or graduate standing. 4 cr.

Internships, Advanced Studies, and Honors Thesis

602A, B. Internship in Political Science
Field experience in a governmental or nongovernmental organization at the local, state, national, or international level. Arrangements should be made through the political science department. Open to juniors or seniors with at least a 3.00 GPA. Permission of the Undergraduate Program Committee of the department is required prior to the internship. From 4 to 16 credits may be taken; however, only 4 credits may be for grade. The rest will be credit/fail, and only 4 credits may be applied to the political science major. May be taken in conjunction with Advanced Study in Political Science. 602 A) Variable 4–12 cr. Cr/F. 602 B) 4 cr. Letter grade.

795, 796. Advanced Study in Political Science
Senior POLT majors, with a cumulative average of 3.20 or greater, may undertake advanced study (political science), in an area of their choice, in consultation with member(s) of the faculty. Normally, the result of the project will be a significant written product of a quality comparable to that done at the 700 course level. Students must initiate the project discussion and obtain approval of the Undergraduate Program Committee of the department before

undertaking the project. The advanced study project will constitute the tenth course in the major, and the department will recognize the completion of advanced study by recognizing the student as having completed the major "with distinction." 4 cr.

799. Honors Thesis
Senior POLT majors, with a cumulative average of 3.20 or greater, may undertake a special honors project in an area of their choice. The results of this special project will be a significant written product constituting an honors thesis, under the supervision of a faculty sponsor. Students must initiate the project discussion and obtain the approval of the Undergraduate Program Committee before undertaking the project. The honors thesis will constitute the tenth course in the major. 4 cr.

Portuguese (PORT)

Department of Spanish and Classics
(For faculty listing, see page 160; see also course listings under Spanish.)

401-402. Elementary Portuguese
For students without previous knowledge of Portuguese. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of the language. Labs. No credit toward a major. (No credit for students who have had two or more years of Portuguese in secondary school; however, any such students whose studies of Portuguese have been interrupted for a significant period of time should consult the chairperson about possibly receiving credit.) 4 cr.

503-504. Intermediate Portuguese
Conversation and composition based on readings in contemporary Portuguese and Brazilian literature, especially theater, which is closest to conventional language. A traditional grammar text supplements reading. Lab. 4 cr.

Program for International Perspectives (PIP)

(For program description, see page 72.)

401. International Perspectives: Science, Business, and Politics
Examination of the interaction of developments in science, economics, and politics as they shape international affairs. Topics include science and technology; world trade and investment; politics, cultural values, and ethics in world affairs. Team-taught, modular course. 4 cr.

501. North-South Issues in International Affairs
Comprehensive survey of underlying economic and social differences creating the dialogue and conflicts between the Third World and the industrialized nations. Preference given to those who have completed PIP 401 and to dual majors. 4 cr.

685-686. Foreign Experience
Dual majors will register for PIP 685-686 for foreign experience situations not covered by the foreign language departments' Study Abroad (685-686). Most commonly this will be study in a non–English-speaking country for an academic year, summer, or a semester. It should be in a country where the language spoken is that which the student presents to satisfy his/her foreign language requirement. The University Committee on International Studies will consider alternative experiences such as internships or purposeful travel upon petition. Prereq: permission. 0–16 credits. (Financial aid requires a minimum of 6 cr.) Cr/F.

699. Topics in International Affairs
Special topics course with varying subject matter and format. Study of areas and subjects not covered by existing courses. Center for International Perspectives provides information on current offering. Recommended as a dual major elective. 4 cr.

701. Seminar in International Affairs
Capstone of the dual major in international affairs. To be taken after completion of the foreign language and foreign experience requirements. Strong emphasis on research and analysis, use of foreign language skills, writing, and criticism. Prereq: permission. 4 cr.

Psychology (PSYC)

(For program description, see page 32.)

Chairperson: David E. Leary
Professors: William M. Baum, Raymond L. Erickson, Gordon A. Haaland, David E. Leary, John A. Nevin
Associate Professors: Victor A. Benassi, Ellen S. Cohn, Peter S. Fernald, Kenneth Fuld, Earl C. Hagstrom, John E. Limber, Carolyn J. Mebert, Rebecca M. Warner, Daniel C. Williams, William R. Woodward
Assistant Professors: Robert G. Mair, Kathleen McCartney, Edward J. O'Brien, William Stine

The listings that follow are general descriptions of the courses. Students are referred to the Instructors' Course Descriptions published by the department each semester for specific details about each section. Listings will be made available in departmental offices before and during the preregistration period.

PSYC 401 is a prerequisite for all courses in the psychology department except PSYC 402, 491, 571, and 770.

PSYC 402 is a prerequisite for all 700-level psychology courses except 770 and 771.

General Courses

401. Introduction to Psychology
Psychology as a behavioral science; its theoretical and applied aspects. Coverage of basic topics in the field, including developmental, learning, personality, abnormal, social, perceptual/sensory, and physiological psychology. To experience actively the nature of psychological research, students have an opportunity to participate in a variety of studies as part of a laboratory experience. 4 cr.

461. Clinical Approaches to Human Behavior
Normal and abnormal behavior from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. Human behavior; clinical procedures of evaluating and modifying behavior. Nature of the clinical approach; no clinical training. Prereq: PSYC 401. (Not for major credit.) 4 cr.

491. General Topics in Psychology
New courses of general interest and focus are presented under this listing. The staff will present material not normally covered in regular course offerings. May repeat but not duplicate areas. Not for major credit. 4 cr.

Major Courses

402. Statistics in Psychology
Design, statistical analysis, and decision making in psychological research. Substantive problems as illustrations of typical applications and underlying logic. No credit for students who have completed ADMN 424, MATH 536, MATH 644, RECO 528, or SOC 502. 4 cr.

502. Research Methods in Psychology
Research design, including experimental and correlation design; internal versus external validity; measurement; writing a research report; graphic and statistical methods for summarizing data; sampling; and special problems such as experimenter effects, reactivity of measurement, and others. The use of hypothesis testing and data analysis in research. Prereq: PSYC 401 and 402. 4 cr.

511. Introduction to Perception, Language, and Thought
Human mental processes. Visual and auditory perception; language; attention; memory; decision processes; problem solving; creativity. Interrelationships among these areas of human psychology. Prereq: PSYC 401. 4 cr.

512. Psychology of Primates
A comparative analysis of primate cognitive, linguistic, and social processes. The origins of human behavior will be explored from the perspectives of history, evolution, and contemporary work in neuropsychology, linguistics, sociobiology, and related fields. Prereq: PSYC 401. 4 cr.

521. Principles of Learning and Their Application
Principles developed from experimental study of human and animal learning; their theoretical integration; their application to the understanding of human behavior. Procedures for changing behavior in practical situations, related to theories of learning. Prereq: PSYC 401. 4 cr.

522. Behaviorism
Introduction to behaviorism as a philosophy of science. Some historical background, but concentration on modern behaviorism as exempli-

fied in the works of B. F. Skinner. Prereq: PSYC 401. 4 cr.

531. Psychobiology
The human as a biological machine; advantages and limits of such an approach for studying behavior. Perception, language, and thought; learning and memory; emotions from the point of view of physiology. Prereq: PSYC 401. 4 cr.

551. Psychology of Sex Roles
The psychology of women and men, and sex-role differences in socialization, personality, achievement motivation, altruism, aggression, power, etc. Prereq: PSYC 401. 4 cr.

552. Social Psychology
Behavior of individuals as affected by other individuals, groups, and society. Topics include attitude change and social influence, conformity, social interaction, interpersonal attraction, impression formation, research. Prereq: PSYC 401. 4 cr.

553. Personality
Major theories, methods of assessment, and research. Prereq: PSYC 401. 4 cr.

571. The Great Psychologists
Historical introduction to some of the great psychologists and their classic works. 4 cr.

581. Child Development
The developing child in the context of his/her society. Current problems in and influences on development of the child. Personality and cognitive development; exceptional children. Prereq: PSYC 401. 4 cr.

582. Adult Development
Personality, social, cognitive development of the adult within society. Prereq: PSYC 401. 4 cr.

702. Advanced Statistics and Research Methodology
Experimental design, analysis, and interpretation. Repeated measures, designs, trend analyses, nonparametric analyses, confounding, missing data, interpretation of interactions, and computer processing of data. Intended primarily for majors planning to attend graduate school. Prereq: PSYC 402; 502;/or permission. 4 cr. (Not offered every year.)

703. Experimental Psychology
Representative problems in experimental psychology including reaction time, vision, hearing, learning, and memory. Laboratory experiments illustrate experimental methods and data analyses in each area. Each student is responsible for designing, conducting, and analyzing an original experiment. Prereq: PSYC 402; 502;/or permission. 5 cr.

704. Research Methods in Social Psychology
Critical examination of the experimental method and nonexperimental alternatives, including survey research, field techniques, and evaluation research. The importance of ethical responsibility, experimental artifacts, and validity issues. Each student responsible for an original research project. Prereq: PSYC 402; 502;/or permission. 4 cr.

705. Tests and Measurement
Testing intelligence, creativity, achievement, interests, and personality. Test construction; evaluation; relation to psychological theory, research, and practice. Prereq: PSYC 402; 502;/or permission. 4 cr.

710. Visual Perception
Anatomy, physiology, psychophysics, and perceptual processes of vision. Topics include physics of light, psychophysics, color, space and form, depth, motion, eye movements, visual learning and development, constancy, and illusions. Prereq: PSYC 402; 502; 511;/or permission. 4 cr.

711. Sensation and Perception
Anatomy, physiology, psychophysics, and perceptual processes of the visual, auditory, gustatory, olfactory, and cutaneous senses. Topics include stimulus definition, psychophysics, sensory transduction, sensory and perceptual adaptation, neural coding of space, time, magnitude, and quality. Prereq: PSYC 402; 502; 511 or 512;/or permission. 4 cr.

712. Psychology of Language
Theories of language structure; functions of human language; meaning; relationship of language to other mental processes; language acquisition; indices of language development; speech perception; reading. Prereq: PSYC 402; 502; 511 or 512;/or permission. 4 cr.

713. Cognition
Complex mental activities; consciousness and attention; concept formation; reasoning; problem solving; creative thinking; relationship between cognition and affective behavior. Prereq: PSYC 402; 502; 511 or 512;/or permission. 4 cr.

721. The Experimental Analysis of Behavior
Environmental and biological determiners of behavior. Theory, research methods, and applications. Major concepts and recent research. Prereq: PSYC 402; 502; 521 or 522;/or permission. 4 cr.

722. Human Learning
Experimental study of human learning and retention. Memory, transfer, verbal learning, perceptual learning, concept learning, and observational learning. Methodologies typical of research in these areas. Prereq: PSYC 402; 502; 512, 521, 522, or 703;/or permission. 4 cr.

723. Behavior Modification and Therapy
Applications of learning and behavior theory to the solution of socially relevant problems, including maladaptive behavior in educational and therapeutic settings. Emphasis on current research and theory. Prereq: PSYC 402; 502; 521, 522, or 703;/or permission. 4 cr.

731. Brain and Behavior
Relationships between the nervous system and behavior. Physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in humans; evolution of these functions in lower animals. Prereq: PSYC 402; 502; 531;/or permission. 4 cr.

732. Comparative Psychology
Behavior from the perspective of evolutionary theory. Comparisons of basic processes, such as learning and social behavior, across species. Current psychological theories of behavior discussed in the light of theories formulated by ethologists and ecologists. Prereq: PSYC 402; 502; 512, 521, or 522;/or permission. 4 cr.

747. Psychology Applied to Teaching and Learning
Primarily for advanced psychology majors. Covers theoretical and practical issues related to teaching and learning, particularly the teaching and learning of psychology. Includes a closely supervised practicum experience of leading one or two small groups of students enrolled in a lower-level psychology course. Not intended as sole preparation for teachers of psychology. Prereq: PSYC 402; 502;/or permission. 4 cr.

752. Advanced Social Psychology
A general survey of current research and major theories. An in-depth critical analysis of selected topics such as attribution theory, social cognition, and theories of aggression. Prereq: PSYC 402; 502; 552;/or permission. 4 cr.

755. Psychology and Law
Applications of psychology to the study of the law, including theories of legal and moral judgment, participants in the legal system (judges, police, victims, witnesses), the trial process, and plea bargaining. Special focus on the death penalty, the insanity plea, and child witnesses. Prereq: PSYC 402; 502;/or permission. 4 cr.

761. Abnormal Behavior
Disturbing behaviors; historical developments; viewpoints of etiology; identifying and understanding disruptive behavior; diagnostic implications for treatment as a function of varying theoretical viewpoints. Prereq: PSYC 402; 502; 553;/or permission. 4 cr.

762. Counseling
Theories of counseling; ethical considerations; professional and paraprofessional activities in a variety of work settings. Prereq: PSYC 402; 502; 553 or 461;/or permission. 4 cr.

770. History of Psychology
Survey of the history of psychology up to the 20th century. Major figures, theories, and developments. Relationship to developments in cultural history, philosophy, and the natural sciences. Beginnings of modern scientific psychology. 4 cr.

771. Psychology in 20th-Century Thought and Society
Reassesses, extends, and integrates knowledge of 20th-century psychology within the historical perspective. Major figures, schools, systems, theories. Social, institutional, and international developments since the 19th century.

Review of major fields of psychology. Prereq: PSYC 401. 4 cr.

781. Developmental Psychology
Concepts, issues, theories, and methods in developmental psychology and their role in research. Cognitive, language, social, and personality development. Prereq: 402; 502; 512, 581, 582, or FS 525;/or permission. 4 cr.

783. Developmental Psychopathology
Major issues in psychopathology from a developmental perspective. Emphasis on theories of etiology, approaches to treatment, and research issues in a variety of atypical populations. Diagnostic classification schemes, rights of children, and methods of assessment. Prereq: PSYC 402; 502; 581;/or permission. 4 cr.

Special Courses

591. Special Topics in Psychology
New or specialized courses are presented under this listing. Staff present material not normally covered in regular course offerings. May repeat but not duplicate areas. Prereq: PSYC 401. 4 cr.

791. Advanced Topics
Advanced material in which instructor has specialized knowledge through research and study. May repeat but not duplicate areas. Prereq: PSYC 402; 502;/or permission. 4 cr.

793. Externship
Supervised practicum in one of several cooperating New Hampshire mental health/rehabilitation facilities. Coursework knowledge applied to meaningful work and team experience. Commitment includes a negotiated number of weekly work hours and weekly seminars. Supervision by institution personnel and the instructor. Course applications accepted beginning in March for fall term and October for spring term. Prereq: permission; PSYC major; PSYC 402; 502; additional psychology courses desirable. A maximum of 4 credits of 793, 794, and 795 combined can count toward the minimum of 36 credits for PSYC major. Up to 8 cr.

794. Advanced Externship
Supervised advanced practicum experience in cooperating New Hampshire mental health/rehabilitation facilities. Expands and builds on experiences and skills acquired in PSYC 793. Commitment includes a negotiated number of hours of work per week and participation in weekly seminars. Supervision done by institution personnel and instructor. Course applications accepted beginning in October for spring term. Prereq: PSYC 793; permission. Maximum of four credits of 793, 794, and 795 combined can count toward the minimum of 36 credits for PSYC major. Up to 8 cr. (Offered spring semester only.)

795. Independent Study
A) Physiological; B) Perception; C) History and Theory; D) Learning; E) Social; F) Cognition; G) Statistics and Methods; H) Experimental; I) Personality; J) Developmental; K) Counseling; L) Psychotherapy; M) Research Apprenticeship; N) Teaching of Psychology (content area to be determined). Specific independent study opportunities are sometimes posted in the psychology offices. Arrangements to be made with a specific faculty member; enrollment by permission only. A maximum of 4 credits of 793, 794, and 795 combined can count toward the minimum of 36 credits for PSYC major. Prereq: PSYC 402; 502; /or permission. 1–4 cr.

797. Senior Honors Seminar
For senior psychology honors students. Discussion of methodological and theoretical issues relevant to the design of honors projects. Students propose honors theses to be supervised by psychology dept. faculty member in PSYC 799. Prereq: admission to psychology honors program. 4 cr. (Typically offered in fall.)

799. Senior Honors Thesis
Under supervision of psychology dept. faculty members, students complete the honors projects proposed and begun in PSYC 797. The honors project, which should be empirical in nature, culminates in an oral presentation at the end of the semester. Prereq: admission to psychology honors program; PSYC 797. 4 cr. (Typically offered in spring.)

Religious Studies (RS)

(For program description, see page 22.)

Coordinator: Bernadette Komonchak

416. Masterpieces of Eastern Religious Literature and Ideas
Introduction to a number of the great works of religious literature within the primal and Eastern religious traditions, to a variety of methods and perspectives involved in their interpretation, and to the fundamental ideas and attitudes toward life that they express. 4 cr.

417. Masterpieces of Western Religious Literature and Ideas
Introduction to the development and analysis of a number of great works of religious literature within the Western religious tradition, to a variety of methods and perspectives involved in their interpretation, and to the fundamental ideas and attitudes toward life that they express. 4 cr.

599. Special Topics
Studies of particular religious traditions, or periods within those traditions, or special topics and issues of concern within religious studies such as mythology, ritual, mysticism, etc. 4 cr.

695, 696. Independent Study
Independent study of traditions, topics, or figures within the scope of religious studies. Before registration, student must formulate a project and secure consent of a cooperating department faculty member who will supervise the independent study. 2 or 4 cr.

699. Senior Seminar
A capstone experience intended to help students draw together their various studies in the field of religion. Prereq: any two courses in religious studies or permission. 4 cr.

Reserve Officers Training Corps

(For program description, see page 75.)
(See Aerospace Studies and Military Science.)

Resource Economics (RECO)

Department of Resource Economics and Community Development
(For program description, see page 42; see also course listings under Community Development.)

Chairperson: Edmund F. Jansen, Jr.
Professors: Owen B. Durgin, Edmund F. Jansen, Jr.
Adjunct Professor: Betty H. Roberts
Associate Professors: Bruce E. Lindsay, Douglas E. Morris
Assistant Professors: John M. Halstead, Alberto B. Manalo Lecturer: George E. Frick
Extension Educators: John F. Damon, Gerald W. Howe, Michael R. Sciabarrasi, William H. Zweigbaum

411. Resource Economics Perspectives
Microeconomic theory and analysis in resource management and use decisions. Survey of significant resource problems from an economic perspective and the application of economic analysis. Cannot be taken for credit after ECON 402 or equivalent. Special fee. 4 cr.

501. Agricultural and Natural Resource Product Marketing
Structure, organization, and performance of the business section in agriculture, forestry, and other local natural resource-based industries; commodity marketing systems; demand estimation, pricing policies, consumer characteristics, and related topics. Prereq: RECO 411 or equivalent;/or permission. 4 cr. (Offered every third semester.)

504. Farm Business Management
Planning, operation, and control of the farm with application to natural resource-based businesses. Emphasis on decision making, problem solving, and operational strategies. Prereq: RECO 411 or equivalent. Lab. 4 cr.

506. Population, Food, and Resource Use in Developing Countries
Economic, technical, cultural, social, and political factors that influence food supplies, nutrition resource use, employment, and income distribution in the developing countries; the population explosion; strategies for expanding food supplies; social and institutional constraints, strategies and policies for economic development. Prereq: RECO 411 or equivalent. 4 cr. (Offered every third semester.)

510. Accounting & Finance for Small Business
Introduction to concepts, theory, and applications of accounting and financial principles related to the management and control of small

business ventures. Emphasis on actual practices in the quantification, recording, and communication of financial transactions in a business. Relationships of income and cash flows to expenses. Budgeting, planning, and control of functions. Development of the financial model for a small firm. Computer applications in accounting and finance. 4 cr.

512. Gulf of Maine Economic Resources
Topics include fisheries management, oil and gas recovery, and ocean minerals mining. Lab and field work will include opportunity to observe and interview those professionally involved in harvesting marine resources in the Gulf of Maine. Offered as a one-week course at the Shoals Marine Laboratory. Prereq: intro econ course or permission. 1 cr. (Summers only.)

528. Applied Statistics I
Development of elementary statistical techniques through the analysis of prepared data. Continuous and discrete probability distributions; distributions of sample statistics; small-sample theory; regression; correlation; analysis of variance. Permission of instructor required for upper-division students. No credit for students who have completed ADMN 424, MATH 536, MATH 644, PSYC 402, or SOC 502.

595, 596. Problems in Natural and Agricultural Resources
Students pursue field, laboratory, or library problems in natural and environmental resources that are not covered by other courses. Faculty consultant and study topic must be chosen before registration. In consultation with the faculty adviser, students select the problem area, create a bibliography for reflection, and pursue the topic. A professionally written paper is expected at termination of the study. May be repeated once for credit. Prereq: permission. 2–4 cr.

604. Agribusiness Finance
Concepts of farm and agribusiness financial decision making, financial statement analysis, investment analysis, risk management, financing new investments, and asset appraisal. Prereq: intro microecon theory; RECO 504 desired or permission. Lab. 4 cr.

606. Land Use Economics
Economic and institutional factors affecting human use of land resources; historical discussion of land ownership patterns; supply and demand; production relationships; location and resource use; benefit-cost analysis; institutional restraints and planning for more efficient use of land. Real estate market and taxation. Prereq: RECO 411 or equivalent. 4 cr. (Offered every third semester.)

611. Marine Resource Economics
Economic overview of the marine environment; interactions/conflicts surrounding this multiple-use resource. Economics of fisheries; marine recreation; offshore facilities; aquaculture; waste disposal. Prereq: RECO 411 or ECON 402;/or permission. 4 cr. (Offered every third semester.)

615. Linear Programming Methods
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications; nonlinear programming, discrete programming; and solving input-output and game-theory problems. Applications to firm and aggregate economic analysis. Prereq: elementary matrix algebra or permission. 4 cr. (Offered every other year.)

627. Community Economics and Finance
Economic and financial factors affecting community and local government decisions. Emphasis on use of economic theory and analytical techniques to evaluate problems in contemporary New England communities and towns. Prereq: RECO 411 or ECON 402. (Also offered as CD 627.) 4 cr. (Offered every third semester.)

676. Economics of Water Use and Quality Management
Economics of water use; role of government and policy agencies, water supply and demand, economic impact of water and water quality standards, alternatives in quality management, externalities, and methods of evaluation. Prereq: elementary biological or physical science (or FORS 504); RECO 411. 4 cr. (Offered every third semester.)

701. Statistical Methods I
Analysis of variance and general linear model; measured numbers, nature of statistical evidence, sampling distributions, and principles of statistical inference; application of specific linear models to given sets of data. Prereq: upper-division undergraduate or graduate standing. 4 cr.

702. Natural Resources Policy
Contemporary issues in the management and allocation of natural resources; impact of humans on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. 4 cr. (Also offered as EC 702.)

704. Agricultural and Food Policy
Issues and problems in agricultural and food policy in the United States are identified and analyzed from the perspective of producers, consumers, and the government. Economic, political, and social consequences of alternative policies and programs are evaluated. Prereq: at least one RECO 600-level course or permission. 4 cr. (Offered every third semester.)

706. Economics of Resource Development
Resource scarcity and theories of economic development; major resource development problems of land and natural resources, urban-rural conflicting demands, and conservation and water supply; capital needs, externalities, and market failure. Prereq: intermed econ theory. 4 cr. (Offered every third semester.)

708. Environmental Economics
Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy; property right issues. Prereq: intermed microecon theory; permission. 4 cr. (Offered every third semester.)

710. Resource Economics Seminar
Seminars arranged to students' needs and offered as demand warrants: A) Rural Development; B) Marine Economics; C) Community Economics; D) Land and Water Economics; E) Quantitative Methods; F) Recreation Economics; G) Small Business Economic and Managerial Issues. In-depth treatment of area, including classic works. May be repeated. 2–4 cr.

718. Law of Natural Resources and Environment
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prereq: EC 635 or RECO 606 or permission. (Also offered as EC 718.) 3 cr. (Not offered every year.)

756. Rural and Regional Development
Concepts and methods of delineating regional economies, methods of measuring activity, regional development, and public policies. Emphasis on empirical research studies. Prereq: intermed econ theory or permission. 4 cr. (Offered every third semester.)

795. Investigations in Resource Economics
Special assignments in readings, investigations, or field problems. A) Agricultural Marketing; B) Agricultural Production and Farm Management; C) Community Development; D) Economics of Human Resources; E) Economics of Population and Food; F) Land Economics; G) Marine Economics; H) Rural Economic Development; I) Regional Economics; J) Water Economics. Prereq: permission. May be repeated. Variable 2–4 cr.

Russian (RUSS)

Department of German and Russian
(For program description, see page 33.)

Chairperson: Aleksandra I. Fleszar
Associate Professor: Aleksandra I. Fleszar
Assistant Professors: Arna B. Bronstein, Ronald D. LeBlanc
Visiting Assistant Professor: Masaru Toda

New students will be assigned to the proper course on the basis of proficiency tests. A student may not receive UNH credit for elementary Russian courses if he/she has had two or more years of secondary school Russian. If a significant number of years have elapsed since completion of the last course, a student may petition the department to take 400-level language courses for credit.

401-402. Elementary Russian
Oral-aural practice and written drills designed to achieve a mastery of basic grammatical patterns. Language lab and computer lab work required. Previous knowledge of Russian not required. 4 cr.

425. Introduction to the Soviet Union through Post-Revolutionary Literature
Introduction to contemporary Soviet society through 20th-century Soviet literature. Emphasis on the structure of the Soviet society as expressed through the arts. 4 cr.

485. Russian Seminar in the Soviet Union—Language and Culture
Four weeks of language, culture, and civilization classes on the intermediate level. Conducted in the Soviet Union by Soviet instructors. Classes four hours per day, six days per week; field trips. Prereq: RUSS 402 or equivalent; permission. 4 cr. (Summers only.)

503-504. Intermediate Russian
Continuation of RUSS 401-402. Review of Russian grammar, and practice in oral and written expression. Prereq: RUSS 402 or equivalent high school or college course with a grade of C or better. 4 cr.

505, 506. Russian Conversation and Reading
Designed to increase fluency in Russian conversation and reading. Students are advised to take this as a sequence along with RUSS 503-504. Prereq: RUSS 401-402 or permission. 4 cr.

521. Survey of Russian Literature in English
Selected masterpieces of 19th- and 20th-century Russian literature. Pushkin, Gogol, Tolstoy, Dostoevsky, Chekhov, Pasternak, Solzhenitsyn, and others. Lectures and readings in English. Open to all students, including freshmen. 4 cr.

525. Introduction to Russian Culture and Civilization
Survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as HIST 563.) 4 cr.

585. Russian Language Seminar in the Soviet Union
Five weeks of Russian language classes on all levels conducted in the USSR, four hours per day, six days per week. No prerequisites. 4 cr. (Summers only.)

586. Russian Language Seminar, Civilization, and Culture in the Soviet Union
Five weeks of culture and civilization classes and field trips to museums, art galleries, schools, factories, etc. Conducted in the USSR. Classes and excursions average three hours per day, seven days per week. No prerequisites. 4 cr. (Summers only.)

593. Major Russian Authors in English
In-depth discussion and analysis of major Russian authors or literary periods. A different author or period offered each semester. Lectures and readings in English. Open to all students. Not for major credit; majors must register for RUSS 693. 4 cr.

631-632. Advanced Russian Conversation and Composition
Advanced spoken and written Russian designed to maintain aural-oral fluency; advanced grammar. Prereq: RUSS 503-504 or equivalent. 4 cr.

691. Readings in Russian Literature
Linguistic and stylistic characteristics of the works covered in RUSS 521. Readings and lectures entirely in Russian. 4 cr.

692. Drama
A play production in Russian emphasizing phonetic articulation, intonation, and fluency and allowing in-depth analysis of a particular text. 4 cr.

693. Major Russian Authors
Same as RUSS 593, except that majors do selected readings in Russian and conduct in-depth research on a specified topic. Final project required. 4 cr.

733. Advanced Language and Style
For students who have a strong, active control of grammar. The most difficult problems of Russian grammar and syntax; poetry and prose. Develops confidence in expression both in everyday situations and in abstract concepts (emphasis on the latter). 4 cr.

734. History and Development of the Russian Language
Overview of the changes in sounds, structure, and vocabulary from Proto-Indo-European through Old Church Slavonic, Old Russian, to contemporary Russian. Emphasis on changes in the literary language from the end of the 18th century to the present. Readings in Old Church Slavonic and Old Russian. 4 cr.

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. Independent Study in Russian
Open to highly qualified juniors and seniors. To be elected only with permission of the section coordinator and the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

797, 798. Special Studies in Russian Language and Literature
Selected topics in language, culture, and literature. 2 or 4 cr.

School of Health Studies (SHS)

(For program description, see page 60.)

400. Health-Human Values
Physiological, emotional, social, and environmental factors affecting health. Basic health information to broaden understanding of health-related issues. Students examine their patterns of decision making in issues directly affecting their lives. 4 cr.

798. Special Topics in Health Studies
Explores areas related to specific professional health interests. May repeat but not duplicate subject areas. A) Communication Disorders; B) Health Management and Policy; C) Medical Technology; D) Nursing; E) Occupational Therapy; F) Physical Education; G) Leisure Management and Tourism; J) Family Studies; I, K-Z) Interdisciplinary. Prereq: permission. 1–4 cr.

Social Science (SCSC)

Coordinators for the Social Science Division, College of Liberal Arts, are Jo-Ann Kelly and the chairperson of the Social Science Division.

681. Internships
Fieldwork in a state or local government department, agency, or institution, or in an approved private agency. Work will be under supervision of agency. Department chairperson or representative is responsible for arranging the program. Offered through departments of history, political science, psychology, sociology and anthropology, or the Whittemore School of Business and Economics. Prereq: senior standing. Variable to 16 cr.

682. Washington Internship
Internship placements in Washington, D.C., through the Washington Center. Individual internships arranged with legislative and judicial offices, law firms, public interest organizations; in the arts, the media, labor, international affairs, business, consumer affairs. Supervision by agency personnel and faculty sponsor. Students should have above-average academic record before applying. Open to all majors. Applications available in the Whittemore School Advising Center, McConnell Hall. Prereq: second semester junior, or senior. Student must also register for a graded, 4-credit independent study in the student's major. Internship credit variable to 12 cr. Cr/F.

Social Work (SW)

(For program description, see page 33.)

Chairperson: Betty Holroyd Roberts
Professor: Betty Holroyd Roberts
Associate Professors: Robert E. Jolley, Pauline Soukaris
Assistant Professor: Stephen H. Gorin

524. Introduction to Social Work and Social Welfare
The role of social work within agency structures. Programs, policies, social work services studied in historical perspective; their auspices, goals, and operations for consumers from various ethnic, racial, and social groups. Weekly observational/participatory assignments at community agencies. 4 cr.

525. Introduction to Social Welfare Policy: Provisions
U.S. social welfare provisions: income, housing, employment, and health care. Program and policies in historical perspective: their auspices, goals, and operations for consumers from various social, racial, and ethnic groups. 4 cr.

550. Human Behavior and Social Environment I
Introduction to human behavior and development as it influences and is influenced by multiple factors in the social environment, including individual genetic and biological composition, race, gender, age, socio-economic status, ethnicity, geographic location, physical appearance, and ability. How these factors operate throughout the life cycle. Provides a knowledge base and perspective to understand a client's behavior, attitude, and values in relation to the attitudes and values of the social work professional and the larger society. 4 cr.

551. Human Behavior and Social Environment II
Continuation of 550. Agents of socialization that most significantly affect individual development and behavior, and a dynamic and changeable concept of social systems as they affect individual and group behavior in relation to the dominant society. Prereq: SW 550; major. 4 cr.

622. Social Work Practice I
Introduction to methods and practice. Basic principles, values, and ethics. Interviewing skills, problem assessment, social contracting. Skills training in lab sessions. Required for majors, should be taken in junior year. Prereq: SW 524 or permission. 4 cr.

623. Social Work Practice II
Continuation of SW 622. Delineation and study of intervention and change strategies differentiated with individuals, groups, and communities. Required for majors. Prereq: SW 622. 4 cr.

632. Special Topics in Social Welfare
Seminar for advanced majors. Topics may include income maintenance, alcoholism, health care, aging, child welfare, and mental health; to increase understanding of factors that influence program development and service delivery. 4 cr.

633. Seminar in Social Work Methods
Analysis and comparison of change theories, intervention strategies, therapeutic techniques. Seminar format. Possible topics: techniques of group work, casework or community practice, behavior modification, and staff development and supervision. Prereq: senior major standing. 4 cr.

640. Social Welfare Field Experience: I
Majors will be placed in a social welfare setting for a minimum of 225 hours; individual arrangements with faculty coordinator. Required for majors. Prereq: SW 623 and permission. (No credit toward a minor.) 5 cr. Cr/F.

640A. Social Welfare Field Experience I: Seminar
Seminar on campus. Prereq: SW 623 and permission. Coreq: SW 640. (No credit toward a minor.) 3 cr.

641. Social Welfare Field Experience: II
A continuation of SW 640 with a minimum of 225 hours. Required for majors. Prereq: SW 640A and permission. (No credit toward a minor.) 5 cr. Cr/F.

641A. Social Welfare Field Experience II: Seminar
Continuation of 640A. Required of majors. Prereq: SW 623 and permission. Coreq: SW 641. (No credit toward a minor.) 3 cr.

700. Social Gerontology
Theories, social problems, programmatic responses, and recent research on aging; emphasis on psycho-social forces. Prereq: senior status;/or permission. 4 cr.

701. Women and Aging
Analysis of the major theories about the social conditioning of aging women and its effect in contemporary society. Human service response. Psycho-social, biological, legal, and economic implications. Prereq: senior status or permission. 4 cr.

705. Child Welfare: Policies, Programs, and Practice
Examination of the major policy and program questions of child welfare with a focus on child care and protection, adoption and foster care, juvenile delinquency, service delivery, and concepts of treatment in public and private programs. Prereq: senior status or permission. 4 cr.

795, 796. Independent Study in Social Service
Independent work under social service faculty guidance. Prereq: 12 hours social service coursework; permission. Variable 1–6 cr. Cr/F.

Sociology (SOC)

Department of Sociology and Anthropology
(For program description, see page 33; see also additional course listings under Anthropology.)

Chairperson: Peter Dodge
Professors: Melvin T. Bobick, Walter F. Buckley, Bud B. Khleif, Arnold S. Linsky, Stuart Palmer, Frederick Samuels, Murray A. Straus
Associate Professors: Peter Dodge, Lawrence C. Hamilton, Sally Ward, Kirk Williams
Assistant Professor: Karl A. Pillemer
Lecturer: Moshem Bazargan

400. Introductory Sociology
Human social and cultural relationships as revealed in customs and institutions. Social theory, methods and techniques of research, and current research findings. Laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the Time and Room Schedule. 4 cr.

500. Introduction to Social Psychology
Social structure and culture and human behavior. Sociological analysis of behavior in interpersonal relationships, small groups, formal organizations, and other social units. Social psychological issues within various institutions of society. 4 cr.

502. Statistics
Elementary applied statistical techniques; tables, graphs, cross-classifications; central tendency and dispersion; correlation and linear regression; confidence intervals and hypothesis testing. No credit for students who have completed ADMN 424, MATH 536, MATH 644, PSYC 402, or RECO 528. 4 cr.

515. Introductory Criminology
Scientific study of causes and control of crime. Indexes, rates, theories of crime and delinquency, police, courts, probation, prison, and parole. 4 cr.

520. The Family
Anthropological and institutional approach comparing societal customs and organizations. Laboratory-problem method of instruction offered occasionally; students interested should register for the section identified as "Laboratory" in the Time and Room Schedule. 4 cr.

530. Race and Ethnic Relations
Majority-minority group relations; special attention to nature and results of Black-White and ethnic group relations in the United States. 4 cr.

540. Social Problems
Relation of customs and institutions to such social problems as crime, delinquency, alcoholism, physical and mental disease, sexual deviance, poverty, old age, broken families, and racial and religious prejudices. Especially for nonmajors. 4 cr.

560. Rural-Urban Sociology
Application of sociological and social psychological principles to the study of populations at various points on the rural-urban continuum. 4 cr.

570. Sexual Behavior
A comparative approach to questions of the universality and variability of human sexual behavior. Topics include the changing expression of sexuality at various stages of the life-cycle, patterns of arousal and response for each sex, the social control of sexuality, and sexual dysfunctions. 4 cr.

597. Special Topics in Sociology
Occasional or experimental offerings. Prereq: permission. May be repeated for different topics. 4 cr.

599. Critical Analysis in Sociology
Basic skills essential to the study of sociology; development of critical reading of sociological literature through the practice of systematic evaluation of evidence and the process of theory construction; written and oral analysis of sociological classics; use of library resources.

To be taken by sociology majors no later than the junior year; open to other interested students. 4 cr.

600. Social Institutions
Relationships among education, religion, economy, government, paedotrophic and intersex practices, art, and recreation. Cross-cultural approach. 4 cr.

601. Methods of Social Research
Cross-sectional and longitudinal survey design; direct and indirect measurement techniques; design of field and laboratory experiments; special topics. Prereq: major in sociology or social service;/or permission. 4 cr.

611. History of Social Theory
Analysis of the writings of major contributors to the development of sociological theory from Plato to Max Weber. Special emphasis given to works of Marx, Weber, and Durkheim. 4 cr.

612. Contemporary Sociological Theory
Major schools, concepts, and issues in present-day sociological theory. Readings on functionalism, conflict theory, systems theory, critical theory, and hermeneutics. 4 cr.

620. Studies in Social Psychology
Application of basic concepts of social psychology to a series of studies involving theoretical, methodological, and substantive issues. Prereq: SOC 500. 4 cr.

625. Female, Male, and Society
Critical, cross-cultural study of sex-related behavior in historical as well as contemporary perspective. Draws on anthropological, social-psychological, and sociological literature. (Also offered as ANTH 625.) 4 cr.

629. Small Groups
Interaction among individuals in small groups and between small groups; perception, attitude, and behavior. Analytical techniques are applied. Prior course in social psychology recommended. 4 cr.

635. Medical Sociology: Organization and Processes of Modern Medicine
Interrelationship of health, medicine, and society; the social construction of wellness, illness, and healing; age, sex, class, and ethnicity in medical care; institutional networks and the social control functions of medicine; roles and relations of physicians, patients, nurses, and other health workers; medicine in a cross-national context. 4 cr.

642. Introduction to Social Policy
Definition of social policy. Role of the social scientist in social policy research. Sociological research for policy decisions. Research examples in specific policy areas. Utilization of sociological research in policy decisions. 4 cr.

645. Class, Status, and Power
Pattern of distribution of economic, honorific, and political variables within the populations of complex societies; allocation of personnel to the roles in question, notably through occupational mobility; and the impact of such processes upon behavior, both individual and social. Prereq: SOC 400 or 600. 4 cr.

655. Sociology of Crime and Justice
Seminar devoted to analyses of the relationships between violent, property, and "victimless" crime on the one hand and the police, judicial, and correctional components of criminal justice systems on the other. Prereq: SOC 515 or permission. 4 cr.

697. Special Topics in Sociology
Occasional or experimental offerings. Prereq: permission. May be repeated for different topics. 4 cr.

699. Senior Thesis
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision from two faculty members. Should be initiated by next-to-last semester. 4–8 cr.; in latter case to extend over two semesters.

720. Current Developments in Sociology of the Family
Current topic selected each semester, such as stratification and the family, intrafamily communication, power structure of the family, kinship in modern societies. Critical review of the literature; class or individual research project usually carried out. Prereq: 8 credits of sociology; SOC 520 recommended. 4 cr.

721. Family Interaction
Analysis of family interaction from a sociological perspective. Consideration of individual family members, relationships, and the family as a unit using a social systems approach. Prereq: SOC 400 or permission. 4 cr.

735. Complex Organizations
Comparative study of the structure and dynamics of complex, formal organizations (business, military, political, governmental, educational, medical): power and social control; organizational processes, performances, and effectiveness; impact on persons and societies. Prereq: permission. 4 cr.

740. Culture Change
Various types of society; development of theory. Descriptive studies of institutional as well as theoretical materials selected from the writings of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. 4 cr.

741. Social Change and Societal Development
Comparative, interdisciplinary approach. Interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prereq: permission. SOC 740 recommended. 4 cr.

750. Middle East: Issues of Ethnicity, Work, and Identity
Community studies approach to such topics as: ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as ANTH 750.) 4 cr.

757. Social Institutions of Latin America and the Caribbean
Selective analysis of distinctive institutions and social systems, with particular attention to social aspects of the process of modernization. Prereq: permission. 4 cr.

761. Population Dynamics
Major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems, and policies of countries at different stages of economic development. Interrelationship of population and society. 4 cr.

770. Culture, Personality, and Society
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as ANTH 770.) 4 cr.

780. Social Conflict
Nature, setting, and initiation of social conflict, its dynamics, and factors affecting its course and outcome. Prereq: permission. 4 cr.

781. The Holocaust
Study and analysis of the mass persecution and destruction of European Jewry during the Nazi period, 1933–1945. Investigation of the creation of a terror state, the Nazi program of destruction, deportations and death camps, the Jewish struggle to comprehend this fate, perception of events through the minds of the victims, survivors' testimonies, the actions and indifference of the Western world. 4 cr.

785. The Study of Work
Understanding society through the structure of work. Case studies, in an ethnographic manner, of high-status and low-status occupations to provide understanding of social processes and interrelationships in the social structure. 4 cr.

790. Applied Sociology
(1) Current level of use of sociological knowledge; (2) the advocate, consultant, and researcher roles in applied settings; (3) techniques of applied research; (4) implications of applied sociology, including ethical problems. Each student will focus on a social problem and write a paper covering the above issues. Applied projects where possible. Prereq: meth of soc res. 4 cr.

794. Evaluation of Social Programs
Evaluation research defined: purposes of evaluation; design of evaluation studies; setting of programs; utilization of evaluation results. Examination of case studies of evaluations of social programs. Students are responsible for

designing an evaluation study in their chosen substantive area. Prereq: meth of soc res. 4 cr.

795, 796. Reading and Research in Sociology
A) Communications; B) Criminology; C) Culture Change; D) Culture and Personality; E) Deviant Behavior; F) Family; G) Population; H) Rural-Urban; I) Social Control; J) Social Differentiation; K) Social Movements; L) Social Psychology; M) Social Research; N) Social Theory. Prereq: 12 credits of sociology or permission. 2–8 cr.

797. Special Topics in Sociology
Occasional or experimental offerings. Prereq: permission. May be repeated for different topics. 4 cr.

Soil Science (SOIL)

Department of Forest Resources
(For program description, see page 42; for faculty listing, see page 118; see also course listings under Environmental Conservation, Forest Resources, Water Resources Management, and Wildlife Management.)

401. Introduction to Soil Morphology
Description of soils in the field. Application of soil properties to site evaluation for septic tank absorption fields. No credit for majors or those pursuing soil certificate program. 2 cr.

501. Soils and the Environment
Physical, chemical, and biological aspects of soils in the environment. Labs coordinate with lectures. Special fee. Lab. 4 cr.

502. Soil-Plant Relationships
Soils evaluated in terms of requirements for optimal growth of plants. Emphasis on nutrient availability. Soils and world food problems. Special fee. Lab. 4 cr.

601. Soil Morphology
Description of soils in the field. Application of soils properties to forestry, plant science, and community planning. Strong orientation to fieldwork. Generally taken concurrently with SOIL 704. Prereq: SOIL 501 or permission. Special fee. Lab. 3 cr.

606. High Intensity Soil Mapping
Production of high intensity soil maps using standards of Soil Scientists of Northern New England. One week field session following spring semester. Prereq: permission. 1 cr.

609. Soils and Community Planning
Using a town plan and soils map, students develop reports for multiple urban and rural land use—housing, sewage, recreation, transportation, runoff, etc. USDA soil classification system; Soil Conservation Service rating criteria; New Hampshire soils. Guest lecturers. Prereq: permission. 2 cr.

614. Soil Management
Principles of soil management in a rural-urban environment. Course covers various concerns associated with urban development as well as food and fiber production, particularly in terms of their impact on water quality and stewardship of soil resources. Topics include soil as a waste treatment system, soil and land appraisal, conservation and use of soil resources for economic and aesthetic purposes, and the impact of soil management on water quality. Prereq: SOIL 501. Special fee. Lab. 4 cr. (Not offered every year.)

620. Topics in Soil Science
One-week short course taught in summer only. Consult Division of Continuing Education or Department of Forest Resources for current offering. 1 cr.

702. Chemistry of Soils
Chemical composition of soil, colloidal phenomena and the exchange and fixation of elements, cation exchange capacity and source of negative charge, inorganic reactions in soil and their effect on soil properties. Prereq: one year college chem or permission. 3 cr.

703. Chemical Analysis of Soil
Methods of soil chemical analysis. Coreq: SOIL 702. Prereq: quantitative analysis; SOIL majors or permission. Not available for graduate credit. Lab. 2 cr.

704. Soil Genesis and Classification
Processes involved in formation of soils, properties of soils as they reflect genetic processes. Classification systems of soils related to soil genesis and soil landscapes. Generally taken concurrently with SOIL 601. Prereq: SOIL 501 or permission. 2 cr.

705. Forest Soils
Basic ecological and management perspectives; soil-site quality evaluation; forest land classification and interpretation; forest soil management techniques. Prereq: basic soils course or permission. Special fee. Lab. 3 cr. (Not offered every year.)

706. Soil Mapping
Production of modern high-intensity soil maps. Two-week field session following spring semester. Coreq: SOIL 704. Special fee. 2 cr.

775. Land-Use Seminar
Multidisciplinary approach to land-use planning. Class is assigned a tract of land and is expected to cooperate in the development of a comprehensive land-use plan. Course culminates in a full "dress rehearsal" presentation of the plan to a town planning board for approval. Prereq: permission (by application). (Also offered as WARM 775.) A year-long course; 2 cr. per semester, 4 cr. total. "IA" grade (continuing course) given at end of the first semester.

795. Independent Work in Soil Science
A) Soil-Plant Relationships; B) Physics of Soils; C) Chemistry of Soils; D) Soil Classification; E) Forest Soils. Prereq: permission. 1–4 cr.

Spanish (SPAN)

Department of Spanish and Classics
(For program description, see page 34; see also course listings under Portuguese.)

Chairperson: Barbara H. Wing
Professors: Richard J. Callan, Charles H. Leighton
Associate Professors: F. William Forbes, Bernadette Komonchak, Barbara H. Wing
Assistant Professor: Phoebe A. Porter
Instructors: Alan D. Haley, William Mejías-López, Susan M. Riddell, Elisa F. Stoykovich, Monica V. Torregrosa
Lecturer: Nora F. Kerr

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if a student has had two or more years of the foreign language in secondary school. No student educated in a foreign country or for whom Spanish is the native tongue will be permitted to register for any Spanish course numbered 649 or below, except 601. All courses conducted in Spanish except where noted.

401-402. Elementary Spanish
For students without previous knowledge of Spanish. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of Spanish. Labs. No credit toward a major. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the chair about possibly receiving credit.) 4 cr.

407. Accelerated Spanish
SPAN 401-402 in one semester. Study of fundamental speech patterns, reading, and writing to achieve a firm basis for active command of Spanish. Labs. Previous knowledge of Spanish is not required. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the chair about possibly receiving credit.) 8 cr.

501. Review of Spanish
Emphasis on aural-oral practice; review of basic structure; reading and writing to develop active command of the language. Labs. Designed for those whose study of Spanish has been interrupted for a significant amount of time and for those who have had only two years of high school Spanish. 4 cr.

503-504. Intermediate Spanish
Complete literary texts of intellectual worth; review of language structure; oral and written expression of ideas. Discussion and papers in Spanish. Open to students who have passed SPAN 402 with a C (2.00) or better. No credit toward the major. Lab. 4 cr.

525. Spanish Civilization and Culture
Historical, geographical, and artistic expressions of Spanish civilization that have formed the character of contemporary Spanish culture. Readings, slides, films, tapes, and records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

526. Latin American Civilization and Culture
Significant historical, geographical, and artistic expressions of pre-Colombian and Latin American civilization. Readings, slides, films, tapes, records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

601. Spanish Phonetics
Practical application of fundamental phonetic theory to spoken Spanish. Required of Spanish majors. 4 cr.

621. Spanish and Portuguese Literature in Translation
Major works by principal authors, such as: Camõens, Cervantes, Lope de Vega, Calderón, Eça de Queiroz, Unamuno, Ortega y Gasset, García Lorca, Casona, etc. Readings, discussions, papers in English. Does not count for Spanish major. 4 cr.

622. Latin American and Brazilian Literature in Translation
Major works by principal authors, such as Inca Garcilaso, Díaz del Castillo, Machado de Assís, Borges, Asturias, Neruda, E. Veríssimo, Fuentes, Leñero, Guimarães Rosa, and Jorge Amado. Readings, discussion, papers in English. Does not count toward Spanish major. 4 cr.

631, 632. Advanced Spanish Conversation and Composition
To maintain and perfect written and spoken Spanish through intensive classroom work, individual conferences, and laboratory sessions. Prereq: A grade of C or better in SPAN 504 or equivalent. 4 cr.

One course from SPAN 650, 651, 652, 653, 654 (or an equivalent course) is prerequisite to all higher literature courses in Spanish.

650. Introduction to Critical Analysis
Methods and practice of literary criticism. Critical analysis of representative essays, fiction, poetry, and drama from Spain and Latin America. Frequent short papers. Required of Spanish majors; should be taken concurrently with or immediately following Spanish 632. 4 cr.

651, 652. Introduction to Spanish Literature and Thought
Reading and analysis of major works within the historical, cultural, and social background of the Iberian peninsula. Papers, discussion, and examinations in Spanish. Prereq: SPAN 631, 632. May be taken concurrently with SPAN 632 with permission of adviser. 4 cr.

653, 654. Introduction to Latin American Literature and Thought
Reading and analysis of major works within the historical, cultural, and social background of the New World. Papers, discussion, and examinations in Spanish. Prereq: SPAN 631, 632. May be taken concurrently with SPAN 632 with permission of adviser. 4 cr.

685, 686. Study Abroad
Studies at a Spanish or Latin American university. Prereq: primarily for juniors and seniors who have passed SPAN 503-504 or equivalent with grade of B (3.00) or better. Noncredit orientation meetings required during semester prior to departure. Interested students should consult with the program directors. Variable to 16 cr. Cr/F. (An "IA" grade will be assigned until official transcript is received from the foreign institution.)

691, 692. Readings in Current Periodicals
Advanced practice in reading, speaking, and writing, based on current events in contemporary periodicals of the Spanish-speaking world. Co- or prereq: SPAN 632 or equivalent. May be repeated. 2 cr.

733. History of the Spanish Language
Evolution of the Spanish language from the period of origins to the present. 4 cr.

752. Drama and Poetry of the Siglo de Oro
Social and historical background of the baroque period. Representative plays of Lope de Vega, Tirso de Molina, Calderón; lyric poetry of Lope, Góngora, and Quevedo; prose developments. Prereq: SPAN 652 or 654 or equivalent. 4 cr. (Not offered every year.)

754. Cervantes
Cervantes's literary art. Selections from the major works. The Quijote, its originality and significance; its antecedents; its religious, philosophical, and sociological aspects; and its artistic structure. Prereq: SPAN 652 or 654 or equivalent. 4 cr. (Not offered every year.)

755. Literature of the 19th Century
Larra, Espronceda, Bécquer, Pérez Galdós, and Blasco Ibáñez. Romanticism, realism, and naturalism. Prereq: SPAN 652 or 654 or equivalent. 4 cr. (Not offered every year.)

757. Theater and Poetry of the 20th Century
The Generation of 1898 and Modernismo: Lorca, Casona, Buero Vallejo, Sastre, Salinas, Guillén, and Miguel Hernández. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

758. Spanish Prose of the 20th Century
Novels, short stories, and essays. Unamuno, Baroja, Menéndez Pidal, Ortega y Gasset, Julián Marías, Aranguren, Pérez de Ayala, Gironella, and Cela; survey of contemporary prose. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

760. Unamuno and Ortega y Gasset
Philosophical ideology and literary content of major contributions of Miguel de Unamuno and Jose Ortega y Gasset. Prereq: SPAN 652, 654, or equivalent;/or permission. 4 cr. (Not offered every year.)

771. Latin American Drama
From pre-Hispanic origins to the present, modern playwrights of Mexico and Puerto Rico. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

772. Latin American Novel
Development from romanticism to the present; contemporary trends and techniques. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

773. Latin American Short Story
Representative authors; stress on 20th century. Principles of interpretation. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

774. Major Latin American Authors
Works and lives of selected writers; pertinent historical circumstances. Prereq: SPAN 652, 654, or equivalent. 4 cr. (Not offered every year.)

790. Grammatical Structure of Spanish
Overview of the grammatical structure of Spanish through in-depth analysis of both morphology and syntax, with emphasis on the meaningful contrasts within the Spanish language and the grammatical contrasts between Spanish and English. 4 cr.

791. Methods of Foreign Language Teaching
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795. Special Studies in Spanish Language and Literature
B) Medieval Spanish Literature; C) Spanish Literature of the Renaissance; D) Spanish Literature of the Golden Age; E) Spanish Literature of the 18th and 19th Centuries; F) Spanish Literature of the 20th Century (1898–1936); G) Contemporary Spanish Literature; H) Latin American Literature of the 16th and 17th Centuries; I) Latin American Literature of the 18th and 19th Centuries; J) Latin American Literature of the 20th Century; K) Contemporary Latin American Literature; L) Structural and Applied Linguistics; M) Spanish Literary Criticism; N) Latin American Essay; O) Latin America; P) Catalán; Q) Spanish Poetry; R) Latin American Poetry; S) Galdós; T) Archetype Latin American Literature; U) Special Teaching Problems; V) Spanish Civilization and Culture; W) Latin American Civilization and Culture; X) Borges; Y) Spanish Theater; Z) Spanish for Graduates. Guided study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prereq: permission of the major supervisor. 2 or 4 cr.

796. Special Studies in Spanish Language and Literature
A) Hispanic Minorities of the United States; B) Hispanic Film; C) Introduction to Hispanic Linguistics; D) Hispanic Dialectology. Guided

study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prereq: permission of the major supervisor. 2 or 4 cr.

Technology (TECH)

Otis J. Sproul, Dean

The following courses are not necessarily offered every year.

564. Fundamentals of CADD/CAE/CIM
Fundamentals of CADD/CAE/CIM; graphics workstation techniques and principles. Topics covered include display functions, graphics construction techniques, entity manipulation, symbol libraries, variational geometry, and solids modeling. Prereq: permission. 3 cr.

583. Technology Systems
Study of the requirements, limitations, benefits, and hazards that are constraints on the development of technological systems. Prereq: prior courses in physics or chemistry and algebra II at high school level; sophomore or higher standing at UNH; permission. 4 cr.

650. Cooperative Work Experience
Course required of all students participating in the College of Engineering and Physical Sciences Cooperative Program during employment semesters. Prereq: permission. 0 cr. Cr/F.

697. Undergraduate Ocean Research Program
Students work as members of interdisciplinary project teams on contemporary ocean-related problems under the guidance of a faculty adviser. Student team defines problem, prepares a budget, conducts literature surveys, engages in dialogue with experts in the ocean community, deals with vendors, designs and builds a working engineering model, gathers and analyzes scientific data or conducts a comprehensive study, makes interim reports, and defends the results before a jury of experts. Prereq: normally senior standing and permission of the program director. A year-long effort: 2 credits each semester, 4 credits total, and "IA" grade given at the end of the first semester. 4 cr.

Theater (THEA)

Department of Theater and Dance
(For program description, see page 34; see also course listings under Communication and Dance.)

Chairperson: David J. Magidson
Professors: John C. Edwards, Carol Lucha Burns, David J. Magidson
Associate Professors: Jean M. Brown, Gilbert B. Davenport, Charles L. Robertson
Assistant Professors: Douglas A. Cumming, David M. Richman
Instructor: H. Gay Nardone
Faculty in Residence, Instructor: Susan D. Kisslinger
Lecturers: Ruth Grossen, Paul Mroczka
Associated Faculty/Staff: Susan E. Goldin, Thomas Scharff

435. Introduction to Theater
Emphasis on modern theater forms; e.g., legitimate, musical, cinema, television. Survey of theater areas, personnel, and methods. Attendance at University Theater and cultural events productions. Minimal participation in laboratory and major productions. 4 cr.

436. History of Theater I
History and theory in its social framework from the beginnings to 1800. 4 cr. (Not offered every year.)

438. History of Theater II
1800 to present. 4 cr. (Not offered every year.)

441. Exploring Theatrical Process
Introduction to the process of creation. Investigation of interaction of stimulus and artwork. Exploration of classic to modern works in theater and dance illuminating artist, process, and product. (Also offered as DANC 441.) 4 cr.

450. History of the American Musical
Study of the development of the American musical and its relationship to American social history. 4 cr.

457. Oral Interpretation
Analysis of literature for performance; demonstration and experimentation with performance methods; development of a critical standard for evaluation of performance and literature. 4 cr.

459. Stagecraft
Stage scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theater productions. 4 cr.

475. Stage Makeup
Fundamentals of juvenile, old age, character, and special stage makeup techniques. Prereq: permission. Lab fee. 2 cr.

520. Education through Dramatization
Application to educational curricula of drama techniques including sensory awareness, movement, pantomime, story telling, story dramatization; also lesson plan writing. 4 cr.

533. Introduction to Film
Introduction to the art, history, technology, and theory of the narrative motion picture from the silent period to the present. Examination of films by such filmmakers as Griffith, Keaton, Eisenstein, Renoir, Welles, Hitchcock, Bergman, Kurosawa. (Also offered as CMN and ENGL 533; students majoring or minoring in communication or in theater must register for CMN or THEA 533.) 4 cr.

541. Arts Administration
Contemporary arts administration; theories and techniques of cultural resource development, organization, structure, labor relations, marketing, consumer behavior, public relations, fund raising, audience development, and long-range planning. 4 cr.

546. Stage Costume Design and Execution
Costume history, styles, design theory, patternmaking, and construction. Prereq: permission. 4 cr.

547. Stage Properties
Research and manufacture of period and modern stage, trim, and hand properties. Prereq: THEA 459. 4 cr.

548. Stage Lighting Design and Execution
Elementary electricity, design theory, instrumentation, control, and practice. 4 cr.

549. Voice and Diction I
Based on individual needs; particular reference to theater, television, radio. Individual and group practice sessions. Coreq: THEA 551. Prereq: permission. 2 cr.

550. Voice and Diction II
Basic skills for oral interpretation, theater, etc., including analysis and development of dialects. Coreq: THEA 552. Prereq: THEA 549. 2 cr.

551. Acting I
Development of fundamental vocal and physical stage techniques for actors and directors through exercises, improvisation, and theater games. Coreq: THEA 549. 4 cr.

552. Acting II
Application of prior training in THEA 551 (prerequisite) to building characterizations in scenes and short plays. Coreq: THEA 550. 4 cr.

556. Introduction to Television Production
Theory and actual studio experience, practice, and procedures. All aspects of television work and formats. Students operate every piece of studio equipment and write, produce, and direct several shows. Prereq: CMN 455 or permission. (Also offered as CMN 556.) 4 cr.

560. Filmmaking
Theory of cinematic construction grounded in production work. Visualization, story-boarding, pictorial composition, creation of filmic reality, narrative devices, and editing. Students produce own short films. Lab fee. Prereq: permission. (Also offered as CMN 560.) 4 cr.

580. Broadcast News Preparation/Delivery
Introduction to radio and television news writing, editing, and delivering. Emphasis on practical radio news-writing experience. Prereq: permission. (Also offered as CMN 580.)

583. Puppetry
The art of puppetry as it applies to classroom dramatics. Students develop skills in hand and rod puppetry; writing and performing. 4 cr.

592. Special Topics in Theater
Special topics, problems, or projects in theater. Content varies according to needs and interests of students and faculty. May be repeated for credit. 2–4 cr.

616. Studies in Film
Advanced, focused study of the cinema. Topics vary from year to year and with instructor.

Focus may range from general considerations of film theory, film criticism, and film history, to specific analyses of selected genres, directors, and periods. (Also offered as CMN 616 and ENGL 616; students majoring or minoring in theater must register for THEA 616.) Prereq: ENGL/CMN/THEA 533 or instructor's permission. 4 cr.

621. Creative Drama
Advanced drama techniques leading to the design and execution of drama sessions with children. Includes role-playing, improvisation, and story dramatization. Prereq: permission. 4 cr.

622. Storytelling, Story Theater, and Involvement Dramatics
Students actively develop storytelling techniques based on individual needs. Includes an examination of story theater and involvement styles and the development of the ensemble. 4 cr.

624. Musical and Theater for Youth
Historical examination and analysis. Emphasis on theory and application of playwriting, stage and costume design, acting and directing techniques. Participation in production for youth required. 4 cr.

627. Methods of Education through Dramatization
Materials and technique practicum for teaching material in THEA 520. (Division of Continuing Education only.) Prereq: permission. 2–4 cr.

637. History and Law of Mass Communication
Media regulation discussed in historical/social contexts in which it took place. Begins with movable type and goes through present modes of regulation including executive, FCC, and the courts. Prereq: CMN 455 and permission. (Also offered as CMN 637.) 4 cr. (Offered every other year.)

652. Scene Design
Stage drafting, modules, materials, design theory, and styles. Individualized exercises, final project. Prereq: THEA 459. 4 cr.

653. Performance Project
Application of acting and directing theory to assigned responsibilities in a University Theater production or to an individual performance project. Prereq: THEA 551; 552; permission. To be taken in conjunction with THEA 654, but not concurrently. May be repeated to 4 cr. 2 cr.

654. Scenic Arts Project
Application of experience in design and technical aspects to assigned responsibilities in a University Theater production or to an individual project or presentation. Prereq: THEA 459; 652; permission. To be taken in conjunction with THEA 653, but not concurrently. May be repeated to 4 cr. 2 cr.

655. Musical Theater Workshop
Introduction to performing and directing the American musical. Discussion and application of beginning audition, acting, and staging techniques. Lab. 4 cr.

657. Directing
Continuation of THEA 552 (prerequisite). The director and performer develop interaction of the character. Ensemble playing. Full directing responsibility for a one-act play. 4 cr.

691. Laboratory or Field Experience
Taken in the senior year. 4 cr.

692. Special Topics in Theater
Variable topics in theater research, theory, or performance. May be repeated. 2–4 cr.

693. Theater Management I
Theater organization, fund raising, public relations, audience development, business and box-office management. Special topics may be explored. Prereq: four courses in theater. 4 cr.

697. Senior Seminar
Meetings as preparation for senior project; overview of recent developments and trends in the oral communication arts and sciences. Prereq: senior standing. 2 cr.

698. Senior Project
Further development and completion of senior project. Prereq: senior standing. 2 cr.

729. Community-Oriented Drama Programs
Advanced practicum in designing, developing, and producing drama programs for the school and community. 4 cr.

730. Theater Management II
Theory and technique of theater management applied to a specific assignment; may involve internships with professional, community, or educational theaters. Prereq: THEA 693. 4 cr.

741. Play Analysis for Production
Analysis and discussion to develop production concepts for actors, technicians, directors, designers, teachers. Prereq: THEA 435, 436, or 438; either 459, or 551 and 552. 4 cr. (Not offered every year.)

750. Writing for Performance
Playwriting; radio, television, and film. Emphasis will vary. Focus on original work with possible performances in other classes. May be taken three times for credit. Prereq: permission. 4 cr.

755. Advanced Musical Theater
Emphasis on characterizations and directing techniques. Use of scripts and scores of representative composers, lyricists, and librettists. Prereq: THEA 655. Lab. 4 cr.

758. Acting III
Continuation of THEA 657 and of the sequence begun in THEA 551 and 552. Styles of drama for the actor and director. Greek, Shakespearean, 18th-century comedy, and 19th-century realism. Prereq: THEA 551; THEA 552; THEA 657; / or equivalent. 4 cr.

768. Chamber Theater
Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. 4 cr.

781. Theater Workshop for Teachers
Intensive seminar-workshop. Rehearsal techniques, theater production, and stage direction; work in lab and in summer repertory theater production as applicable to secondary-school theater. Offered in the summer session. 4 cr.

782. Theater Workshop for Teachers
Continuation of THEA 781 (not a prerequisite). Offered in the summer session. 4 cr.

795, 796. Independent Study
Advanced individual study in one of the three areas of the department. Could be combined with senior project (for majors) for a total of 12 credits in the same semester if the student wishes to study off campus. Project is to be developed with supervising instructor. May be repeated. 1–8 cr.

Vocational/Technical and Adult Education (VTAE)

(For program description, see page 43.)

Coordinator: David L. Howell
Professor: William H. Annis
Associate Professors: Peter J. Horne, David L. Howell, Lewis Roberts, Jr.
Thompson School Associate Professor: Thomas A. March
Assistant Professor: Patricia D. Bedker

440. Concepts of Career Exploration
Examines the four major roles of people (as family members, citizens, workers, and users of leisure time) and how these roles apply to learning in a university setting. Through this concept of career exploration, students develop skills to (1) use the concept as a teaching or learning strategy; (2) explore individual areas for improvement; (3) relate their present and future classes to entering the world of work; and (4) develop flexibility for changes that may occur in the future. 4 cr.

498. Options in Vocational/Technical and Adult Education Seminar
Discussion of current issues, problems, and research and development in vocational/technical and adult education. Students, faculty, and other personnel serve as discussion leaders. Required of vocational/technical and adult education majors and minors. 2 cr. (Fall semester only.)

500. Occupational Competency Examination and Evaluation
Examination and/or evaluation to determine the level of competency within an occupation. Restricted to vocational/technical and adult education majors. Prereq: permission. Special fee. 0–30 cr. Cr/F.

525. Current Issues in Agriculture and Natural Resources
Current issues in agriculture that affect the lives of people now and in the future. Biotechnology; the complex industry of agriculture; issues related to our natural resources such as acid rain, forest lands, and water supply. Presentations by guest lecturers. 1 cr.

600. Leadership Techniques in Diverse Populations
Analysis of various theories and styles of leadership; characteristics of groups, group dynamics, and conflict resolution. Methods used in planning and conducting effective meetings. Methods of group problem solving and decision making. Analysis of leadership styles in diverse situations. 4 cr.

630. Development of Food and Fiber in Third World Countries
The world food situation and the role of agriculture and education in development of third world agrarian systems. Identification of constraints on food production, technology transfer, advantages and disadvantages of different agriculture systems, agricultural marketing, and career opportunities in international agriculture. Optional trip to United Nations over spring break. 4 cr.

650. Microcommunications
Organization, presentation, and evaluation of microlessons in a variety of educational settings. Preliminary experience and practice in communications. Variables of communicating under controlled conditions with videotaping for immediate feedback. Required for majors and minors. Special fee. 4 cr.

666. Teaching Vocational Education to Students with Special Needs
The development of strategies for the identification and teaching of special needs students in vocational education. Topics covered include legislation, identification of disadvantaged and handicapped learners, suggested teaching strategies, the development of Individual Vocational Education Programs (IVEPs), exemplary programs, current issues and problems, and other identified topics of student interests. Prereq: EDUC 500 or permission. 4 cr.

695. Investigations in Vocational/Technical and Adult Education
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Education; G) Cooperative Education; H) Disadvantaged and Handicapped Education. An opportunity for undergraduates to address a special problem. Prereq: permission. May be repeated. 2–4 cr.

696. Field Experience
Work with an agency, institution, or organization to gain technical and/or professional competence not otherwise available. Student plans experience with departmental adviser. Credit approval subject to recommendation of faculty members and performance of student. Prereq: permission. 2–16 cr.

700. Workshops in Vocational/Technical and Adult Education
Modularized instruction of in-service education. Focus varies with the needs of the student. May be repeated up to 8 credits. 1–2 cr.

702. Concepts of Vocational/Technical and Adult Education
Development of vocational/technical education in the U.S.; socioeconomic influences responsible for its establishment; federal and state requirements for secondary and postsecondary schools. Coordination of programs with general education and vocational fields. Focus on selected concepts relevant to adult education. Special attention on the adult as a learner, volunteer management, evaluation and accountability, experiential learning, and adult education. Required of all degree candidates in VTAE concentrations. 4 cr.

752. Youth Organizations
Organizational Development: advising youth organizations; teaching parliamentary procedure; developing programs and activities; leadership.

FFA/SOEP (Future Farmers of America/ Supervised Occupational Experience Programs, for high school youth).

VICA (Vocational Industrial Clubs of America).

4-H (Cooperative Extension Youth Program). 4 cr.

783. Conducting and Supervising Adult Education Programs
Analysis of traditional and nontraditional adult education programs; development of strategies of program planning, instruction, evaluation, and supervision. 4 cr.

791. Planning for Teaching
Organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, function of consulting committees, working with youth groups, program evaluation. Course scheduled concurrently with EDUC 694. Prereq: Microcommunications. 4 cr.

794. Issues in Vocational Curriculum for Special Learners
Contemporary issues in vocational/special education; provides vocational educators with skills needed to meet the special learning needs associated with disadvantaged and handicapped learners. Encompasses development and modification of curriculum to meet the needs of individuals with specific disabilities. 4 cr.

796. Investigations in Vocational/Technical and Adult Education
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Programs; G) Cooperative Education Programs; H) Disadvantaged and Handicapped Education Programs. Student-selected problems in one of the areas listed. Elective after consultation with the instructor. Hours to be arranged. May be repeated. 2–4 cr.

Agricultural Mechanization

451. Welding and Fabrication Technology
Processes and procedures of welding (arc, oxyacetylene, gas metal arc, gas tungsten arc) and metal fabrication. Lab. 3 cr.

461. Internal Combustion Engines, Principles and Maintenance
Internal combustion engines and their components with emphasis on how they function, preventive maintenance, and troubleshooting. Prereq: Permission. Lab. 3 cr.

462. Internal Combustion Engines, Repair and Overhaul
Principles and techniques of engine overhaul. Each student is required to provide and overhaul, to factory specifications, at least one 4-stroke cycle engine. Prereq: Internal Combustion Engines, Principles and Maintenance; permission. Lab. 3 cr.

470. Residential Electricity
Electrical principles, laws, and installation with emphasis on the National Electrical Code. Prereq: permission. Lab. 3 cr.

475. Construction Methods and Materials
Materials and methodology of building construction from foundations to roofs. Special fee. Lab. 4 cr.

Water Resources Management (WARM)

Department of Forest Resources
(For program description, see page 44; for faculty listings, see page 118; see also course listings under Environmental Conservation, Forestry, Soil Science, and Wildlife Management.)

500. Summer Work Experience
Work in the field of water resources management; must be performed under professional supervision or approved by forest resources faculty. Students are responsible for arranging their own experience. The department assists students in locating acceptable internships. Prereq: WARM majors. May be repeated. 0 cr. Cr/F.

504. Freshwater Resources
Major determinants of freshwater resources including hydrologic cycle and water balance, precipitation, stream-flow measurement, pollution, water supply and sewage treatment, water resource development. Special fee. Lab/field trips. 4 cr.

603. Watershed Management
Principles of land use as they relate to water resource management. Human effects on the water cycle. Watershed management for manipulation of water quantity and quality. Effect of development on water quality. Interpretation of water resources problems in light of existing social, economic, political, and cultural factors. Special fee. Lab/field trips. Prereq: WARM 504. 4 cr.

609, 610. Independent Study
Projects arranged according to student needs. Prereq: permission. 1–4 cr.

611. Wetland Resource Management
Analysis of the natural resources of coastal and inland wetlands and environmental problems caused by human use and misuse of these ecosystems. Special fees. Lab/field trips. 4 cr.

700. Issues in Water Resource Management
Combination of lectures and student independent research on coherent topic areas. Planned issues include origin, consequences, and methods of quantifying cumulative land-use effects on water resources; water resource issues in developing countries; risk assessment as a methodology and as a tool to set policy in water resource management. Special fee. Field trips. Prereq: WARM 603. 2 cr.

775. Land-Use Seminar
Multidisciplinary approach to land-use planning. Class is assigned a tract of land and is expected to cooperate in the development of a comprehensive land-use plan for the tract. Course culminates in a full "dress rehearsal" presentation of the plan to a town planning board for approval. Prereq: permission (by application) of the instructor. (Also offered as SOIL 775.) A year-long course: 2 credits each semester, 4 credits total, and "IA" grade (continuing course) given at the end of the first semester.

Wildlife Management (WILD)

Department of Forest Resources
(For program description, see page 44; for faculty listing, see page 118; see also course listings under Environmental Conservation, Forest Resources, Soil Science, and Water Resources Management.)

433. Wildlife Ecology
Historical, biological, ecological, and sociological factors affecting the wildlife resource and its management. Concepts in populations and their dynamics, communities, habitat, and management techniques. Special fee. Lab. 4 cr.

515. Wildlife Habitat Management
Wildlife habitats of New Hampshire; their structural components; useful techniques for creating and managing them. Prereq: course in dendrology or plant identification or permission of instructor. Special fee. 3 cr.

566. Wildlife Law Enforcement I
Fundamentals of wildlife law enforcement, its history, values, and the philosophy of managing people in the outdoors. Lab. 3 cr.

609, 610. Seminar
Seminars arranged according to student needs. A) Fire Ecology; B) Urban Wildlife; C) Waterfowl; D) Endangered Species. Prereq: junior standing and permission. Special fee. Optional lab/field trips. 0–3 cr.

635. Wildlife Management Techniques
Field and laboratory techniques frequently used by wildlife biologists in management and research. Special fee. Prereq: wildlife management major. 2 cr.

636. Wildlife Biology
Biological and management characteristics of the major categories of wildlife species including upland game birds, small game, big game, furbearers, and nongame. Prereq: WILD 533 or permission. 2 cr.

667. Wildlife Law Enforcement II
Techniques of wildlife law enforcement: dogs, computers, and other specific enforcement tactics. Hunter safety and conduct. Prereq: WILD 566 or permission. Lab. 3 cr.

695. Investigations in Wildlife Management
A) Wildlife Energetics and Physiology; B) Habitat Management; C) Population Dynamics; D) Waterfowl Management; E) Fire Ecology; F) Wildlife Management; G) Captive Wildlife Care; H) Landscapes and Wildlife Habitat. Prereq: permission. 1–4 cr.

737. Wildlife Population Dynamics
Mechanisms that influence and characteristics of terrestrial wildlife populations. Introduction to census methods and computer modeling. Special fee. Prereq: senior major or permission of instructor. 4 cr.

738. Wildlife Management
Habitat evaluation and management of terrestrial vertebrates. Consideration of game, nongame, and fur bearers. Special fee. Prereq: senior major or permission of instructor. 4 cr.

772. Wildlife Energetics
Energy requirements of wildlife species and the manner in which these needs are met in their natural environment. Thermodynamics in ecological systems, factors influencing metabolic rate, food habits, food-use efficiency, food availability. Prereq: permission. Special fee. 2 cr.

Women's Studies (WS)

(For program description, see page 22.)

Coordinator: Cathryn Adamsky
Associate Professors: Cathryn Adamsky, Barbara A. White

401. Introduction to Women's Studies
Interdisciplinary survey of the major areas of women's studies; women's history, cross-cultural perspectives, women in literature, psychology of women, etc. Basic principles and concepts fundamental to more advanced women's studies research. Topics vary. Required for minor. 4 cr.

595. Special Topics in Women's Studies
In-depth study of topics not covered in regular course offerings. Prereq: permission. 1–4 cr.

795. Independent Study
For advanced students who have the preparation to carry out an individual project of supervised research on a specific women's studies topic. Preparation should include WS 401 or equivalent, and/or other women's studies courses. Prereq: permission of instructor and women's studies coordinator. Barring duplication of topic, may be repeated for a maximum of 8 cr. 1–4 cr.

796. Advanced Topics in Women's Studies
Advanced or specialized topics not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Prereq: permission. 4 cr.

798. Colloquium in Women's Studies
Intensive study of specialized topic for advanced students. Topics vary with instructor. Prereq: permission. Preference given to women's studies minors who have completed 12 WS credits. Required for WS minors. Barring duplication of topic, may be repeated for credit. 1–4 cr.

Zoology (ZOOL)

(For program description, see page 45.)

Chairperson: Peter F. Sale
Professors: Arthur C. Borror, James F. Haney, Larry G. Harris, Peter F. Sale, John J. Sasner, Edward K. Tillinghast
Associate Professors: John E. Foret, Edward N. Francq, W. Huntting Howell, Stacia A. Sower, James T. Taylor, Charles W. Walker, Winsor H. Watson III
Assistant Professor: Richard R. Olson
Instructor: Marianne Klauser Litvaitis

412. Principles of Zoology
Concepts of animal biology, introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Special fee. Lab. 4 cr. (Spring semester only.)

474. Introduction to Field Marine Biology
Daily lecture, laboratory, and field work on marine biology: intertidal, plankton, fisheries, benthic organisms. Emphasis on understanding of ecological and physiological factors under field conditions. Three-week course at the Shoals Marine Laboratory, Isles of Shoals, in cooperation with Cornell University. 4 cr. (Summers only.)

503. Introduction to Marine Biology
A lecture course emphasizing the organization of marine biological communities. Various marine environments—pelagic, benthic, temperate, tropical—and their characteristic communities. Major emphasis on the approaches (e.g., analysis of energy flow and predator-prey interactions) used to analyze marine communities as well as the sampling techniques employed for each approach and the characteristic habitat type. Three lectures, one discussion section/week. Prereq: BIOL 411-412. 4 cr.

507-508. Human Anatomy and Physiology
All systems in human body. Laboratories: a dissection of preserved cats and experiments

with living tissues. Special fee. (Students may not receive credit for both ZOOL 507-508 and ZOOL 519.) 4 cr.

518. Vertebrate Morphology
Evolutionary and comparative examination of vertebrate anatomy. Structure of the major systems at the macroscopic and microscopic levels. Prereq: BIOL 411-412 or equivalent. Special fee. Lab. 5 cr.

519. Comparative Animal Physiology
Principles and comparative function of cell, organ, and system levels of animal respiration, circulation, fluid regulation, energetics, coordination, and neuroendocrine mechanisms. Prereq: Biology core curriculum or permission. Special fee. Lab. 4 cr.

542. Ornithology
Identification and biology of birds, especially those of northeastern United States. Field trips, laboratory, and lectures. Prereq: one semester of biology. 4 cr.

560. Anatomy and Behavior of the Gull
Daily lectures; lecture demonstrations, laboratories, and field work. Functional anatomy of all organ systems, with emphasis on sensory, nervous, digestive, and respiratory systems. The large nesting colonies of two species of gulls on Appledore Island will be used to demonstrate territoriality, aggression, mating, and other basic patterns of gull behavior. Prereq: one course in college level biology. Staff. 1 cr. Cr/F. (Summer only.)

628. Introductory Invertebrate Zoology
Lecture and laboratory survey of invertebrate phyla; systematic morphology, phylogeny, and natural history. Prereq: BIOL 411-412. Lab. 4 cr.

629. Developmental Biology of the Vertebrates
Principles of animal development including metamorphosis, regeneration, and aging in selected vertebrates. Prereq: ZOOL 518; ZOOL 519; and BIOL 604. Lab. 4 cr.

674. Field Marine Science
Daily lectures; laboratory and field work. Offered at the Isles of Shoals in cooperation with Cornell University. Initial overview of the marine sciences, emphasizing living material in natural habitats; biology of intertidal plants and animals; biological oceanography; ichthyology; and fisheries. Also introductory physical and chemical oceanography, marine geology, marine ecology, and the effects of human activity on the marine environment. Prereq: at least a full year of college biology. 6 cr. (Summer only.)

704. Comparative Endocrinology
Endocrine organs; relationship to control of the internal environment, growth, development, and adaptation to external environment. Prereq: ZOOL 518; ZOOL 519; organic chemistry. 4 cr.

705. Techniques in Endocrinology
Application of modern laboratory techniques to study of hormonal and molecular mechanisms in the endocrine system. Prereq: ZOOL 704 or ANSC 701 or BCHM 751, 752, 753, 754, and permission. (Also offered as BCHM 705.) Special fee. Lab. 4 cr.

707. Human Genetics
Inheritance patterns; gene and chromosome mutation rates and effects; linkage and gene frequency. Prereq: BIOL 604 or equivalent; /or permission. 4 cr. (Not offered every year.)

709. Environmental Physiology of Animals
Animals' responses to natural changes or extremes of the physical environment. Synthesis of basic concepts from ecology and physiology for students with background in these areas. Emphasis on adaptation of animals to major environmental parameters such as nutrient levels, light, temperature, ionic environment, etc., as well as temporal (seasonal, daily) changes in these major environmental factors. Examples from several levels of organization including biofeedback mechanisms. Prereq: BIOL 541; ZOOL 519; /or equivalent. 4 cr. (Not offered every year.)

711. Ichthyology
Introduction to the evolution, systematics, anatomy, physiology, and ecology of fishes, with emphasis on New England species. Prereq: BIOL 411-412 or equivalent. Lab. 4 cr. (Alternate years.)

712. Mammalogy
Origins, diversification, reproduction, ecology, behavior of mammals. Identification of local forms. Prereq: BIOL 411-412 or equivalent. Lab. 4 cr.

713. Animal Behavior
Individual and social behavior. The role of anatomy, physiology, ecology, and prior experience. Techniques and practical application. Prereq: one year of zoology. Lab. 4 cr. (Not offered every year.)

717. General Limnology
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of the aquatic environment. Factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prereq: BIOL 541 or equivalent. (Also offered as BOT 717.) 4 cr.

719. Field Limnology
Freshwater ecology examined through laboratory exercises with freshwater habitats. Methods to study freshwater lakes; interpretation of data. Seminars and occasional Saturday field trips. Prereq: present or prior enrollment in BOT 717, ZOOL 717, or equivalent; permission. (Also offered as BOT 719.) 4 cr.

720. Field Marine Science for Teachers
Primarily for teachers grades 6 through 12, but open to others. Overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shore birds) in their natural environments. Also such topics as coastal zone problems, marine fisheries, economics of marine organisms, and the educational resources of the marine environment. Fieldwork. Offered at the Isles of Shoals (Shoals Marine Laboratory) in cooperation with Cornell University. Three lectures and two labs or field trips per day. Prereq: college-level introductory biology. 1 cr. (Summer only.)

721. Parasitology
Introduction to the more important parasites causing disease in humans and animals. Living materials will be used as much as possible. Prereq: one year of zoology. Lab. 4 cr. (Not offered every year.)

723. Molecular Biology of the Eukaryotic Cell
Examination of dynamic interrelationships between cellular structure and function at molecular level. Viral, prokaryotic, and eukaryotic models are used to illustrate molecular regulatory mechanisms underlying biological complexity. Recent advances are presented against a background of fundamental concepts. Emphasis on normal and impaired cellular differentiation, growth, interphase function, and proliferation. Also considered are the coupling of energy to cellular processes, the role of bioelectricity, and intrinsic and extrinsic chemical messengers. Prereq: organic chemistry. Recommended: developmental or cell biology (ZOOL 629, 728, BOT 632), biochemistry or physiology (ZOOL 519 or ANSC 717). 4 cr.

724. Laboratory in Cell Biology
Complements class material (in ZOOL 723) and stresses use of modern research tools in addressing fundamental questions about the biology of the cell. Immunochemical techniques, traditional and innovative applications of electron and light microscopy, bioassay, cell culture and fractionation, and electrophysiology. Coreq: ZOOL 723. Special fee. 2 cr.

728. Developmental Biology of the Invertebrates
Principles of animal development. Cellular processing of developmental information. Reproduction and development in the invertebrates. Prereq: BIOL 411-412 or ZOOL 628. Lab. 4 cr.

730. Vertebrate Histology
Microscopic anatomy of vertebrate tissues and organs at the light microscope level; emphasis on mammalian histology; some comparative study of lower vertebrates. Prereq: ZOOL 508 or 518, or equivalent. Lab. 4 cr.

750. Biological Oceanography
Biological processes of the oceans, including primary and secondary production, trophodynamics, plankton diversity, zooplanton feeding ecology, microbial ecology, and global ocean dynamics. Emphasis on experimental approaches. Term project involves either development of an ecosystem model or performance of a field experiment. Field trips on R/V *Jere Chase* and to the Jackson Estuarine Laboratory. Prereq: one year of biology or permission of instructor. (Also offered as ESCI 750.) 4 cr.

751. Adaptations of Marine Organisms
Ecological physiology of selected algae and invertebrates from the Gulf of Maine. Offered at the Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell University. Prereq: field marine science, plant or animal physiology, physiological ecology; understanding of chemical quantitative methods and analysis. 4 cr. (Summer only.)

753. Marine Vertebrates
Lectures, laboratories, and field work on the systematics, ecology, and physiology of fishes, marine reptiles, marine birds, and marine mammals of the Gulf of Maine. Offered at the Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell University. Prereq: field marine science or vertebrate biology. 4 cr. (Summer only.)

772. Fisheries Biology
Principles of fisheries science, with emphasis on techniques used to assess the biological characteristics of exploited fish populations, and the use of such information for fisheries management. Prereq: ZOOL 711 or equivalent; permission. Lab. 4 cr. (Alternate years.)

775. Reproduction and Development of Marine Invertebrates
Cultivation, experimental and descriptive embryology, developmental energetics, substrate selection, metamorphosis, and ecological significance of reproductive patterns in major invertebrate groups. Prereq: ZOOL 674 (UNH), Biol Sci 364 (Cornell), or invertebrate zoology. Offered at Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell Univ. 4 cr. (Summer only; not offered every year.)

777. Neurobiology and Behavior
Survey of fundamental concepts and recent discoveries in neurobiology. Topics include structure and function of neurons, development, cellular basis of behavior (sensory and motor systems), neuropharmacology, and neural plasticity (learning). Prereq: Biology core curriculum or permission. 4 cr.

778. Neuroscience Techniques
Techniques and laboratory-oriented course designed for students of the behavioral and physiological sciences who wish to understand the basic electrophysiological properties of neurons and how they interact. Both invertebrate and vertebrate systems are called upon to illustrate principles of synaptic transmission, integration, sensory information processing, and the control of movement. Prereq: ZOOL 777 or equivalent. Lab. 4 cr.

791, 792. Advanced Studies in Zoology
A) Marine Ecology; B) Stream Ecology; C) Freshwater Zooplankton Ecology; D) Population Ecology; E) Advanced Invertebrate Zoology; F) Protozoology; G) Comparative Physiology; H) Concepts and Techniques in Reproductive Biology; I) Comparative Neurophysiology; J) Morphogenesis; K) Quantitative Ecological Analysis. Graduate-level courses open to advanced undergraduates wishing a more detailed treatment of a field. Limited enrollment. Research-oriented with outside readings primarily from the original scientific literature. Enrollment by permission of instructor only; priority given to graduate students. For complete course descriptions see Graduate Catalog. 4 cr.

795, 796. Special Problems in Zoology
A) Animal Behavior; B) Developmental Biology; C) Ecology; D) Electron Microscopy; E) Endocrinology; F) Evolution; G) Genetics; H) Histology; I) History of Biology; J) Invertebrate Biology; K) Parasitology; L) Physiology; M) Protozoology; N) Teaching Practices; O) Underwater Research; P) Vertebrate Biology; Q) Biological Techniques. Students may elect one or more sections for advanced study. Reading, laboratory work, organized seminars, conferences. Prereq: permission. 1–4 cr.

University of New Hampshire at Manchester

The following courses are normally offered only at the University of New Hampshire at Manchester. For more information, see page 77 or contact UNHM at 220 Hackett Hill Rd., Manchester, N.H., 03102, telephone (603) 668-0700.

Administration

ADMN 547. Survey of Business Law
Overview of the law pertaining to business and business relationships including such areas as contract, agency, sales, partnership, negotiable instruments, and property. Case methods. Prereq: sophomore status or permission based on appropriate experience. Not equivalent to ADMN 647-648, Business Law I & II. No credit toward the administration major at the Whittemore School. 4 cr.

Biology

BIOL 405. Principles of Biology I
Lecture and laboratory introduction to chemical and cellular phenomena common to all living things; survey of major taxonomic groups of organisms. Suitable for all students. Required of UNHM students planning to major in life sciences. Lab. 4 cr.

BIOL 406. Principles of Biology II
Lecture and laboratory survey of animal organization and physiology, with emphasis on humans; introduction to ecology, evolutionary biology, and ethology. Suitable for all students. Required of UNHM students planning to major in life sciences. Lab. 4 cr.

BIOL 443. Natural History of North America
Introduction to the major terrestrial, aquatic, and marine communities of North American continent. Consideration given to climatic, geological, and ecological factors that have shaped the continent and its natural communities. Designed specifically for students who are not planning to major in the sciences. No prerequisites. Lab fee: $25. 4 cr.

Computer Information Systems

CIS 411. Introduction to Computer Applications
Role of key microcomputer applications: spreadsheets, word-processing, and data base management systems. Practical experience with relevant software packages is major part of the course. No prior computer experience or coursework necessary. 4 cr.

CIS 412. Microcomputers and Office Automation
In-depth exploration of the modern automated office. Students investigate tools available for the office environment such as local area networks, telecommunications applications of microcomputers, and electronic mail. In addition, students gain advanced skills with DBMS, spreadsheet, and word-processing software. Prereq: CIS 411 or permission. 4 cr.

CIS 538. Business Programming Language I with COBOL
Structured programming course in which students further develop the concepts and techniques of computer programming. Topics include exception, summary and control break reports, table processing, and file creation and maintenance. Emphasis on development of advanced program design and documentation techniques. Prereq: background or coursework (e.g., CS 406) in computer applications and programming or permission of instructor. 4 cr.

CIS 539. Business Programming Language II
Advanced course in programming. Students work with indexed and relative files and cooperatively develop systems of programs to solve business problems. Course is implemented in COBOL. Prereq: CIS 538. 4 cr.

CIS 542. Operating System Applications
Introduction to operating system concepts with relevant lab experiences. Operating systems for both micro- and mainframe computers; available utilities; the generation of batch files for operation of a LAN. Operating systems covered may include MS-DOS, UNIX, and VAX VMS. Prereq: CIS 411; CS 406; or permission. 4 cr.

CIS 544. Computer Systems Development with High-Level Tools
Overview of the project life-cycle; evolution of high-level tools. Emphasis on prototyping techniques as implemented using fourth-generation languages (4GLs). Students complete projects using prototyping techniques and a fourth-generation language. Prereq: CIS 411; CS 406; or permission. 4 cr.

Humanities

HUMA 411. Humanities I
Introduction to the humanities and Western culture through literature, history, philosophy, music, art, and architecture. Examination of selected historical periods from classical Greece through the Renaissance through readings, films, slides, and field trips. Materials fee: $20. 4 cr.

HUMA 412. Humanities II
Introduction to the humanities and Western culture through literature, history, philosophy, music, art, and architecture. Examination of selected historical periods from the Enlightenment to the present through the use of readings, films, slides, and field trips. Materials fee: $20. 4 cr.

HUMA 519. Humanities: Classical Greece
Examination of the culture of Classical Greece through the history, drama, philosophy, and art of the period. Open to all students. Recommended for students in the humanities concentration. 4 cr.

HUMA 525. Social Justice in America
Introduction to theories of social justice and examination of historical examples of the law, economy, society, and public policy affecting social justice from the Colonial period to the present. 4 cr.

HUMA 575, 576. Introduction to Film I and II
Exploration of cinema as art and as social expression. Study of film from the point of view of filmmakers, genres, and periods of film production. Approximately 12 films will be viewed (some on videotape). Lab fee. 4 cr.

HUMA 622. Studies of Freedom and Liberty
Principles of freedom and liberty that helped to form Western culture from the Renaissance to the present. Topics include concepts of human nature, theories of government and society. Readings include Machiavelli, Locke, Paine, Mill, Marx, Freud, Sartre, and Marcuse. 4 cr.

HUMA 658. The West and the Modern World
Study of the post–World-War-II era. Subjects include the complex political and economic relationships between the industrialized west and economically underdeveloped nations, and the ideological conflicts (e.g., Marxism vs. liberal democracy) that continue to divide the world. Special focus on post–World-War-II America, with attention to America's role in the contemporary world, especially the connections between American global interests and internal American political, economic, and social arrangements. 4 cr.

HUMA 695. Humanities: A Study of Creativity
A study of human creativity through representative lives and works of such figures as daVinci, Einstein, Käthe Kollwitz, Bach, Dickens, and Freud. Lectures, class discussions, films, and slides supplemented by gallery tours, plays, and concerts. Open to students with a background in humanities or by permission of the instructors. Materials fee. 4 cr.

HUMA 696. Humanities: A Study of Contemporary Issues
Current social and political issues with focus on recent developments in public policy, science, and business, and their impact on social values. Prereq: junior status or permission. 4 cr.

Independent Study

UMST 599. Independent Study: Special Topics
Flexible course structure permitting independent research, study, or group discussion of advanced material not covered in regular course offerings in a concentration. Occasional offerings depend on availability of staff. Cannot be taken more than twice if credits count toward the associate degree. 1–4 cr.

Sign Language Interpreting

INTR 435. American Sign Language I
Introduction to the structure and vocabulary of American Sign Language; background information on deaf culture. Focus on basic patterns of grammar and usage; practice in learning to think in the visual mode. Limited to 15 students. 4 cr.

INTR 436. American Sign Language II
Continuation of and expansion on concepts and principles introduced in ASL I. Focus on more advanced vocabulary and patterns of grammar; use of space and modulation of signs to denote aspects of time and location; and additional information on Deaf Culture. Limited to 15 students. 4 cr.

INTR 437. Orientation to Deafness
Overview of deafness as a physical disability. Focus on the human auditory system, audiological testing, and implications of deafness in early childhood. Pre- or coreq: ENGL 401. 2 cr.

INTR 438. Psycho-Social Aspects of Deafness
Effects of deafness on the development of the individual from early childhood to adulthood. Includes information on language acquisition, social development and self-image, history of deaf education, organizations serving deaf people, community and culture, and controversies in the field. Pre- or coreq: ENGL 401. 4 cr.

INTR 530. Conversational Sign Lab
Opportunity to use ASL conversationally with deaf instructors. Class is conducted entirely in ASL; instructors provide continual evaluation of and feedback on language skills. Prereq: INTR 435 and 436 or consent of program director. 2 cr.

INTR 531. American Sign Language III
Second-year course, focusing on various linguistic aspects of sign, including use of classifiers, locatives, temporal and distributional aspect, directionality, time, and pronominalization. Limit: 15. Prereq: INTR 436 or consent of program coordinators. 4 cr.

INTR 532. American Sign Language IV
Builds and expands upon groundwork and grammatical principles established in prerequisite courses (ASL I, II, and III), introducing the student to sociolinguistic aspects of ASL as it functions with the Deaf cultural context. Areas of investigation include use of formal vs. informal sign register; sign variation by region, age, and gender; social factors that give rise to code switching; and political and cultural evolution of the U.S. Deaf community. Taught in the target language using the direct experience method. Prereq: INTR 531. 4 cr.

INTR 533. Practicum I
Experiential course providing the opportunity to work with deaf adults or children and with professionals in the field, particularly interpreters. Emphasis on observation and interactions. Prereq: INTR 436; INTR 438; enrollment in the interpreter training program. Recommended coreq: INTR 535. 2 cr.

INTR 534. Practicum II
Students work in a variety of settings under the supervision of qualified interpreters and acquire experience in handling actual interpreting situations. Prereq: INTR 533 and INTR 535. 2 cr.

INTR 535. Interpreting I
Introduction to the general principles, logistics, and ethics of interpreting. Emphasis on application of ASL grammar to the interpreting process and on sign-to-voice interpreting/transliterating. Prereq: INTR 436. Recommended coreq: INTR 537. 4 cr.

INTR 536. Interpreting II
Continuation of and expansion on the theory and practice of Sign Language interpretation. Audio and video tape used extensively to further fluency in expressive and receptive interpreting, with attention to content, context, style affect, and register. Additional work in transliteration, ethics, and preparation for the state screening exam. Prereq: INTR 535. Recommended coreq: INTR 537. Limited to 15 students. 4 cr.

INTR 537. Deafness and Interpreting Seminar
Orientation to a variety of issues and settings encountered in the field of interpreting. Students engage in outside research on chosen topics and present their findings to the class. Emphasis on the development of strategies for communicating with deaf clients possessing minimal language skills and with other special population groups. Prereq: INTR 436. Recommended coreq: INTR 535. 2 cr.

INTR 538. Interpreting and the Community
Trends and issues in the field of Sign Language interpretation. Students engage in outside research on various aspects of Sign Language, Deaf Culture, and interpretation. Prereq: INTR 438; INTR 535. Recommended coreq: INTR 536. Limited to 15 students. 2 cr.

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Director of Financial Aid

Faculty and Extension Educators

Faculty

(This listing is current as of January 4, 1989. The date of appointment appears in parentheses following the faculty member's name.)

Abeles, Sigmund M. (1970)
Adjunct Professor of the Arts; A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957.

†Aber, John D. (1987)
Associate Professor of Forest Resources and Earth, Oceans, and Space; B.S., Yale University, 1971; M.F.S., University of Texas School of Law, 1973; Ph.D., Yale University, 1976.

Adamovich, Frank W. (1968)
Associate Professor and Documents Librarian; B.S., Fitchburg State College, 1960; M.S., Simmons College, 1968.

Adams, Robert L. A. (1967)
Associate Professor of Geography; B.A., Williams College, 1961; M.A., Clark University, 1966; Ph.D., ibid., 1971.

Adamsky, Cathryn (1981)
Associate Professor of Women's Studies; B.A., Clark University, 1955; Ph.D., University of Rochester, 1959.

Adkins, Charles E. (1986)
Lieutenant Colonel, U.S. Army and Professor of Military Science; B.S., West Point Military Academy, 1969; M.S., Massachusetts Institute of Technology, 1976.

Aikins, Janet (1979)
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Associate Professor of Psychology; B.A., Harvard University, 1967; M.A., Princeton University, 1969; Ph.M., Yale University, 1973; Ph.D., ibid., 1975.
Wright, John J. (1970)
Professor of Physics; B.S., Worcester Polytechnic Institute, 1965; Ph.D., University of New Hampshire, 1969.
Wright, Vicki C. (1986)
Adjunct Assistant Professor of the Arts; B.F.A., Ohio Wesleyan University, 1977; M.A., Arizona State University, 1986.
Wrightsman, Dwayne E. (1964)
Professor of Finance and Administration; B.S., Manchester College, 1958; M.B.A., Indiana University at Bloomington, 1959; Ph.D., Michigan State University, 1964.
Yamamoto, Yutaka (1973)
Associate Professor of Philosophy; B.S., University of California at Berkeley, 1957; M.A., University of Michigan at Ann Arbor, 1967; Ph.D., ibid., 1973.
Yeager, Jack A. (1981)
Associate Professor of French; B.A., Colorado State University, 1968; M.A., University of Kentucky, 1969; Ph.D., University of Wisconsin at Madison, 1982.
Yount, John A. (1962–64, 1965)
Professor of English; B.A., Vanderbilt University, 1960; M.F.A., University of Iowa, 1962.
Zabarsky, Melvin J. (1969)
Professor of the Arts; B.F.A., Boston University, 1958; M.F.A., University of Cincinnati, 1960.
Zaso, Gus C. (1970)
Associate Professor of Leisure Management and Tourism; A.B., Syracuse University, 1957; M.A., Central Michigan University, 1962; Re.D., Indiana University at Bloomington, 1965.
Zezula, Jerilee A. (1979)
Thompson School Assistant Professor of Applied Animal Science; B.S., Michigan State University, 1970; D.V.M., ibid., 1971.
Zia, Lee L. (1985)
Assistant Professor of Mathematics; B.S., University of North Carolina at Chapel Hill, 1978; M.S., University of Michigan at Ann Arbor, 1980; Ph.D., Brown University, 1985.
Zipke, Jean (1987)
UNHM Instructor of Composition; B.A., University of Michigan at Ann Arbor, 1967; M.A., Northwestern University, 1968.
Zsigray, Robert M. (1970)
Professor of Microbiology and Genetics; A.B., Miami University, 1961; M.S., Georgetown University, 1967; Ph.D., ibid., 1969.

Cooperative Extension Educators

Adams, Nancy E. (1980)
Associate Extension Educator, Agriculture, Rockingham County; B.S., University of New Hampshire, 1975; M.S., Michigan State University, 1977.
Auger, Philip A. (1977)
Assistant Extension Educator, Forestry, Rockingham County; B.S.F., University of New Hampshire, 1974.
Barker, Lawrence R. (1987)
Assistant Extension Educator, 4-H, Coos County; B.S., University of New Hampshire, 1981; M.B.A., Plymouth State College, 1986.
Barnaby, Roland T. (1988)
Assistant Extension Educator, Sea Grant, Rockingham County; B.Ed., Plymouth State College, 1963; M.Ed., University of New Hampshire, 1970.
Barney, Sally W. (1982)
Associate Extension Educator and Extension Specialist, 4-H, Youth Development; B.S., University of New Hampshire, 1968; M.O.E., ibid., 1987.
Baxter, Charlene F. (1988)
Associate Extension Educator, Home Economics, Sullivan County; B.S., Cornell University, 1974; M.P.S., ibid., 1982.
Belisle, Ann M. (1988)
Extension Educator, Home Economics, Carroll County; B.S., University of Maine at Orono, 1985; M.S., ibid., 1987.
Bennett, Karen P. (1980)
Assistant Extension Educator, Forestry, Merrimack County; B.S.F., University of New Hampshire, 1979.
Black, Donald C. (1971)
Associate Extension Educator, Forestry, Strafford County; B.S., University of Massachusetts at Amherst, 1963.
Bonneville, Richard A. (1985)
Associate Extension Educator and Extension Specialist, 4-H Camping and Natural Resources; B.S., Springfield College, 1964; M.Ed., ibid., 1965.
Boozer, Claudia R. (1983)
Associate Extension Educator, Home Economics, Rockingham County; B.S.Ed., University of Rhode Island, 1972.
Bressett, Lauren L. (1976)
Assistant Extension Educator, 4-H, Cheshire County; B.S., Keene State College, 1975.
Buob, Thomas E. (1982)
Associate Extension Educator, Agriculture, Grafton County; B.S., Christian Brothers College, 1970; M.S., University of New Hampshire, 1979.

Burk, Earline E. (1986)
Assistant Extension Educator, 4-H Youth Development, Hillsborough County; B.S., University of New Hampshire, 1980; M.S.T., Antioch College, 1986.

Burrows, Dorothy (1988)
Extension Instructor, 4-H, Carroll County; B.A., University of Massachusetts at Amherst, 1970.

Bush, Judith J. (1979)
Associate Extension Educator, Home Economics, Merrimack County; B.S., Oregon State University, 1963; M.A., University of Connecticut, 1965.

Buteau, Shirley O. (1979)
Associate Extension Educator, Home Economics, Coos County; B.S., University of Maine at Farmington, 1971.

Cheever, Deborah J. (1977)
Assistant Extension Educator, 4-H, Merrimack County; B.S., Keene State College, 1977; M.O.E., University of New Hampshire, 1984.

Clement, Bruce A. (1985)
Associate Extension Educator, Agriculture, Cheshire County; B.S., University of New Hampshire, 1968; M.S., University of Connecticut, 1980.

Clifford, Virginia W. (1978)
Associate Extension Educator, 4-H, Belknap County; B.S., University of New Hampshire, 1956; M.S., ibid., 1958.

Colby, Perley D. (1953)
Associate Extension Educator, Agriculture, Hillsborough County; B.S., University of New Hampshire, 1952.

Conklin, V. Jean (1984)
Assistant Extension Educator and Regional Specialist, Diary; B.S., University of New Hampshire, 1981; M.S., Virginia Polytechnic Institute and State University, 1983.

Crosby, Paul B. (1984)
Assistant Extension Educator, Forestry, Coos County; B.A., Drew University, 1978; M.S., University of New Hampshire, 1983.

Cross, Charlotte W. (1981)
Assistant Extension Educator and Extension Specialist, Textiles and Clothing/Home Environment; B.S., University of Maine at Orono, 1970; M.S., Oregon State University, 1978.

Damon, John F. (1961)
Extension Educator and Extension Specialist, Community Planning; B.S., University of New Hampshire, 1961; M.S., North Carolina State University, 1973.

Dole, Sumner A., III (1977)
Associate Extension Educator, Forestry, Belknap County; B.S., University of New Hampshire, 1973.

Dusseault, Laurel A. (1980)
Associate Extension Educator, 4-H, Hillsborough County; B.S., Boston University, 1959; M.Ed., University of New Hampshire, 1978.

Eaton, Alan T. (1978)
Associate Extension Educator and Extension Specialist, Entomology; B.S., University of Massachusetts at Amherst, 1972; M.S., Virginia Polytechnic Institute and State University, 1975; Ph.D., North Carolina State University, 1978.

Edmonds, Robert L. (1984)
Associate Extension Educator and Extension Program Leader, Forestry; B.S., S.U.N.Y. College of Environmental Science and Forestry, 1965; M.S., ibid., 1969.

Elliott, Linda M. (1983)
Assistant Extension Educator, Home Economics, Cheshire County; B.S., State University of New York at Oneonta, 1969; M.S., ibid., 1975.

Ernst, F. Carlton, Jr. (1983)
Associate Extension Educator and Extension Specialist, Livestock; B.S., University of Maryland, 1960; M.S., ibid., 1970.

Fabrizio, Richard F. (1965)
Assistant Extension Educator, 4-H, Grafton County; B.V.A., University of Massachusetts at Amherst, 1959.

Farrey, Judith E. (1973)
Associate Extension Educator and Extension Specialist, 4-H, Youth Development; B.S., Tufts University, 1958; M.S., University of New Hampshire, 1979.

Ferguson, John R., Jr. (1965)
Associate Extension Educator, Forestry, Hillsborough County; B.S., University of New Hampshire, 1960.

Gahm, Allan (1984)
Extension Instructor, 4-H, Strafford County; B.S., University of Vermont, 1980.

Garland, Lynn B. (1969)
Associate Extension Educator, 4-H, Rockingham County; B.S., University of Maryland, 1969; M.S., University of New Hampshire, 1979.

Gilman, Francis E. (1969)
Associate Extension Educator and Extension Specialist, Agricultural Engineering/Farm Safety Coordinator; B.S., University of Maine at Orono, 1958.

Gregory, Paula J. (1980)
Assistant Extension Educator, Home Economics, Hillsborough County; B.Ed., Keene State College, 1971; M.O.E., ibid., 1977.

Howe, Gerald W. (1972)
Associate Extension Educator and Extension Specialist, Community and Rural Development; B.S., University of Massachusetts at Amherst, 1970; M.S., ibid., 1977; M.S.L., Vermont Law School, 1983.

Hunter, Barbara J. (1982)
Assistant Extension Educator, Home Economics, Belknap County; B.A., Montclair State College, 1966; M.S., University of New Hampshire, 1975.

Jones, Debra A. (1987)
Assistant Extension Educator, 4-H, Hillsborough County; B.S., Virginia Polytechnic Institute and State University, 1978; M.S., Mississippi State University, 1983.

Kapitan, Shelley W. (1986)
Associate Extension Educator, Agriculture, Rockingham County; B.S., Purdue University, 1981; M.S., University of Dayton, 1984.

Knight, Suzann E. (1983)
Assistant Extension Educator, Home Economics, Merrimack County; B.S., University of Massachusetts at Amherst, 1972; M.O.E., Keene State College, 1978.

Knowles, Stanley W. (1962)
Extension Educator and Extension Specialist, Forestry; B.S., University of New Hampshire, 1959; M.S., ibid., 1970.

Long, Valerie A. (1979)
Associate Extension Educator and Extension Specialist, EFNEP; B.S., Mount Saint Mary, 1973; M.S., University of New Hampshire, 1979.

Lord, William G. (1973)
Associate Extension Educator and Extension Specialist, Fruit; B.S., University of New Hampshire, 1970; M.S., University of Massachusetts at Amherst, 1972.

Luppold, Deborah (1986)
Associate Extension Educator and Area Extension Agent EFNEP; B.S., University of Massachusetts at Amherst, 1975; M.S., Boston University, 1979.

Luther, Robin A. (1985)
Assistant Extension Educator, 4-H, Sullivan County; B.S., Rutgers, the State University of New Jersey, 1981; M.Ed., ibid., 1985.

Maes, Deborah B. (1982)
Assistant Extension Instructor, Home Economics, Grafton County; B.S., Keene State College, 1975; M.E., Plymouth State College, 1987.

Marriott, Bruce A. (1973)
Associate Extension Educator, Agriculture, Belknap County; B.S., University of Massachusetts at Amherst, 1964; M.S., ibid., 1971.

Mates, Heather M. (1987)
Assistant Extension Educator, Home Economics, Rockingham County; B.S., University of New Hampshire, 1977; M.A., San Francisco State University, 1987.

Mawson, Julia Steed (1986)
Associate Extension Educator and Extension Specialist, Sea Grant; B.S., Lowell Technological Institute, 1973; M.A.T., University of New Hampshire, 1978.

McAllister, Edward H. (1981)
Associate Extension Educator and Extension Specialist, Staff Development; B.S., Delaware Valley College, 1971; M.S., University of Maryland, 1981.

McWilliam, Gail D. (1983)
Assistant Extension Educator, Agriculture, Sullivan County; B.S., University of Vermont, 1978.

Meeker, Bonnie Sharon (1986)
Associate Extension Educator and Extension Specialist, Sea Grant; B.S., Oregon State University, 1957; M.E., University of New Hampshire, 1975.

Mitchell, Frank S. (1980)
Assistant Extension Educator, 4-H Outdoor Education, Hillsborough County; A.A.S., Thompson School of Applied Science, 1974; B.S., University of New Hampshire, 1976; M.S., ibid., 1980.

Mullen, Alice A. (1987)
Associate Extension Educator, Home Economics, Hillsborough County; B.S., University of New Hampshire, 1978; M.S., State University of New York, 1985.

Nute, Jonathan W. (1987)
Assistant Extension Educator, Forestry, Hillsborough County; B.A., University of New Hampshire, 1973; M.S., Yale University, 1985.

Paganelli, David John (1987)
Assistant Extension Educator, Forester, Grafton County; B.S., University of Idaho, 1983; M.S., Virginia Polytechnic Institute and State University, 1986.

Parr, Northam D. (1982)
Assistant Extension Educator, Forester, Grafton County; B.S., University of New Hampshire, 1979; M.S., ibid., 1986.
Patmos, Raymond M., Jr. (1972)
Associate Extension Educator, Forestry, Cheshire County; B.S., University of New Hampshire, 1966; M.B.A., Plymouth State College, 1980.
Plowman, Faye T. (1983)
Associate Extension Educator and Extension Specialist, Housing/Equipment; B.S., Michigan State University, 1970; M.A., ibid., 1972.
Pohl, Peter W. (1969)
Associate Extension Educator, Forestry, Carroll County; B.S., University of New Hampshire, 1966; M.S., ibid., 1978.
Porter, John C. (1974)
Associate Extension Educator and Extension Specialist, Dairy; B.S., University of New Hampshire, 1971; M.S., Cornell University, 1973.
Pratt, Margaret Jean (1986)
Extension Instructor, Agriculture, Hillsborough County; B.A., Brown University, 1977; M.S., Colorado College, 1986.
Schroeder, Calvin E. (1969)
Associate Extension Educator, Agriculture, Strafford County; A.A.S., Thompson School of Applied Science, 1963; B.S., University of New Hampshire, 1967; M.O.E., ibid., 1980.
Sciabarrasi, Michael R. (1980)
Associate Extension Educator and Extension Specialist, Agricultural Business Management; B.S., University of Massachusetts at Amherst, 1976; M.S., Virginia Polytechnic Institute and State University, 1978.
Seavey, David C. (1970)
Associate Extension Educator, Agriculture, Merrimack County; A.A.S., Thompson School of Applied Science, 1963; B.S., University of Rhode Island, 1966; M.S., University of New Hampshire, 1969.
Sorensen, David C. (1969)
Extension Educator, Agriculture, Carroll County; B.S., University of Rhode Island, 1964; M.S., ibid., 1967.
Swier, Stanley R. (1978)
Associate Extension Educator and Extension Specialist, Entomology/Pesticide Applicator Training; B.S., Utica College of Syracuse University, 1969; M.S., Northern Arizona University, 1974; Ph.D., Ohio State University, 1976.
Szymujko, Joseph A. (1958)
Assistant Extension Educator, Forestry, Sullivan County; B.S., University of New Hampshire, 1954.
Temke, Mary W. (1984)
Associate Extension Educator and Extension Specialist, Human Development; B.S., Pennsylvania State University, 1966; M.Ed., ibid., 1967; Ph.D., University of North Carolina at Chapel Hill, 1979.
Turaj, Steven J. (1988)
Associate Extension Educator, Agriculture, Coos County; B.S., University of Connecticut, 1974; M.S., West Virginia University, 1980.
Violette, Catherine A. (1986)
Associate Extension Educator and Extension Specialist, Nutrition; B.S., University of Maine at Orono, 1974; B.S., ibid., 1975; M.S., ibid., 1977.
Williams, Charles H. (1969)
Associate Extension Educator and Extension Specialist, Ornamentals; B.S., Pennsylvania State University, 1956; M.S., Michigan State University, 1967; Ph.D., University of New Hampshire, 1981.
Wojtusik, Robyn (1987)
Extension Instructor, 4-H, Rockingham County; B.S., University of Connecticut, 1982; M.S., ibid., 1987.
Wood, Dorothy A. (1971)
Associate Extension Educator, Home Economics, Hillsborough County; B.S., Boston University, 1949.
Wood, Stephen A. (1974)
Assistant Extension Educator, Forestry, Cheshire and Sullivan counties; B.S., University of Maine at Orono, 1973.
Zweigbaum, William H. (1985)
Assistant Extension Educator and Extension Specialist, Agricultural Business Management; B.A., Clark University, 1975; M.S., Virginia Polytechnic Institute and State University, 1982.

Faculty Emeriti

(with length of service)

Abbott, Helen D.
Associate Professor Emerita, Library; A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939; (1943 to 1972).
Abeles, Sigmund
Professor Emeritus of the Arts; A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957; (1970 to 1987).
Allen, Fred E.
Professor Emeritus of Animal Sciences; B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936; (1940 to 1976).
Allmendinger, E. Eugene
Associate Professor Emeritus of Naval Architecture; B.S., University of Michigan at Ann Arbor, 1941; M.S., University of New Hampshire, 1950; (1958 to 1983).
Amell, Alexander R.
Professor Emeritus of Chemistry; B.S., University of Massachusetts at Amherst, 1947; Ph.D., University of Wisconsin at Madison, 1950; (1955 to 1988).
Anderson, Charlotte K.
Professor Emerita, Library; B.A., University of Michigan at Ann Arbor, 1935; A.B.L.S., ibid., 1936; A.M.L.S., ibid., 1951; (1943 to 1980).
Barton, Philip S.
Director Emeritus, Thompson School of Applied Science and Thompson School Professor Emeritus of Applied Animal Science; B.S., University of New Hampshire, 1928; M.Ed., ibid., 1938; (1939 to 1969).
Beasley, Wayne M.
Associate Professor Emeritus of Materials Science; B.S., Harvard College, 1946; S.M., Massachusetts Institute of Technology, 1965; (1957 to 1984).
Beckett, John A.
Forbes Professor Emeritus of Management; B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946; C.P.A.; (1962 to 1981).
Beckwith, Marion C.
Professor Emerita of Physical Education; A.B., Oberlin College, 1935; M.Ed., University of New Hampshire, 1937; (1935 to 1979).
Blanchard, Fletcher, Jr.
Professor Emeritus of Electrical Engineering and Associate Director of Engineering Design and Analysis Laboratory; B.S., Union College, 1948; M.S., Lehigh University, 1950; (1972 to 1987).
Blickle, Robert
Professor Emeritus of Entomology; B.S., Ohio State University, 1937; M.S., University of New Hampshire, 1939; Ph.D., Ohio State University, 1942; (1939 to 1941, 1946 to 1979).
Blood, Edward
Assistant Professor Emeritus of Physical Education and Supervisor of Athletic Facilities Emeritus; B.S., University of New Hampshire, 1935; (1936 to 1971).
Boynton, C. Hilton
Professor Emeritus of Dairy Science and Extension Dairyman Emeritus; B.S., Iowa State College, 1934; M.S., ibid., 1940; Ph.D., Rutgers, the State University of New Jersey, 1962; (1945 to 1972).
Boynton, Jason E.
Associate Professor Emeritus of Education; B.Ed., Plymouth Teachers College, 1949; M.Ed., University of New Hampshire, 1952; (1966 to 1983).
Brackett, Thelma
University Librarian Emerita; A.B., University of California at Berkeley, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962; (1942 to 1961).
Bratton, Karl H.
Professor Emeritus of Music; B.M., University of Kansas, 1931; M.A., Teachers College, Columbia University, 1945; (1945 to 1971).
Breeding, Charles H. J.
Thompson School Professor Emeritus of Applied Soil Science; B.S., University of New Hampshire, 1949; M.S., ibid., 1966; (1963 to 1980).
Browne, Evelyn
Professor Emerita of Physical Education; A.B., University of California at Berkeley, 1942; M.A., Teachers College, Columbia University, 1943; M.A., University of New Hampshire, 1962; (1942 to 1981).
Bruns, Paul E.
Professor Emeritus of Forest Resources; A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D., University of Washington, 1956; (1958 to 1980).
Bullock, Wilbur L.
Professor Emeritus of Zoology; B.S., Queens College, 1942; M.S., University of Illinois at Urbana, 1947; Ph.D., ibid., 1948; (1948 to 1987).
Byers, Gordon L.
Professor Emeritus of Soil and Water Science; B.S., Macdonald College, 1948; M.S.A., Ontario Agricultural College, Canada, 1950; (1956 to 1986).
Casás, R. Alberto
Professor Emeritus of Spanish and the Humanities; B. en L., Universidad de Barcelona, Spain, 1936; A.M., Columbia University, 1947; Ph.D., ibid, 1954; (1952 to 1987).

Chapman, Donald H.
Professor Emeritus of Geology; B.A., University of Michigan at Ann Arbor, 1927; M.A., ibid., 1928; Ph.D., ibid., 1931; (1931 to 1974).

Collins, Walter M.
Professor Emeritus Animal Sciences; B.S., University of Connecticut, 1940; M.S., ibid., 1949; Ph.D., Iowa State University, 1960; (1951 to 1983).

Conklin, James G.
Professor Emeritus of Entomology; B.S., Connecticut Agricultural College, 1926; M.S., University of New Hampshire, 1929; Ph.D., Ohio State University, 1941; (1931 to 1971).

Corbett, Alan C.
Associate Professor Emeritus of Animal Science and Veterinarian; B.S., University of Maine at Orono, 1936; M.S., ibid., 1937; D.V.M., Michigan State University, 1940; (1940 to 1978).

Daggett, Albert F.
Professor Emeritus of Chemistry; B.S., University of New Hampshire, 1928; M.S., ibid., 1930; Ph.D., Columbia University, 1934; (1928 to 1931, 1935 to 1976).

Davis, Myra L.
Associate Professor Emerita of Secretarial Studies; B.S., Central Missouri State University, 1939; M.A., Iowa State University, 1945; (1945 to 1987).

Dawson, Charles O.
Professor Emeritus of Civil Engineering; B.C.E., Ohio State University, 1930; M.S.C.E., ibid., 1940; (1930 to 1976).

Deichert, Lillian C.
Associate Professor Emerita, Loan Librarian; A.B., Hunter College, 1933; M.L.S., Pratt Institute, 1960; (1964 to 1975).

Dishman, Robert B.
Professor Emeritus of Political Science; A.B., University of Missouri at Columbia, 1939; A.M., ibid., 1940; Ph.D., Princeton University, 1948; (1951 to 1987).

Dodds, John A.
Thompson School Associate Professor Emeritus of Applied Animal Science; B.S., University of Vermont, 1936; M.Agr.Ed., University of New Hampshire, 1960; (1953 to 1979).

Drew, William H.
Associate Dean Emeritus of the Graduate School and Professor Emeritus of Resource Economics; B.S., Pennsylvania State University, 1947; M.S., Rutgers, the State University of New Jersey, 1949; Ph.D., Vanderbilt University, 1961; (1956 to 1987).

Dunlop, William R.
Professor Emeritus of Animal Science; D.V.M., V.S., Ontario Veterinary College, 1938; (1950 to 1981).

Dunn, Gerald M.
Professor Emeritus of Plant Science; B.S., West Virginia University, 1948; M.S., Purdue University, 1950; Ph.D., ibid., 1951; (1951 to 1982).

Ellis, Elizabeth E.
Extension Associate Professor Emerita of Home Economics; B.S., Teachers College, Columbia University, 1927; M.A., ibid., 1929; (1929 to 1960).

Emery, Harvard B.
Professor Emeritus of Mechanical Engineering; Certificate in M.E., Lowell Institute, 1938; (1954 to 1979).

Fogg, Marguerite F.
Associate Professor Emerita of Nursing; Diploma, Margaret Pillsbury Hospital School, 1940; B.S., Boston College, 1957; M.S., ibid., 1960; (1967 to 1983).

Granger, Ralph H.
Assistant Director Emeritus, Thompson School of Applied Science, and Thompson School Associate Professor Emeritus of Applied Business Management; B.S., University of Massachusetts at Amherst, 1935; M.S., ibid., 1939; (1946 to 1976).

Haendler, Helmut M.
Professor Emeritus of Chemistry; B.S.Ch.E., Northeastern University, 1935; Ph.D., University of Washington, 1940; (1945 to 1978).

Haley, Russell
Professor Emeritus of Marketing; A.B., College of Wooster, 1946; M.B.A., Columbia University, 1948; Ph.D., Union Graduate School, 1974; (1975 to 1987).

Haslerud, George M.
Professor Emeritus of Psychology; B.A., University of Minnesota, 1930; Ph.D., ibid., 1934; (1945 to 1972).

Hatch, John W.
Professor Emeritus of the Arts; Diploma, Massachusetts School of Art, 1941; B.F.A., Yale University School of Fine Arts, 1948; M.F.A., ibid., 1949; (1949 to 1985).

Heckel, Maynard C.
Professor Emeritus of Adult Education and Director Emeritus of Cooperative Extension Service; B.S., Rutgers, The State University of New Jersey, 1949; M.S., Cornell University, 1956; Ed.D., ibid., 1961; (1971 to 1987).

Heidgerd, Lloyd H.
Associate Professor Emeritus and Biology Branch Librarian; A.B., Oberlin College, 1941; M.A., Teachers College, Columbia University, 1948; Ed.D., University of Illinois at Urbana, 1958; A.M.L.S., University of Michigan at Ann Arbor, 1969; (1969 to 1985).

Hepler, Elizabeth
Associate Professor Emerita, Loan Librarian; A.B., University of Michigan at Ann Arbor, 1944; M.S., Southern Connecticut State College, 1968; (1966 to 1983).

Hochgraf, Frederick G.
Associate Professor Emeritus of Materials Science; B.Met.E., Rennsselaer Polytechnic Institute, 1954; M.S., Cornell University, 1958; (1958 to 1987).

Holden, John T.
Professor Emeritus of Political Science; A.B., Wesleyan University, 1936; M.P.A., Harvard University, 1941; M.A., ibid. 1942; Ph.D., ibid., 1943; LL.D. (Hon.), Nasson College, 1958; (1947 to 1972).

Holder, Mary
Associate Professor Emerita of Home Economics; B.S., Mount Allison University, 1940; M.S., Michigan State University, 1949.

Hraba, John B.
Director Emeritus of System Planning and Professor Emeritus of Electrical Engineering; B.S., University of New Hampshire, 1948; M.Eng., Yale University, 1949; Ph.D., University of Illinois at Urbana, 1955; (1949 to 1981).

Hudon, Louis J.
Professor Emeritus of French; A.B., Bowdoin College, 1938; M.A., Yale Univeristy, 1942; Ph.D., ibid., 1943; (1961 to 1983).

Ikawa, Miyoshi
Professor Emeritus of Biochemistry; B.S., California Institute of Technology, 1941; M.S., University of Wisconsin at Madison, 1944; Ph.D., ibid., 1948; (1963 to 1986)

James, Marion E.
Professor Emerita of History; A.B., University of New Hampshire, 1940; A.M., Harvard University, 1949; Ph.D., ibid., 1955; (1955 to 1986).

Johnson, Richard E.
Professor Emeritus of Mathematics; B.A., Intermountain Union College, 1934; M.A., University of Washington, 1938; Ph.D., University of Wisconsin at Madison, 1941; (1966 to 1978).

Keener, Harry A.
Dean Emeritus of the College of Life Sciences and Agriculture, Director Emeritus of the Agricultural Experiment Station, and Professor Emeritus of Animal Science; B.S., Pennsylvania State University, 1936; M.S., West Virginia University, 1938; Ph.D., Pennsylvania State University, 1941; (1941 to 1978).

Kennedy, Robert G.
Thompson School Professor Emeritus of Applied Plant Science; B.V.A., University of Massachusetts at Amherst, 1940; M.S., University of New Hampshire, 1961; (1941 to 1980).

Kimball, Robert O.
Associate Professor Emeritus of Mathematics; B.S., University of New Hampshire, 1941; M.A., ibid., 1952; (1946 to 1986).

Klotz, Louis H.
Associate Professor Emeritus of Civil Engineering; B.S.C.E., Pennsylvania State University, 1951; M.S.C.E., New York University, 1956; Ph.D., Rutgers, The State University of New Jersey, 1967; (1965 to 1986).

Korbel, John J.
Professor Emeritus of Economics and Administration; S.B., Harvard University, 1939; M.B.A., Harvard Graduate School of Business Administration, 1941; Ph.D., Harvard University, 1959; (1966 to 1986).

Ladd, Dwight R.
Dean Emeritus of Whittemore School of Business and Economics and Professor Emeritus of Administration; A.B., Brown University, 1943; M.B.A., Harvard University, 1949; D.B.A., ibid., 1956.

Langer, Clarence A.
Professor Emeritus of Plant Science and Extension Horticulturist Emeritus, Fruits; B.S., Michigan State University, 1933; M.S., ibid., 1948; Ph.D., ibid., 1952; (1962 to 1974).

Laurent, John L.
Professor Emeritus of the Arts; B.F.A., Syracuse University, 1948; M.A.T., Indiana University at Bloomington, 1954; (1954 to 1985).

Lavoie, Marcel E.
Associate Professor Emeritus of Zoology; B.A., St. Anselm College, 1940; M.S., University of New Hampshire, 1952; Ph.D., Syracuse University, 1956; (1950 to 1952, 1955 to 1984).

Leighton, Roger S.
Associate Extension Educator Emeritus, Program Leader Forestry Emeritus, and CFM Supervisor Emeritus; B.S., University of New Hampshire, 1941; (1952 to 1979).

Marschner, Donald C.
Professor Emeritus of Business Administration; B.A., Brown University, 1929; Ph.D., Columbia University, 1964; (1964 to 1975).

McIntosh, Edward D.
Captain Emeritus, Marine Program; (1971 to 1981).

Merritt, Richard D.
Associate Professor Emeritus of the Arts; Certificate, Rochester Institute of Technology, 1948; (1948 to 1986).

Metcalf, Theodore G.
Professor Emeritus of Microbiology; B.S., Massachusetts College of Pharmacy, 1940; Ph.D., University of Kansas, 1950; (1956 to 1981).

Miller, Edmund G.
Professor Emeritus of English; A.B., Dartmouth College, 1943; M.A., Columbia University, 1947; Ph.D., ibid., 1955; (1951 to 1987).

Morrow, Kenneth S.
Professor Emeritus of Dairy Science; B.S., University of Minnesota, 1918; M.S., ibid., 1925; (1934 to 1966).

Munroe, M. Evans
Professor Emeritus of Mathematics; B.A., University of Texas at Austin, 1940; Sc.M., Brown University, 1941; Ph.D., ibid., 1945; (1959 to 1982).

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Partridge, Allan B.
Associate Professor Emeritus of History; A.B., Clark University, 1922; A.M., ibid., 1923; (1925 to 1971).

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Associate Professor Emeritus of Education; B.S., University of New Hampshire, 1947; M.Ed., ibid., 1952; Ed.D., Harvard University, 1960; (1966 to 1978).

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Associate Dean Emeritus of the College of Life Sciences and Agriculture and Professor Emeritus of Plant Pathology; B.S., University of Maine at Orono, 1937; M.S., ibid., 1939; Ph.D., State University of Washington, 1950; (1941 to 1943, 1950 to 1982).

Ringrose, Richard C.
Professor Emeritus of Animal Science; B.S., Cornell University, 1932; Ph.D., ibid., 1936; (1942 to 1975).

Rosen, Sam
Professor Emeritus of Economics; B.A., University of Wisconsin at Madison, 1942; M.A., Harvard University, 1948; Ph.D., ibid., 1952; (1957 to 1985).

Sawyer, Albert K.
Professor Emeritus of Chemistry; A.B., Colby College, 1940; M.S., University of Maine at Orono, 1947; (1949 to 1985).

Sawyer, Philip J.
Professor Emeritus of Zoology; B.S., University of New Hampshire, 1940; M.S., ibid., 1948; Ph.D., University of Michigan at Ann Arbor, 1956; (1952 to 1983).

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Professor Emeritus of Botany; B.S., University of New Hampshire, 1951; M.S., ibid., 1952; Ph.D., University of Wisconsin at Madison, 1955; (1957 to 1984).

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Associate Professor Emerita of the Arts; B.S., Iowa State University, 1945; M.F.A., Cranbrook Academy of Art, 1953; (1954 to 1987).

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Professor Emeritus of Civil Engineering; B.S., Purdue University, 1924; C.E., ibid., 1934; S.M., Harvard University, 1939; (1928 to 1966).

Skoglund, Winthrop C.
Professor Emeritus of Animal Science; B.S., University of New Hampshire, 1938; M.S., Pennsylvania State College, 1940; Ph.D., Pennsylvania State University, 1958; (1950 to 1981).

Smith, Gerald L.
Associate Professor Emeritus of Animal Science and Extension Animal Scientist; B.S., University of New Hampshire, 1948; M.S., Pennsylvania State College, 1951; (1948 to 1980).

Stewart, Glenn W.
Associate Professor Emeritus of Geology and State Geologist; B.S., University of New Hampshire, 1935; M.S., Syracuse University, 1937; M.A., Harvard University, 1950; (1938 to 1939, 1941 to 1979).

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Professor Emeritus of Mechanical Engineering; B.S., Tufts College, 1922; D.Eng. (Hon.), University of New Hampshire, 1974; (1922 to 1968).

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Professor Emeritus of Zoology; S.B., Bates College, 1938; Ph.D., University of California at Berkeley, 1942; (1952 to 1978).

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Teeri, Arthur E.
Professor Emeritus of Biochemistry; B.S., University of New Hampshire, 1937; M.S., ibid., 1940; Ph.D., Rutgers, the State University of New Jersey, 1943; (1938 to 1940, 1943 to 1982).

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Associate Professor Emerita of Secretarial Studies; B.S., University of Minnesota, 1926; M.A., ibid., 1932; (1938 to 1966).

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Professor Emeritus and University Librarian; B.A., State University of New York at Buffalo, 1949; A.M.L.S., University of Michigan at Ann Arbor, 1952; A.M., ibid., 1957; Ph.D., ibid., 1974; (1962 to 1988).

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Associate Professor Emeritus of Civil Engineering; B.S., Yale University, 1932; M.S., Columbia University, 1933; M.E., Yale University, 1941; (1966 to 1977).

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Weeks, Silas B.
Associate Professor Emeritus of Resource Economics and Extension Community Resource Development Specialist Emeritus; B.S., Cornell University, 1937; (1955 to 1981).

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Associate Professor Emeritus of Music; B.Ed., Southern Illinois University at Carbondale, 1937; M.A., University of Iowa, 1941; Ph.D., ibid., 1958; (1958 to 1981).

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Professor Emeritus of Electrical and Computer Engineering; B.S., University of New Hampshire, 1937; S.M., Massachusetts Institute of Technology, 1948; (1948 to 1983).

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Associate Professor Emerita of Physical Education; Cert., Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934; (1944 to 1970).

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Wurzburg, Frederic W.
Associate Professor Emeritus of Political Science; B.S., Columbia University, 1956; Ph.D., ibid., 1961.

Enrollment Statistics—Fall Semester

	1985–86	1986–87	1987–88	1988–89
	(Men/Women—Total)			
Freshmen	1087/1364 — 2451	1028/1365 — 2393	1101/1392 — 2493	1080/1326 — 2406
Sophomores	953/1239 — 2192	992/1269 — 2261	1041/1324 — 2365	1072/1342 — 2414
Juniors	973/1127 — 2100	881/1196 — 2077	920/1220 — 2140	974/1299 — 2273
Seniors	1003/1248 — 2251	980/1171 — 2151	951/1241 — 2192	1019/1243 — 2262
1st Year—T.S.A.S.	211/ 141 — 352	189/ 137 — 326	180/ 130 — 310	153/ 140 — 293
2nd Year—T.S.A.S.	74/ 42 — 116	102/ 68 — 170	81/ 57 — 138	74/ 48 — 122
D.C.E.—A.A.	52/ 68 — 120	47/ 71 — 118	51/ 95 — 146	53/ 96 — 149
Graduates—Master's	334/ 420 — 754	367/ 421 — 788 (incl. CAGS)	401/ 467 — 868 (incl. CAGS)	456/ 498 — 954 (incl. CAGS)
Graduates—Doctorates	135/ 88 — 223	135/ 84 — 219	139/ 88 — 227	150/ 108 — 258
Total	**4822/5737 —10559**	**4721/5782 —10503**	**4865/6014 —10879**	**5031/6100 —11131**
Continuing Education*	608/1015 — 1623	722/1116 — 1838	779/1096 — 1875	786/1123 — 1909
Summer Session	1214/1700 — 2914	1200/1798 — 2998	1168/1940 — 3108	1156/1893 — 3049

	1985–1986	1986–1987	1987–1988	1988–1989	1985–1986	1986–1987	1987–1988	1988–1989
Baccalaureate Curricula	**Life Sciences and Agriculture**				**Liberal Arts**			
Senior	298	251	229	231	769	815	829	938
Junior	259	202	220	256	902	959	985	1107
Sophomore	201	200	243	261	1071	1241	1288	1314
Freshman	233	228	303	267	1184	1245	1236	1116
Total	**991**	**881**	**995**	**1015**	**3926**	**4260**	**4338**	**4475**
	Engineering & Physical Sciences							
Senior	483	422	414	394				
Junior	399	368	331	335				
Sophomore	400	350	328	309				
Freshman	478	382	402	404				
Total	**1760**	**1522**	**1475**	**1442**				
	Whittemore School				**Health Studies**			
Senior	387	387	386	391	314	276	334	308
Junior	288	315	323	284	252	233	281	291
Sophomore	268	261	287	291	252	209	219	239
Freshman	315	325	338	399	241	213	214	220
Total	**1258**	**1288**	**1334**	**1365**	**1059**	**931**	**1048**	**1058**
Graduate Curricula	**Graduate School**							
†Master's	754	788	868	954				
Doctorates	223	219	227	258				
Total	**977**	**1007**	**1095**	**1212**				
Associate Degree Curricula	**Thompson School**				**Division of Continuing Education**			
2nd Year	116	170	138	122				
1st Year	352	326	310	293				
Total	**468**	**496**	**448**	**415**	**120**	**118**	**146**	**149**

* Credit courses

† Does not include Institutes and Special Summer Session in Technology. Includes Certificates of Advanced Graduate Study. 1985–1986 figures also include 2 students coded as "other."

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