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Bulletin of the University of New Hampshire

Undergraduate Issue

April 1974-75

Bulletin of the
University of New Hampshire

1974-75

Undergraduate Catalog Issue

For information about undergraduate admission to the University, students may contact:

Eugene A. Savage,
Director of Admissions

For information about courses and academic records, students and former students should contact:

Leslie C. Turner, Registrar

Volume LXV, No. 10 April 1974

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University Calendar 1974-75

Semester I 1974-75

September 1, Sunday	8 a.m. Residence halls open
September 3, Tuesday	Registration; 4 p.m. First faculty meeting
September 4, Wednesday	8 a.m. Classes begin
September 5, Thursday	1 p.m. Opening Convocation
September 20, Friday	Last day to drop courses without \$10 late drop fee
September 27, Friday	Last day to add courses
October 3, Thursday	Last day to carry over 20 credits without surcharge, or for partial tuition refund on withdrawal
October 11, Friday	Last day to opt for Pass/Fail
October 18, Friday	9 a.m. Mid-semester reports for freshmen due
October 19, Saturday	Classes hold Thursday schedule
October 26, Saturday	Classes hold Friday schedule
October 29, Tuesday	Mid-semester, last day to drop courses or withdraw without academic liability
November 26, Tuesday	7 p.m. Residence halls close, Thanksgiving
December 1, Sunday	2 p.m. Residence halls open
December 2, Monday	8 a.m. Classes resume; preregistration Sem. II begins
December 12-13, Thurs.-Fri.	Reading Days
December 16, Monday	8 a.m. Semester I final examinations begin
December 21, Saturday	6 p.m. Final exams end; 8 p.m. Residence halls close
December 22, Sunday	Commencement

Semester II 1975

February 1, Saturday	8 a.m. Residence halls open
February 2, Sunday	Registration
February 3, Monday	8 a.m. Classes begin
February 14, Friday	Last day to drop courses without \$10 late drop fee
February 21, Friday	Last day to add courses
March 3, Monday	Last day to carry over 20 credits without surcharge, or for partial tuition refund on withdrawal
March 7, Friday	Last day to opt for Pass/Fail
March 21, Friday	9 a.m. Mid-semester rosters for freshmen due
March 30, Sunday	7 p.m. Residence halls close, Spring Recess
April 1, Tuesday	2 p.m. Residence halls open
April 4, Friday	8 a.m. Classes resume
April 5, Saturday	Mid-semester, last day to drop courses or withdraw without academic liability
April 21, Monday	Classes hold Monday schedule
May 19-20, Monday-Tuesday	8 a.m. Preregistration for Semester I, 1975-76 begins
May 21, Wednesday	Reading days
May 30, Friday	8 a.m. Semester II final examinations begin
June 1, Sunday	Final exams end; 8 p.m. Residence halls close
	Commencement

The University reserves the right to modify the Calendar subsequent to printing.

Trustees

His Excellency Meldrim Thomson, Jr., LL.B.

Governor of New Hampshire
ex officio

Howard C. Townsend

Commissioner of Agriculture
ex officio

Newell J. Paire, B.Ed., M.Ed.

Commissioner of Education
ex officio

Thomas N. Bonner, B.A., M.A., Ph.D.

President of the University
ex officio

Harold E. Hyde, B.S., M.S., Ed.D.

President of Plymouth State College
ex officio

Leo F. Redfern

B.A., M.A., M.P.A., Ph.D.

President of Keene State College
ex officio

Philip S. Dunlap, B.S.

Concord (1969-1974)
Chairman of the Board

Bernard I. Snierson, A.B., LL.B.

Vice-Chairman of the Board
Laconia (1963-1975)

Margaret R. Ramsay, B.Ed., M.Ed.

Keene (1971-1975)
Secretary of the Board

Mildred McAfee Horton

B.A., M.A., LL.D.
Randolph (1963-1975)

Richard W. Daland, B.S.

Nottingham (1966-1974)

George T. Gilman, B.S.

Farmington (1967-1975)

Charles V. Spanos, B.A., LL.B.

Claremont (1967-1975)

Frederick C. Walker, B.S., Ed.M.

Dover (1968-1976)

John L. Saturley

Suncook (1970-1974)

Vivian Hodges Brown, B.Ed., M.B.A.

North Hampton (1971-1975)

Richard A. Morse, A.B. J.D.

Manchester (1971-1975)

David Alan Rock

Nashua (1971-1975)

Paul J. Holloway, B.S.

Exeter (1972-1976)

William L. Dunfey, B.A., M.A., D.Sc.

Rye (1972-1976)

Virginia T. Steelman, B.S., M.Ed.

Manchester (1973-1977)

Marshall N. Decker, B.A.

Salem (1973-1977)

Joseph B. Moriarty

Lee (1973-1977)

Alan Bridle

Student Member
Plymouth (1973-1974)

Principal Officers of Administration

Thomas N. Bonner, Ph.D.
President of the University

Norman W. Myers, B.S.
Vice-President-Treasurer

Eugene S. Mills, Ph.D.
Provost

Robert N. Faiman, Ph.D.
*Vice-Provost for Research and
Special Program Administration*

David W. Ellis, Ph.D.
Vice-Provost for Academic Affairs

Allan B. Prince, Ph.D.
*Vice-Provost for Budget and
Administration*

Richard F. Stevens, M.Ed.
Vice-Provost for Student Affairs

John B. Hraba, Ph.D.
*Dean of the Office of Institutional
Research and Planning*

Maynard C. Heckel, Ed.D.
*Dean of the School of Continuing
Studies and Director of the
Cooperative Extension Service*

Gary W. Wulf, M.S.
Director of System Personnel Services

W. Arthur Grant, B.A.
Executive Assistant to the President

C. Robert Keeseey, B.A.
Ombudsman

Harry A. Keener, Ph.D.
*Dean of the College of Life Sciences
and Agriculture and Director of the
Agricultural Experiment Station*

Jan E. Clee, Ph.D.
*Dean of the Whittemore School of
Business and Economics*

Richard S. Davis, Ph.D.
Dean of the College of Technology

Allan A. Spitz, Ph.D.
Dean of the College of Liberal Arts

Basil J. F. Mott, Ph.D.
Dean of the School of Health Studies

William H. Drew, Ph.D.
Acting Dean of the Graduate School

Jane E. Newman, M.Ed.
Dean of Students

Edward J. Durnall, Ed.D.
*Director of the Division of Continuing
Education*

Donald E. Vincent, A.M.L.S.
University Librarian

Andrew T. Mooradian, M.S.
*Director of Department of
Intercollegiate Athletics*

Eugene A. Savage, M.Ed.
Director of Admissions

Leslie C. Turner, M.Ed.
Registrar

For officers of administrative divisions, see page 362.
The University is an equal opportunity/affirmative action employer.

General Information

Facts About the University

History

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 made possible by federal government land grants to establish colleges serving the sons and daughters of farming and laboring families.

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

The College prospered in Durham, and in 1923 the State Legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and 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 (now the Thompson School of Applied Science). In 1962, the Whittemore School of Business and Economics was established.

In 1963 the state's system of higher education was created when the former teachers' colleges at Plymouth and Keene were made divisions of the University and brought under the same Board of Trustees as the Durham campus. 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 at Durham. Beginning in 1971, the Division of Continuing Education was authorized to offer Associate in Arts degree programs as an alternative approach to higher education for New Hampshire residents.

Since 1967, the University has provided a widening range of undergraduate and graduate studies through its program at the Merrimack Valley Branch in Manchester, where development of a permanent campus is under way. In 1972, the School of Continuing Studies was created to coordinate the off-campus, educational programs of the University.

ty system institutions and to carry instructional services to communities throughout New Hampshire.

In the 1973-74 academic year, the University at Durham had 9,718 students enrolled. The State Colleges at Plymouth and Keene had a combined enrollment of 4,786 students, and more than 2,000 students were enrolled in Merrimack Valley Branch programs.

Academic and cultural resources of each campus are amplified through System-shared programs and facilities. Cooperative ventures among the 10 member institutions of the New Hampshire College and University Council blend public and private higher education resources.

Physical Plant

The University campus in Durham covers 156 acres. There are 35 buildings devoted to instruction, research, and administration; 24 residence halls housing about 4,100 men and women; and three modern dining halls. Total University lands—including athletic fields and woodlots—comprise 3,500 acres. Book value of the physical plant exceeds \$72 million. In addition to two new residence halls and a new dining hall, major construction completed during recent years includes:

University Library, with 650,000 volumes, 5,000 periodicals, more than 5,500 tapes and records, music listening rooms, and a substantial microfilm collection, has been expanded to accommodate up to one million volumes and to provide increased study area.

Whittemore School of Business and Economics occupies a new four-story building containing classrooms, seminar rooms, lecture halls, offices, and sophisticated business and technological equipment.

Parsons Hall, completed in 1970, provides modern facilities for the Department of Chemistry.

Athletics—Physical Education Facility, includes indoor swimming pool, track, and gymnasium. *Snively Arena*, an indoor ice hockey rink, also accommodates convocations and major cultural attractions.

Kendall Hall, a five-story building completed in the spring of 1970, is the home of the Animal Sciences Department with offices, classrooms, and laboratories. The library for the College of Life Sciences and Agriculture and for the Departments of Microbiology and Zoology is located on the first floor.

The New England Center, a cooperative effort by the six state universities of New England to provide outstanding continuing education programs throughout the region, is located at Durham. Offices for several regionally oriented educational organizations are in its administration center, and its new residence-dining-learning center provides modern facilities for adult education conferences and seminars.

General Information

Teaching, Service, and Research

The University of New Hampshire is committed to offering quality educational programs and first-rank educational opportunities for its students. At Durham, the University's 515 full-time teaching faculty and 80 part-time professional specialists provide a ratio of one full-time faculty member for each 18 students. More than 75 per cent of the full-time faculty hold doctoral degrees, and many have earned national, even international, reputations in their professional fields.

A faculty member's first responsibility is to his students and to teaching. In the tradition of the nation's land-grant colleges, the University also encourages its faculty to contribute to the growth of man's knowledge through scholarly research and service to the community beyond the campus.

Accreditation

The New England Association of Schools and Colleges is the major accrediting body for the University of New Hampshire, and the University is a member in good standing of that Association. Specialized curriculum programs offered by the University are also accredited by various professional organizations.

Admissions Procedure

General Information

The admissions policy of the University is designed to provide for the admission of those students whose personal records, achievement, aptitude, and motivation demonstrate that they have the qualifications for carrying the desired program satisfactorily. Factors of sex, race, religion, color, and national origin do not enter into the admissions process.

Bachelor Degree Candidacy

The University accepts New Hampshire residents to bachelor degree programs who have scholastic records ranking in the upper two-fifths of their graduating classes from accredited or approved secondary schools, provided they are recommended and have completed appropriate college preparatory course work. Prospective students should realize that some candidates who do not meet the "upper two-fifths" class-rank guidelines are approved for admission to bachelor degree programs on the basis of such related factors as secondary school course selections, achievement trend in the junior and senior years, and school recommendations.

The number of out-of-state students admitted to bachelor degree programs each year is limited and selection is made primarily on the basis of superior academic achievement in secondary school. Such traits as good character, leadership, initiative, and creative ability are considered. Under the present Selective Admissions Program, out-of-state candidates must apply to one of the University's five schools and colleges and will be considered for admission in competition with other out-of-state candidates for the same division.

Students should realize that it may not be possible to transfer to another undergraduate school or college of the University after enrollment. The student who wishes to change to another undergraduate division after enrollment must secure permission from the dean of that college and chairman of the program he wishes to enter. Standards for admission to the different undergraduate areas may vary. In recent years admission to the College of Liberal Arts and the School of Health Studies has been more competitive than to the other three colleges because of the larger number of qualified applicants.

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. Students approved for admission to the Thompson School will be eligible for University residence hall accommodations. Two of the programs offered by the Thompson School, the Forest Technology and the Civil Technology programs, require that candidates present a minimum of two years work in college preparatory mathematics.

The University offers an Associate in Arts degree program through the Division of Continuing Education. This program is available only to commuting New Hampshire residents.

Special Student Status

The University offers the Special Student classification for persons who wish to participate in University course work without entering degree programs. Special or non-matriculated students register for course work through the University's Division of Continuing Education with offices in Huddleston Hall. Special students have full access to the academic counseling services of the Division and should realize that their continuing participation in University course work is predicated upon satisfactory achievement.

General Information

Secondary School Course Requirements for Bachelor Degree Candidacy

All students who present the secondary course requirements outlined in the "Minimum Secondary Program" are eligible to receive consideration for admission to the University's bachelor degree programs. The University encourages students to develop a balance between courses outlined in "Recommended Secondary Program" and their own interests, which may lead them to choose electives outside the traditional academic course areas.

Minimum Secondary Program

	<i>Life Sciences & Agriculture</i>	<i>Liberal Arts</i>	<i>Technology</i>	<i>Whittemore</i>	<i>Health Studies</i>
English	4 units	4 units	4 units	4 units	4 units
Language	0 units	2 units*	0 units	2 units*	0 units
Mathematics	2 units	2 units	3 units†	2 units	2 units
Laboratory Sciences‡	1 unit	1 unit	2 units	1 unit	1 unit§
Social Studies	2 units	2 units	2 units	2 units	2 units

Recommended Secondary Program

	<i>Life Sciences & Agriculture</i>	<i>Liberal Arts</i>	<i>Technology</i>	<i>Whittemore</i>	<i>Health Studies</i>
English	4 units	4 units	4 units	4 units	4 units
Language	2 units*	3 units*	3 units*	3 units*	3 units*
Mathematics	3 units	3 units	4 units†	3 units	3 units
Laboratory Sciences‡	3 units	3 units	3 units	3 units	3 units§
Social Studies	3 units	3 units	2 units	3 units	3 units

* of a single foreign language.

† college preparatory, math including trigonometry.

‡ excluding "General Science".

|| must include Physics or Chemistry.

§ should include Biology.

Admission Test Requirements

All candidates for admission to bachelor degree programs are required to submit the results of the College Entrance Examination Board Scholastic Aptitude Test. The English Composition Achievement Test must also be submitted by all bachelor degree candidates. For those students applying to Bachelor of Arts degree programs, an Achievement Test in a foreign language is also required. The achievement test results are used in course placement rather than in the admissions evaluation, so it is possible for students to submit these results as late as May of their senior year. Other achievement tests are strongly recommended for applicants in the College of Life Sciences and Agriculture and the College of Technology in the area or areas generally related to the student's prospective major, e.g., Level I Mathematics Test for engineering students.

Candidates applying for the Arts Major, studio option; the Bachelor of Fine Arts program; or the Art Education program are required to submit a portfolio. There is no portfolio requirement for those entering the Art History option of the arts major. Candidates applying for the Music, Music Education, and Bachelor of Music programs must make arrangements with the chairman of the Music Department for an audition. Chairmen of both the Art and Music Departments may be reached at the Paul Creative Arts Center.

Except for Early Decision candidates, applications should be submitted only after the first marking period grades are available and for non-resident applicants before February 15. New Hampshire applicants must submit their applications by March 1. Applications received from New Hampshire residents after March 1 may be considered only as vacancies occur. A non-refundable application fee, \$10 for residents of New Hampshire and \$20 for nonresidents, must accompany the application.

Interviews

Interviews are not required as part of the admission process. However, candidates are most welcome to contact the Admissions Office in order to arrange interviews with UNH student admissions representatives who will be pleased to help them become better acquainted with the University. Also group information sessions are frequently held on Saturday mornings. These group sessions are opportunities for an exchange of information and are followed by guided tours of the campus. Applicants may contact the Admissions Office for further information. Students are encouraged to visit the campus, and regularly scheduled tours leave the Memorial Union at 2:00 p.m. Saturday and Sunday when the University is in session. Please note Calendar, page 3.

Early Decision

The University is willing to give secondary school seniors consideration for admission under an Early Decision program. This program is appropriate for a well qualified student who has made the University the first choice. Applicants must submit a regular application, high school record, junior year Scholastic Aptitude Test, and a statement countersigned by the secondary school that indicates the University of New Hampshire is the first-choice college and that other applications will be withdrawn if admitted under Early Decision. Early Decision applications must be submitted between September 15 and December 1. Early Decisions are reported within two weeks of the University's receipt of Early Decision applications.

General Information

Advanced Standing

The University will recognize unusual 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. Applicants who have not been enrolled in formal education during the past two years may also qualify for advanced standing through the College Level Examination Program (CLEP). Further information may be obtained from the Admissions Office.

Transfer Students

The University will consider qualified transfer candidates from approved institutions. Transfer credit is awarded for courses which 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.

While the University is pleased to encourage the competent transfer applicant who has valid and legitimate reasons for desiring transfer to the University of New Hampshire, it cannot encourage the applicant with a history of academic or personal difficulty. University admissions policy restricts consideration for transfer to those students with satisfactory academic and personal records. In the event of personal or academic difficulty, a student is usually better advised to return to his former college after an appropriate period and clear his record before attempting to transfer. Students desiring to transfer for the fall semester must complete application procedures before May 1; for spring semester, by December 1.

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 a student receives preferential admissions consideration and, if admitted, pays in-state tuition. Information may be obtained from the New England Board of Higher Education, 40 Grove St., Wellesley, Mass. 02181.

Health Record Requirement

In order to provide effective health service to students, the University requires that students who have been formally accepted for bachelor or associate degree candidacy and register for nine or more semester credit hours must have complete medical records on file with the Uni-

versity Health Service. These records consist of two University health forms: one a health history statement and the other a record of a recent physical examination conducted by a regular-licensed physician. Students wishing exemption from this requirement on religious grounds must make a written request to the Medical Director of the University Health Service. These two forms will be forwarded to the student following notice of admission and it will be the student's responsibility to return the completed forms to the University Health Service prior to the beginning of classes. Any student failing to submit the completed forms will not be allowed to register for classes in subsequent semesters.

Rules Governing Tuition Rates

Basic Rule: 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. Please see page 314 for the complete statement of Rules Governing Tuition Rates.

Division of Student Affairs

The Division of Student Affairs provides a wide range of student services and programs which supplement the academic programs of the University.

Division functional areas include: the Vice Provost for Student Affairs; the Dean of Students; Residential Life, which includes Dining Services and residence halls; Financial Aid; Recreation and Student Activities; and Counseling and Health Services, consisting of the Health Service, Counseling and Testing, and Career Planning and Placement Service.

Dean of Students Office

The Dean's staff meet students initially through freshman and transfer orientation. They continue to provide assistance, guidance, and information for students throughout their undergraduate years. The staff are concerned with all aspects of campus life as it relates to the total development of students.

Included in the activities of the Office are: Veteran Affairs, International Student Affairs, New Student Programs, Student Judicial System, Student Organizations, Student Rights and Responsibilities, and a variety of special projects and programs designed to improve the quality of student life.

General Information

Residential Life and Dining Services

The University has 23 undergraduate residence halls grouped in three geographic areas on campus with a dining hall located in each area.

Information about and applications for room and board are sent to new students along with notices of admission.

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. Additional information about residence halls and dining services is available through the Office of Residential Life.

Residence Halls

Students are not required to live on campus. Undergraduate University housing is limited to full-time degree candidates; Associate in Arts degree students are not eligible for on-campus housing.

The highest priority for residence hall housing is given to entering freshmen. Transfer and readmitted students are accommodated only to the extent space is available.

Most rooms are designed for double occupancy, but there are some single rooms available. Because of the large number of requests for residence hall spaces, it is often necessary to assign three students to some of the larger rooms.

To be considered for space in a residence hall, entering students must follow the established application procedures. Students assigned to on-campus housing sign a room contract for the entire academic year.

University housing is not guaranteed over the full four-year undergraduate period.

Dining

University policy requires that students living in residence halls board in University dining halls.

Any full-time student who does not live in a residence hall may purchase a meal ticket if dining hall capacities permit, or they may purchase meals at the Memorial Union cafeteria.

Students who have special diets generally find it possible to select these diets from the choices offered in the dining halls. However, students whose diets, because of religion or health, require unusual foods should be aware that Dining Services may not always be able to meet their needs. Any request for exceptions to the board policy because of dietary restrictions must be made prior to the beginning of a semester.

Recreation and Student Activities

Housed in the Memorial Union, the Office of Recreation and Student Activities is the hub for recreational and club sports, social and cultural programs, student organizations, and related activities. A vast range of programs and services is available for the entire University community.

Services in the Union include a reception area/visitors' information center, the University Ticket Office, and a scheduling office for room and facility reservations. The Union serves as the central program information center for the University community.

Recreation

Students participate in a variety of recreational activities, in most instances without additional charge. To accommodate the diverse interests and changing needs of the campus community, recreational activities are organized in three interrelated programs: men's and women's intramural sports, club sports, and leisure-time activities and services.

Men's intramurals range from golf, tennis, and touch football in the fall to ice hockey and water polo in the winter, and cycling and soccer in the spring. A partial list of women's intramurals includes powder puff football, basketball, volleyball, bowling, soccer, softball, and tennis.

The club sports program offers instruction and competition with other college clubs in New England. Rugby, sailing, trap and skeet, and ping pong are among the 24 club sports in the program.

Informal participation in swimming, exercising and jogging, tennis, ice skating, and field sports is available at Snively Arena, the Field House, and the University's Outdoor Recreation Area at Mendums Pond.

Student Activities

Student organizations bring folk and rock concerts to campus and provide a wide variety of social events including dances, movies, and plays. The Memorial Union houses the student-operated FM stereo radio station, the student newspaper, and offices for student organizations, and provides facilities for University entertainment.

Cultural Programs

With two theaters, two art galleries, and auditoriums (the largest seating 4,000 persons), the University is a major cultural resource for the entire state. The Sidore Series brings provocative, well-known speakers and experimental programs throughout the year. The Blue and White Series is host to leading concert artists, and the Allied Arts Series provides a varied program of drama, dance, and music.

General Information

University students perform frequently in concerts, recitals, and theatrical productions. These programs originate in the Music and the Speech and Drama Departments and are open for participation to all undergraduates. The Department of the Arts hosts exhibitions in the newly redecorated University Galleries.

Counseling and Health Services

The Counseling and Health Services staff are concerned with the total well-being of students, offering health care, counseling services, testing, and career planning and placement.

Health Service

The University Health Service in Hood House provides out- and in-patient health care, laboratory tests, x-rays, limited mental-health care, and routine medications. For serious medical problems, students are generally referred to specialists and/or a local hospital. An emergency ambulance service is available at all times.

During the regular academic year, Hood House is staffed by full-time physicians, nurses, and part-time consultants. Appointments with physicians may be made upon request. An appointment is not necessary for medical problems requiring immediate attention and these patients will be treated through the out-patient clinic.

An optional group health insurance plan may be purchased through the University Business Office.

Counseling and Testing Center

The professional staff at the Counseling and Testing Center provide psychological and counseling services and testing to students experiencing difficulties. Services include individual and group counseling, testing, and consultation.

Career Planning and Placement Service

The Career Planning and Placement Service assists students in planning for professional careers following completion of their undergraduate work. The assistance available to students includes: an on-campus interview program, which brings recruiting personnel to the campus between November and April; a library of information on employers and career opportunities; vocational counseling; and aid in finding summer employment.

The service will update student's records and provide assistance to alumni.

Financial Aid

The University Financial Aid Office assists promising students who are unable to meet their educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment. A Financial Aid Bulletin gives specific information.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance.

Before an applicant may be considered for assistance through the University, two forms must be submitted: the UNH Application for Financial Aid and the Parents' Confidential Statement. New Hampshire applicants may obtain these forms from their high school. Non-residents and transfer students may obtain the UNH application form from the Financial Aid Office and the Parents' Confidential Statement from their local high schools. Upperclass applicants may obtain both forms from the Financial Aid office.

Students must meet the following deadlines and should not wait until being admitted to the University before applying for financial aid:

Incoming Freshmen—January 15	Upperclass students—February 15
Transfer students—May 1	Readmitted students—May 1

Grants and Scholarships

A full-time student who is a resident of New Hampshire may be considered for an in-state tuition grant. The amount varies from \$100 to full tuition, and the basic consideration is financial need. Non-residents are eligible for similar grants.

The University participates in the federally sponsored Supplemental Educational Opportunity Grant Program designed to assist students of exceptional need.

There are scholarships for both resident and non-resident students. The basis of these awards may be scholastic attainment, participation in extracurricular activities, or meeting other requirements specified by the donor.

Loan Programs

Three loan funds are administered by the University: UNH Loan Fund, National Direct, and Nursing Student Loans. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

General Information

Many states now have higher education loan plans established by the Higher Education Act of 1965. For information it is suggested that you contact your local bank.

Part-time Employment

The College Work-Study Program, both academic year and summer, assists students who are determined by the University to be in need of financial assistance to complete their college educations.

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

Fees and Expenses

The cost for the freshman year at the University averages about \$2,695 for a resident of New Hampshire and about \$3,995 for a non-resident.

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

Tuition is \$900 (\$2,200 for non-residents) per academic year. As part of the regional cooperation program of the New England Board of Higher Education, some non-residents from certain states will be eligible at the resident rate in selected curricula. The student must indicate on his application for admission his intention to apply for this reduced tuition. Any undergraduate student registering for nine credits or more per semester pays the full tuition.

Any combination of courses taken at the University (Durham Campus), Merrimack Valley Branch, and Division of Continuing Education totaling nine credits or more requires full tuition payment. Any student registering separately at the University (Durham Campus), Merrimack Valley Branch, and Division of Continuing Education and who pays the per-credit-hour charge at the University (Durham Campus) or Merrimack Valley Branch or the course charge at the Division of Continuing Education will be subsequently billed, if any combination totals nine credits or more, an additional amount necessary to meet the full tuition charge.

Students are permitted to enroll for more than 20 credits only with the approval of their College dean. After 30 days of the semester have passed students carrying more than 20 credits will be billed a per-credit fee of \$30 for each credit above 20. (No refund will be made if the student subsequently drops a course bringing him to 20 or less credits.) Any undergraduate student registering for fewer than nine credits pays

\$30 per credit hour, plus a registration fee of \$15 for residents and \$50 for non-residents per semester. The minimum charge for any recorded course is \$30.

All students who are admitted to the University must make an advance deposit of \$50 for residents and \$100 for non-residents. This deposit will be credited on the student's tuition bill. In case a student decides not to attend the University after making his deposit, it will automatically be forfeited.

Three-fourths of tuition and room charges will be refunded to a student withdrawing within one week of registration; one-half after one week and within thirty days; and none thereafter. (See University Calendar, page 3.) A \$10 fee must be paid by all students dropping courses after the first two weeks of classes. The \$10 fee will not be charged to students filing petitions for reduced loads or students withdrawing; and in both of these cases, the regular tuition rebate policy will apply. There are no refunds of the fees which are charged.

Generally there will be no meal-ticket refund except for illness, but a student who withdraws is entitled to a prorated rebate based upon meals remaining from withdrawal-date less two weeks.

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, as noted in the sections on Physical Education and Animal Science and for field trips of the Thompson School.

Books and classroom supplies cost approximately \$150. These may be purchased at the University Bookstore.

There is a Memorial Union fee of \$25; a recreation/physical education fee of \$30; a student service fee of \$10; and a student activity tax of \$18.40 (1973-74) which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities. These fees cover the academic year. An optional student season-athletic ticket is available for \$15 and optional student insurance for \$23.75. Participants in intercollegiate athletics are required to take the student health insurance.

Housing charges average \$550 per academic year.

Personal expenses average \$350. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incidentals, and travel.

All University 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 which provide programs for budgeting educational expenses.

General Information

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

Fees and Expenses

	Resident	Non-resident
Tuition	\$ 900.00	\$2,200.00
Room (average)	550.00	550.00
Board (19 meals/wk.)	620.00	620.00
Activity tax	18.40	18.40
Recreation/physical education fee	30.00	30.00
Memorial Union fee	25.00	25.00
Student services fee	10.00	10.00
Books, class supplies	150.00	150.00
Total	\$2,303.40	\$3,603.40
Personal expenses	\$350.00	\$350.00
Athletic admissions ticket (optional)	15.00	15.00
Health insurance (optional)	23.75	23.75

Reserve Officers Training Corps Programs

The Army and Air Force offer programs leading to a commission as a second lieutenant in their respective services. Students enrolled in either ROTC program may pursue any University curriculum which leads to a baccalaureate or higher degree. The Army and Air Force programs accept both men and women.

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.

Two-year ROTC programs are open to students who have two academic years of study remaining at the University. Applicants for the two-year programs must attend a six-week training session during the summer immediately preceding their entry into ROTC.

ROTC scholarships are offered on a competitive basis by both the Army and the Air Force. Entering freshmen may compete for four-year scholarships during the last year of high school. Students, who are enrolled in a four-year ROTC program, and two-year-program applicants compete for scholarships covering their remaining academic years. Scholarships pay 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. Non-scholarship stu-

ROTC Programs

dents in the last two years of an ROTC program also receive the tax-free \$100-per-month subsistence allowance.

Students in either Army or Air Force ROTC who are qualified for pilot training are provided civilian flight instruction leading to a private pilot's license.

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).

University Academic Requirements

A student is held responsible for all work required for graduation and for the scheduling of all the necessary courses.

General Education Requirements: In addition to the particular requirements for specific degrees, the University requires that every candidate for a bachelor's degree must successfully obtain a passing grade in a minimum of 128 credits; must attain a cumulative grade-point average of at least 2.0 for all courses taken at the University in which a grade is given; and must successfully meet the following general education requirements. (See college sections for specific degree requirements.)

1. Four courses (each of which must carry at least three credits) from among the following (biological sciences, physical sciences, and mathematics) :

Biological Sciences

Animal Science 400
Biochemistry
Biology
Botany
Entomology
Microbiology
Plant Science 421, 706, 708, 762, 769, 773
Soil and Water Science 501 and 504
Zoology

Physical Sciences and Mathematics

Chemical Engineering* 410, 609
Chemistry
Civil Engineering* 501, 505, 611, 621
Earth Science
Electrical Engineering* 402, 512, 620
Mathematics
Mechanical Engineering* 441, 503, 541, 561
Physical Science
Physics
Technology* 501, 555, 601, 610, 683

* These courses do not satisfy degree requirements for B.A. degree. (See pages 32, 58, 76, and 117.)

2. Six courses (each of which must carry at least three credits) from the following (arts, humanities, and social sciences) :

Arts and Humanities

Arts
English
Foreign Languages (except elem. yr.)
and Literature
Humanities
Music
Philosophy
Speech & Drama

Social Sciences

Anthropology
Economics
Geography (except physical geography)
History
Political Science
Psychology
Recreation and Parks 400
Resource Economics (except 501 & 504)
Sociology
Social Science

(University Requirements continued on the next page.)

University Academic Requirements

3. Six courses, one of which must be freshman English unless specifically exempted by the English Department, and each of which must carry at least three credits, from all courses offered by the University including those listed above.

The University, College, or Department may prescribe up to eight of the sixteen courses used to satisfy the general education requirements. A minimum of eight courses are to be freely elected by the student. *Courses taken to satisfy general education requirements may not be in the student's major department.*

A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a combined score of 1200 or better on the CEEB SAT-Verbal, and English Achievement exams. The freshman English course may not be used to satisfy the arts and humanities requirement in general education.

Grades and Honors

Grades: an instructor may assign grades as listed below. The intermediate grades are designated by adding plus to the letter grade. Grade points assigned to plus grades are 0.5 higher than those assigned to the letter grade without the plus.

A (Excellent): academic achievement of outstanding quality.

B+: intermediate grade.

B (Good): academic achievement of high quality.

C+: intermediate grade.

C (Acceptable): academic achievement of a quality acceptable in satisfying the minimum requirements for graduation.

D+: intermediate grade.

D (Unsatisfactory): academic performance below the minimum level established as a prerequisite for graduation, but not so deficient as to demand repetition of the courses, unless such repetition is essential for demonstration of competence in the major field.

F (Failure): academic performance so deficient in quality as to be unacceptable for academic credit.

Cr. (Credit): given in specific courses designated as No Letter Grade (NLG); also assigned spring semester, 1969-70.

P: a passing grade in a course taken under the Pass-Fail option.

Grade reports designate incomplete course work with the notation "IC." "IA" indicates incomplete in a continuing course or thesis. Where appropriate, the grade earned will replace "IA" assigned in previous semesters. "IX" indicates grade not reported.

Grade points per semester hour shall be assigned as follows: A, 4; B+, 3.5; B, 3; C+, 2.5; C, 2; D+, 1.5; D, 1; F, 0; Cr., 0; P, 0.

Honors: A student will be listed for honors if he has a cumulative and semester average of at least 3.0 regardless of the number of grad-

University Academic Requirements

able credits; or a semester average of 3.0 with twelve or more hours of courses carried for letter grades. These categories will be used: 3.0 to 3.4, Honors; 3.5 and 3.6, High Honors; 3.7 to 4.0, Highest Honors. Seniors who have earned honors for their entire college work will be graduated with the honors earned.

Pass-Fail: While earning a bachelor's degree the pass-fail option for grading may be carried in a maximum of four courses outside the courses required by the major department upon election by the undergraduate student. The status of the student is to be known prior to the end of the fifth week of the semester. 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. The Pass-Fail option may not be available for courses taken for a minor. Consult the appropriate College for information.

Students may not use the Pass-Fail option to repeat a course.

Minimum Graduation Average

A cumulative grade point average of 2.0 is the minimum acceptable level for undergraduate work in the University, and for graduation from the University. 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

Any student registering for less than 12 or more than 20 credits must receive the approval of his college dean.

An undergraduate is 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.

Withdrawal from the University

Students who leave the University after Registration Day are expected to file formal withdrawal notification with the Registrar.

Residence

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.

Two Degree Option

General Policy: The option to pursue two degrees simultaneously enhances and broadens the education of certain students at the undergraduate level. 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.

Requirements:

1. Students desiring a dual degree must petition the college dean or deans involved for permission to pursue a dual degree.
2. If the student is planning to take one degree in a highly prescribed curriculum, he should register as a freshman in the appropriate school or college for that curriculum.
3. It is expected that a candidate for two degrees will complete the equivalent of five years of academic work.
4. The two degrees, as awarded by the University of New Hampshire, must be different (i.e., B.A. and B.S., or B.S. and B.S. in Chemistry).

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.

College of Liberal Arts

Allan Spitz, *Dean*
Melville Nielson, *Associate Dean*
James A. Smith, *Associate Dean*
Nancy H. Deane, *Assistant Dean*
George T. Abraham
Academic Counselor
Claire W. Wright,
Academic Counselor
Nancy Wolters,
Administrative Assistant

Divisions and Departments

BIOLOGICAL SCIENCE DIVISION

Microbiology Department
Zoology Department

HUMANITIES DIVISION

The Arts Department
English Department
French and Italian Department
German and Russian Department
Music Department
Philosophy Department
Spanish and Classics Department
Speech and Drama Department

SOCIAL SCIENCE DIVISION

Geography Department
History Department
Political Science Department
Psychology Department
Sociology and Anthropology Department

TEACHER EDUCATION DIVISION

Education Department

Programs of Study

BACHELOR OF ARTS:

Anthropology
The Arts
 Studio
 Art History
Biology
Classics
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Microbiology
Music
 Music History
 Performance Study
 Music Theory
Philosophy
Political Science
Psychology
Social Service
Sociology
Spanish
Speech and Drama
 Communications
 Theater
Zoology

BACHELOR OF SCIENCE:

Art Education
Music Education

BACHELOR OF FINE ARTS

BACHELOR OF MUSIC:

Piano
Organ
Voice
Strings, Woodwind, Brass, or Percussion
Theory

General Information

Purpose and Objectives

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

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

Programs of Study

The College of Liberal Arts offers four degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music.

The *Bachelor of Arts* program is intended primarily to provide a broad liberal education along with a major in one of the fields listed above. Requirements for the Bachelor of Arts degree and information regarding these majors are presented in the section entitled Bachelor of Arts Program.

The *Bachelor of Science* curricula consist of two programs of study which provide preparation for teaching of the Arts or Music. They are arranged in such a manner as to permit considerable specialization while providing a broad cultural education for the students enrolled in them. Requirements for the Bachelor of Science degree and information regarding these curricula are presented in the section entitled Bachelor of Science Curricula.

The *Bachelor of Fine Arts Curriculum* is designed to provide training for the student who plans to enter professional graduate school. Requirements for the Bachelor of Fine Arts curriculum are outlined in the section entitled Bachelor of Fine Arts Curriculum.

The *Bachelor of Music* curriculum is designed to provide professional training in applied music and in musical theory, and to allow students to develop their talent to the equivalent standard of that offered by conservatories of music. Requirements for the Bachelor of Music curriculum and information regarding this curriculum are presented in the section entitled Bachelor of Music Curriculum.

NOTE: Although the University will try to provide sufficient facilities so that a student may pursue any major or curriculum for which the student meets the requirements, such a privilege cannot be guaranteed. Rapidly increasing enrollment sometimes results in the crowding of required specialized courses beyond capacity. On occasion, a student

may remain in a crowded curriculum if willing to take certain courses during the summer session.

Combined Programs of Study

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

MINOR OPTION

A student may earn a minor in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with the major adviser and the minor supervisor. A minor consists of 20 semester hours with C or better in subjects that the minor department approves. (Courses taken on the Pass-Fail basis may not be used for a minor.) No more than 8 credits used by the student to satisfy major requirements may be used for the minor. A student 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 transcript.

DUAL MAJOR OPTION

A student may earn two majors in any disciplines in the University which award the Bachelor of Arts degree if authorized by the major departments and the college dean(s). No more than 8 credits used to satisfy requirements for one major may be used as major requirements for the other. A student should declare an intent to earn two majors as early as possible and no later than the end of the junior year. A student should plan the program in consultation with advisers from both majors.

DUAL DEGREE PROGRAM

The purpose of the two-degree program is to broaden the education of certain students at the undergraduate level. 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 dual program. See page 25 for requirements.

STUDENT DESIGNED MAJOR

See page 124 for requirements for student designed major.

Preparing for Teaching

FIVE-YEAR, UNDERGRADUATE-GRADUATE PROGRAM

The major avenue for becoming certified to teach at the elementary, middle, and high school levels is an integrated undergraduate-graduate program culminating in a fifth year, year-long, paid internship. Before the internship the student will earn a bachelor's degree outside the field of Education. The internship offers 12 graduate credits

College of Liberal Arts

and will normally be coupled with other graduate work leading to a master's degree. A number of existing UNH master's degree programs may be elected including two degree-programs specifically designed for the preservice teacher and offered by the Department of Education. (See Graduate Catalog for description.)

STEP 1. Register for Education 500 (preferably in sophomore year).

The initial, undergraduate phase of the program, Education 500, Exploring Teaching, provides an early experience in the schools as teacher aide and teaching assistant. Students may select this four-credit course at any time; however, most students should choose it prior to completion of their sophomore year. In this initial phase students explore various kinds of teaching sites, working side by side with experienced teachers, so that they may make realistic decisions about teaching as a career.

STEP 2. Apply to Department of Education for admission to the second phase of the teacher education program and apply for a co-adviser from that Department. Plan a program that includes a minimum of 4 credits in each of the following courses: Education 700; 701; 703; 705 (total of 16 credits). Since there is no undergraduate major in Education, students must have selected and completed a major in another department for a baccalaureate degree.

Upon successful completion of the initial phase of the program, the student will be eligible to begin the second phase of the teacher education program. This phase requires a minimum of four credits to be completed in each of four areas of study: Education 703, Alternative Teaching Models; Education 705, Alternative Perspectives on the Nature of Education; Education 701, Human Learning and Development; and Education 700, Educational Structure and Change. Upon decision to enter the second phase of the program, a co-adviser will be appointed in the Department of Education to assist the student in designing the most appropriate course of studies.

A number of variable credit modules will be available to the student in each of the required four course areas, including experiences and workshops in local schools. Certain courses in other departments may substitute for these requirements. Working closely with advisers, students may develop highly individualized programs, choosing from many alternatives. Since credits in these four areas of study may be taken at either the undergraduate or graduate level, students will 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 (Education 706, Introduction

General Information

to Reading in the Elementary Schools) ; and two courses in mathematics appropriate for elementary school teaching (recommended—Mathematics 621, Number Systems for Elementary School Teachers; Mathematics 622, Geometry for Elementary School Teachers).

STEP 3. Apply for admission to the fifth year internship: Education 800-801.

The final phase of the teacher education program will consist of a year-long, paid internship (Education 800-801.) *Students must apply for the fifth year internship and master's degree program by September 15 of their senior year* so that they will have enough time to explore a variety of career and/or graduate study options and finalize their program plans before second semester of the senior year. Opportunities exist for admitted graduate students to take courses toward their master's degree in the second semester of their senior year.

Prior to the intern year students will complete a B.A. or B.S. program with a major in a field outside of the field of education, and thus they will have opportunities for jobs outside the field of education, a broader general education, and greater depth in their area of specialization.

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

UNDERGRADUATE CERTIFICATION OPTION

Because of the professional orientation of majors in Occupational Education, Home Economics, and Physical Education, an undergraduate option for teacher certification in these areas may be elected. This option will require the same professional education components as listed above with the election of one semester of student teaching instead of the year-long, paid internship. Successful completion of Education 500 and positive recommendation from school site staff are required for further professional work. Final screening will take place prior to the student teaching semester. Application for acceptance into student teaching must be filed by February 15 of the junior year.

ACADEMIC STANDARDS FOR ELIGIBILITY TO APPLY FOR THE TEACHER EDUCATION PROGRAMS

Integrated Undergraduate-Graduate option with year-long internship and master's degree: Academic record suitable for admission to graduate school.

College of Liberal Arts

Four-Year Undergraduate Option: minimum 2.5 GPA in major; minimum 2.2 cumulative GPA at time of application for student teaching (February 15 of junior year).

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

ACCREDITATION AND CERTIFICATION OF TEACHING

The teacher education programs at the University are accredited by the New Hampshire State Department of Education and by the National Council for the Accreditation of Teacher Education. Completion of the approved teacher preparation program of the University qualifies a student for certification as a teacher in most states.

For further information contact the Coordinator of Teacher Education.

Bachelor of Arts Program

The Bachelor of Arts Program provides a broad liberal education with a concentration involving a minimum of 32 credits in a major field.

The requirements apply to all students who enter the College of Liberal Arts between July 1, 1974 and June 30, 1975 and are seeking a Bachelor of Arts degree. (Students who entered the College at an earlier time may apply for a change to the requirements of this catalog.)

Bachelor of Arts Degree Requirements

Satisfaction of these requirements ensures satisfaction of the University general education requirements.

1. 128 credits.
2. At least a 2.0 cumulative average in all courses completed at the University of New Hampshire.
3. Four courses in sciences and/or mathematics *outside the major department*, from those offered in biochemistry; biology; botany; chemistry; entomology; earth science; mathematics; microbiology; physics; zoology; Animal Science 400; Plant Science 421, 706, 708, 762, 769, 773; and Soil and Water Science 501 and 504. (Courses must be of at least three credits each.)
4. Two courses in humanities, selected from those offered in arts, English (beyond 401), foreign languages (beyond 401-402), humanities, music, philosophy, and speech and drama, *outside the major department*. (Courses must be of at least three credits each.)
5. Two courses in social sciences from those offered in anthropol-

ogy, economics, geography (excluding physical geography), history, political science, psychology, Recreation and Parks 400, resource economics (excluding 501 and 504), sociology, and social science, *outside the major department*. (Courses must be of at least three credits each.)

6. Two additional humanities or social sciences courses, *outside the major department*. (Courses must be of at least three credits each.)

7. Six additional courses, *not in a student's major department*, selected from all courses offered by the University. English 401 must be taken in the freshman year as one of these courses, unless the student is exempted. Students exempted from English 401 must substitute a course *not in the major department*, to make up a total of six courses in this category. (Courses must be of at least three credits each.)

8. Foreign Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college-level course is required of all students. 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 foreign languages numbered 501 or above, if eligible. This requirement must be satisfied by the end of the sophomore year.

9. Major Requirements: A student must complete at least 32 credits of major course work with grades of C or better. The major department may require a senior paper or project, and/or a comprehensive examination.

Majors in the Bachelor of Arts Program in the College of Liberal Arts

The major department may specify certain (but not more than 13) required courses which constitute the major. A major must be selected prior to the beginning of the junior year.

The objectives, opportunities, and department requirements of majors in the Bachelor of Arts program are described in the paragraphs which follow.

Anthropology

This major aims at providing an introduction to the various branches of anthropology and an appreciation of its place among the other academic disciplines. At the same time it is designed to encourage intensive study of particular topics within the field according to the interests and talents of the student. It is intended to provide both a broad basis for the education of the general student, and to offer sufficient background for those who may wish to pursue a career in anthropology at the graduate level.

College of Liberal Arts

Students majoring in anthropology are required to take a minimum of 32 credits with grades of C or better distributed as follows: Anthropology 411 and 412, one topical course, one ethnographic-area course, Anthropology 785, and any three other courses in anthropology or related disciplines as approved by the supervisor. Anthropology courses are listed separately under Anthropology in the Course Descriptions.

Students wishing to major in anthropology should consult with Professor Richard E. Downs.

The Arts

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 or to acquaint themselves with the history of art. In addition, these courses are designed to offer foundation experience for students interested in art, but who are majoring in other departments in the University. The Department of The Arts offers programs leading to a Bachelor of Fine Arts degree, a Bachelor of Science degree, and a Bachelor of Arts degree.

The Arts major leading to a Bachelor of Arts degree is offered with two options: studio and art history. Students selecting the studio option must complete with a grade of C or better a minimum of 11 courses (44 credits), of which the following are required: Arts 431, Visual Studies; Arts 432, Drawing I; Arts 434, Introduction to Three Dimensional Design; Arts 475 and 476, Introduction to The Arts; two elected art history courses; two elected studio courses; and one upper-level studio course or advanced seminar.

While the above 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 in the department represented by two dimensional or three dimensional programs.

Students selecting the studio option are required to complete four foundation courses (Arts 431, 432, 434, and 475 or 476) during their first year. Candidates applying for the Arts major, studio option; the Bachelor of Fine Arts program; or the Art Education program are required to submit a portfolio. There is no portfolio requirement for those entering the art history option of the Arts major.

Non majors must complete one of the foundation courses (Arts 431, 432, 434) before they are allowed to enroll in any 500-level studio courses.

The University reserves the right to retain a selection from a student's work for a period of not more than two years.

Students selecting the art history option must complete with a grade of C or better a minimum of nine courses (36 credits) of which the following are required: Arts 475 and 476, Introduction to The Arts; Arts 797, Seminar in Art History; four additional courses in art history; and two basic studio courses chosen from among Arts 431, Visual Studies; Arts 432, Drawing I; and Arts 434, Introduction to Three Dimensional Design. A major adviser in the area of the student's interest will be selected.

All students minoring in The Arts must complete with the grade of C or better a minimum of five courses (20 credits), of which the following are required: Arts 431, Visual Studies, or Arts 434, Introduction to 3-D Design; Arts 432, Drawing I; Arts 475 and Arts 476, Introduction to The Arts; and one art elective.

Biology

A new biology major is being planned. The details, including the major requirements, are not yet complete, but it is anticipated that the major will be ready for freshmen entering in the fall of 1974. Several options will be available within the new major, and these would lead to graduate work in some area of biology. In addition, the new major may be combined with a series of education courses to complete a five year program in biology teacher preparation leading to a master's degree and teacher certification.

For more detailed information on this major, please contact Dr. Frank K. Hoornbeek, Zoology Department.

Classics

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 as follows: 40 credits offered by the Classics section, excluding Latin 401-402. Twenty-four of these must be in courses in Greek and Latin. The student will be encouraged to take courses in related fields such as ancient history, classical art, modern languages, and English.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

The supervisor for majors is the Chairman of the Department, Professor John C. Rouman.

English

The Department of English offers two programs of study: the English major and the English-teaching 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 the student to devise a program which has an intelligent rationale. For example, the student who intends 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. The student interested more specifically in journalism should note the descriptions of courses in non-fiction writing. All students should secure the assistance and approval of their advisers in formulating an early plan for the major program. For full details see the booklet entitled *The English Major*, available at the departmental office, Hamilton Smith 113.

For the English major, students must complete ten English courses with a grade of C or better: English 519, two additional 500-level courses, and seven courses numbered above 600. In selecting these courses, students must be sure to meet the following distribution requirements:

1. Two courses in literature prior to 1800: either two advanced courses (numbered above 600), or one advanced course and English 513.
2. Two courses in literature since 1800: either two advanced courses, or one advanced course and one course from the following list: English 514, English 515, English 516.

Students who wish to meet state certification requirements for teaching English in middle or high schools should enroll in the undergraduate English-teaching 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 requirements for the integrated undergraduate-graduate program for teachers, and its several options, see the section entitled "Preparing for Teaching," page 29.) Undergraduate English teaching majors must pass Education 500, Exploring Teaching, preferably before the junior year. They must also pass the following English courses with an average of 2.5 or better: English 512, 514, 710, 711, 712, 718 or 719, 757, 791, and two additional literature courses numbered above 700. English 513 may be substituted for the second 700-level course.

Students who are interested in majoring in English should consult with the Chairman, Professor Robert Hapgood.

French

The French major, in addition to its intrinsic value in the context of the liberal arts, provides knowledge of the language, literature, and culture of France which is useful in a number of careers such as teaching, business, law, and social service. Prospective teachers should consult "Preparing for Teaching," page 29. Students interested in non-teaching careers are urged to consult with the Department of French and Italian and with other appropriate departments early in their academic careers. Special attention is called to the minor in Administration offered through the Whittemore School.

A *major* consists of a minimum of 36 credits. French 401-402, 501, 503-504, 505-506, 514, and 621-622 do not count toward a major. French 605-606 and 790 are required of majors. Majors are encouraged to take courses in the literatures of other countries as well as in fields such as music, art, philosophy, history, political science, and sociology which provide insight into non-literary aspects of culture. A *minor* in French consists of 20 credits in French courses numbered 501 and above. The department chairman supervises the work of both majors and minors.

The Department also offers a junior year abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, French 685-686. Early consultation with the Department is urged.

Geography

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 man's physical and cultural environment that are significant to understanding the character of areas or the spatial organization of the world.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography is an excellent core discipline for a liberal education. Thus, students who have a primary interest in the spatial organization or the regional character of the world and who also desire a liberal education can attain these goals by majoring in geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their course work in geography and closely related fields, and should plan to go on to graduate study after completing an undergraduate major in geography.

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Students who major in geography are required to take Geography 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits with grades of C or better. The seven courses should include Geography 571, 572; 581, 582; 797; and two additional intermediate level courses in geography.

A minor in Geography consists of five courses (20 credits) in Geography with grades of C or better.

Students who are interested in majoring in Geography should consult with the supervisor, Professor William H. Wallace.

German

The Department of German and Russian offers a major in German only. This program is designed to be 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 professions in which a background in foreign languages and literatures is desirable. Examples of such professions are library science, international banking, trade, science, and government services.

3. Those who plan to teach the German language in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must 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.

4. Those who intend to go on to graduate study in the field of Germanic linguistics and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

The department offers a junior year abroad at the University of Salzburg. This program is open to all qualified students at the University of New Hampshire. See description of courses, German 685-686.

A major must comprise a minimum of 32 credits in German language and literature beyond German 508. All students are required to take the Graduate Record Examination in German. German 525, 526, 601-602 (or their equivalents), 781, and two other literature courses on the 600- or 700-level are required courses for all majors.

Greek

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

The minimum requirements for a major in Greek are as follows: 32 credits in Greek, including Greek 401-402. The student will be encouraged to take courses in related fields such as Latin, Classics, and ancient history.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

History

Students majoring in history must complete 32 credits in history courses numbered 500 or above with grades of C or better. These courses must include a minimum of one semester-course from each of the first three groups as given in the Description of Courses offered by the department. At least four semester-courses of the total must be numbered 600 or above. This must include History 697, Colloquia for History Majors, which every senior student majoring in history is required to complete with a grade of C or better. History majors should register with the department for a particular section of this course at some time shortly before the beginning of the senior year.

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

Humanities

The major in humanities allows a student to design and pursue under faculty guidance a coherent interdisciplinary program in the humanities (art, drama, language, literature, music, philosophy). The student defines the subject and selects a program of related courses. The subject may be a historical period or any other topic which can be explored through several disciplines in the humanities. The program must have clear educational and intellectual merit, and prepare the student to undertake a senior project of at least four credits on

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his subject (Humanities 699). The program must be sponsored by a faculty member from the Humanities Division and approved by the Humanities Steering Committee.

A student who wishes to become a Humanities major should submit a formal proposal to the Steering Committee by the end of the sophomore year. Normally, the student should have a grade-point average of at least 2.7. The student should select most of the courses for the program from those offered for major credit by departments within the Humanities Division, but the student is encouraged to include courses from outside the Division (especially from History) when they are appropriate to the major subject. The number of courses in the program may vary, but at least 32 credits of major course work must be completed with grades of C or better.

Before submitting formal proposals, interested students are urged to seek the advice of Steering Committee members and other faculty in the Humanities Division. Inquiries about the Humanities major should be directed to: Anthony Caldwell, coordinator of the Humanities major, Department of English.

Latin

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

The minimum requirements for a major in Latin are as follows: 32 credits in Latin, excluding Latin 401-402. The student will be encouraged to take courses in related fields such as Greek, Classics, and ancient history.

The Department also offers an honors program in Classics. Participation in this program entails completion of the major requirements plus a senior research project and paper.

Microbiology

Students interested in the study of microorganisms, particularly bacteria and viruses, should register as majors in microbiology. Such students may prepare themselves for a career in city, state, or federal government service, or a position with universities, research institutes, or industrial organizations. Opportunities are available in the areas of general, medical, public-health, environmental, and marine microbiology, and in virology.

Students majoring in microbiology are expected to complete courses offered by the department, and by related departments, to a total of 32 semester credits, with grades of C or better. A minimum of 24 semester credits from department offerings must be completed. Courses in organic chemistry and biochemistry are required. It is strongly recommended that students also take courses in mathematics, physics, and quantitative chemistry. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and the supervisor.

Students interested in majoring in microbiology are advised to consult with Professor Theodore G. Metcalf.

Music

The Department of Music offers three degree programs: the Bachelor of Arts, the Bachelor of Music, and the Bachelor of Science in Music Education. The last two are discussed in separate sections of this catalog.

The Bachelor of Arts program offers the student 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.

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

The B.A. degree requirements include the satisfactory completion of a comprehensive examination covering the fields of music history and theory, and a public performance to be given during the senior year—for music-history majors this must be a lecture or lecture-recital; for performance majors, a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition. A more detailed description is available from the Department of Music.

The Bachelor of Arts degree is offered with three options: Music History, Performance Study, and Music Theory. All students majoring in Music must complete with the grade of "C" or better a minimum of 32 credits of course work in music, of which the following are required:

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Music 471-472, 571-572, and 501-502. In addition, the specific requirements for each option are given below.

OPTION I. Music History: advanced theory (4 credits); advanced history and literature (12 credits); any one of 541-550 inclusive (8 credits). A student must also demonstrate the ability to sight-read a Bach chorale harmonization.

OPTION II. Performance Study: advanced theory or literature (4 credits); performance study (16 credits—two credits per semester). Qualified students may major in voice, piano, strings, woodwinds, brass, or percussion. Voice majors must successfully complete, in addition to the foreign language requirement, one of the following course sequences: Italian 401-402, German 401-402, French 401-402.

OPTION III. Music Theory: advanced theory (12 credits); advanced history (4 credits); any one of 541-550 inclusive (8 credits). A student must also demonstrate the ability to sight-read a Bach chorale harmonization. The emphasis in this option is on musical composition and/or theory.

All students minoring in music must complete with the grade of "C" or better a minimum of 20 credits of course work in music, of which the following are required: Music 471-472, Music 501-502.

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 Professor Donald Steele.

Philosophy

400-level courses acquaint the beginning student with some of the fundamental concerns of philosophy and introduce him to philosophical thinking. These courses aim particularly, although not exclusively, to give a self-contained experience of philosophy to the student who plans to take only a single course.

Philosophy 570 (Ancient Philosophy) and Philosophy 580 (Modern Philosophy) are, along with Philosophy 412 (Introduction to Logic), the core of a philosophy major. These courses provide that foundation in the history of philosophy which is prerequisite to serious philosophic thought. Students who are considering a philosophy major, or who are conscious of a more-than-ordinary interest, should register for these courses as early as possible, since they are prerequisite to most of the advanced courses.

500-level courses other than 570 and 580 provide opportunities for philosophic exploration of such special fields as art, politics, education, religion, psychology, semantics, ethics, and logic. Since they presuppose no prior courses in philosophy, they are ideally fitted to

the student who wishes to gain a philosophic perspective upon the field of his major. Philosophy 600 (Philosophy through Literature) and Philosophy 630 (Philosophy of Science) have the same purpose on a more advanced level, still without presupposing prior courses in philosophy.

Philosophy 650, 670, 680, 699, 795 are for majors and others who have achieved advanced standing in philosophy.

Any student who wishes to major in philosophy must choose (or be assigned) an adviser who will help work out a major program. Normally a student must have three semesters left as an undergraduate and have completed the core (Philosophy 570, Ancient Philosophy; Philosophy 580, Modern Philosophy; and Philosophy 412, Introduction to Logic) to be a major.

The rest of the philosophy student's major will consist of at least five additional courses above the 400 level; of these, three must be on the 600 or 700 level. Usually all eight courses will be taken in the Department of Philosophy but when it will serve the student's special interests, courses outside the department may be taken, subject to departmental review.

A student who does superior work in Philosophy and writes (with department approval) a superior Senior Thesis will receive a Letter of Commendation.

Students interested in majoring in philosophy should consult with the Administrative Officer for the Department.

Political Science

The study of politics, to which the courses and seminars of the Political Science Department 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 Political Science Department 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 which 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 the foreign service, and 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

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an undergraduate major in Political Science will provide the most helpful foundation for later graduate study in the field. Such an emphasis will also be valuable for those students seeking careers in journalism, international organizations, and the public affairs and administrative aspects of labor, financial, and business organizations.

The major in Political Science consists of a program chosen to develop an understanding, beyond the introductory level, of at least three of the five fields in which the Department's courses are offered: Political Thought; Scope and Methods of Political Science; American Politics; Comparative Politics; and International Politics.

The total program for a major will consist of no less than 36 credits and no more than 48 credits in Political Science. Each student is responsible for completing the following requirements: 1. the introductory courses Political Science 401 and 402. (Students who successfully complete the departmental examination on American Institutions may substitute Political Science 531 for Political Science 402.) ; 2. the core course at the 500 level in at least three fields. All courses in the major program must be passed with grades of "C" or better.

Introductory courses, numbered 400, are designed for freshmen and should be taken before the end of the sophomore year. Courses at the 500 level are the basic or core courses in each field and are prerequisite for further work in those fields by majors; except by permission of instructor (and successful completion of an examination in the case of 531), they are not open to freshmen. Intermediate courses, numbered 600, are open after successful completion of the respective core course. They are not open to freshmen. Courses at the 700 level are specialized and advanced, and are designed for seniors, and juniors of advanced status; they are not open to freshmen or sophomores. Seminars, numbered 790-799, are open only to seniors, and are designed to encourage individual research, exploration, and small group discussion with faculty.

Majors planning to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Students planning to apply for law school should plan to take the Law School Admission Test early in the senior year; information is available from the office of the Department Chairman. Students who are preparing to teach government courses in secondary schools should coordinate their programs with the Department of Education, and majors in political science should also be aware of dual major options outside the Department. Majors interested in direct practical experience in public affairs during their undergraduate study may enroll in Social Science 681 and work as an intern in a public agency, pending the sponsorship of a faculty member in the department and the approval of the department chairman. Departmental colloquia and other special programs involving public-affairs work are sponsored from time to time.

Psychology

A general function of the Department of Psychology is to provide an academic major that will contribute to the broad education of the undergraduate student. Specifically, the student will be exposed to the scientific study of behavior and will achieve an increased understanding of the behavior of humans and animals.

Students majoring in psychology are required to complete 32 credits in courses which meet the following criteria. Each course that is to be counted toward fulfilling major or minor requirements must be passed with a C or better. Specific requirements for majors are: 1. Psychology 401; 2. Psychology 601; 3. Two courses, selected from among the following options: Psychology 602, 605, 621, 701 through 749; 4. Two courses from among the following options: Psychology 651, 652, 750 through 789; 5. Two additional courses from among the departmental offerings. Students must have completed Psychology 401 and 601 before being officially admitted as a major.

In the cases of students whose educational goals would best be served by variations in Requirements 3 and 4 above, such variations may be worked out between the student and the student's major adviser. Such variations must be approved by the adviser and a statement of the reasons filed in the student's record.

Any psychology major planning to go on to graduate work should include Psychology 602 or 704 among the courses selected.

Students declaring psychology as a major may state their preference for a specific adviser and such preferences will be met where possible. Students expressing no preference will be assigned an adviser. Psychology majors may change advisers with the consent of the adviser to whom they are changing.

Social Service

A major in Social Service has as its primary purpose the preparation of baccalaureate graduates for social work practice. Its additional purposes are to contribute to the liberal education of students and to prepare students for admission to graduate schools of social work or for graduate professional education in one of the other human-service professions.

Social Service majors will be concerned with specialized subject matter dealing with the origin, development, and organization of health and welfare institutions. The social work profession and its relationship to social problems also will be emphasized. To enable each major to

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acquire an understanding of social work/social welfare through observation and participation, the major is required to affiliate in a social-welfare setting for a number of weeks as part of undergraduate study. This may be done the summer preceding the senior year. The details of the field placement will be arranged between the student and the faculty adviser.

Social service majors are required to take: Sociology 400 or Anthropology 411; Psychology 401; any *two* courses from Sociology 500, 530, 540 or Psychology 545; Sociology 520 or Home Economics 683; Sociology 601, 703; Social Service 522, (622), 631. At least 32 credits of this work must be completed with grades of "C" or better in each course.

Students wishing to major in Social Service should consult with Professor Pauline Soukaris at the Social Science Center.

Sociology

The major in sociology is: for students who desire a liberal education with emphasis on study of the organization and differentiation of society, including study of the research methods developed in recent years for a better understanding of social phenomena; and for students who intend to do graduate work in sociology, or for students who plan to attend a graduate school of social work but prefer a choice of undergraduate electives different from that permitted the social service major.

Students who wish to teach sociology in secondary schools are advised that such teachers usually have to teach related social studies. Students with this vocational aim should consult with the chairman of the Department of Education.

It is recommended that majors in sociology take Sociology 400 during their freshman or sophomore years. They must complete a minimum of 36 semester credits with grades of C or higher in sociology. Sociology 400, 601, 602, 611, 612 are required. At least two of the additional major courses must be at the 600 or 700 level (not including 795 or 796 or the project). During the senior year majors must either pass a written comprehensive examination or complete a research project.

Students who are interested in choosing sociology as a major should consult with the chairman of the Departmental Committee for Undergraduate Studies. It is the responsibility of each student majoring in sociology to obtain the latest information from the department office.

Spanish

The major in Spanish is for those students who wish to acquaint themselves more thoroughly with the language, culture, and literature of the Spanish-speaking peoples.

In addition, through the major, the student can achieve practical goals: teaching Spanish in the grade or high schools, or teaching other subjects in bilingual programs. Following advanced degrees, teaching at the college level and engaging in scholarly research, or entering such fields as linguistics or library science are career opportunities. Majors gifted in languages consider the fields of translation and interpretation. With course work in business, sociology, psychology, speech, etc., the Spanish major is uniquely suited to work in Spanish-speaking areas of the world as well as bilingual regions of the United States and also with many governmental agencies.

The Department sponsors a Junior Year in Spain program, which offers students further opportunity to gain practical experience in the use of the Spanish language. The program is open to non-majors as well (see the course description for Spanish 685-686 for further information).

The minimum requirements for a major in Spanish are as follows: 32 credits in Spanish, excluding Spanish 401-402. Specific departmental recommendations will be discussed with the undergraduate advisers.

Students intending to major in Spanish should consult with the Assistant Chairman for Spanish, Professor F. William Forbes.

Speech and Drama

The Department of Speech and Drama offers a major with two options: communications and theater.

The major option in *communications* emphasizes a broad integrative approach to the theories and practices of verbal and non-verbal communication. Interdepartmental course work, reasonable course substitution on an individual basis, proficiency exemption, and field or laboratory work are encouraged to meet individual communications needs or goals. Communications course work can be readily related to social sciences, humanities, etc., and provides a pre-professional preparation for vocations such as law, public relations, personnel work, mass communications, cinema, etc.

The major option in *theater* stresses a broad background in the arts within their social framework. The student interested in the crea-

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tive aspects of speech communication will find an opportunity for personal and pre-professional growth in theater and its drama, with opportunity for independent study of basic theories and personal involvement in active laboratory situations. Theater as a composite art, reflecting life, is closely related to painting, sculpture, music, dance, literature, and philosophy. As a public event, theater can be viewed through social science perspectives. Some of the fields of interest to graduates are children's theater and creative dramatics; public recreation, television, cinema; acting, direction, and design on all levels of theater; and teaching.

Majors in the *communications* option shall elect ten courses (40 hours) distributed as follows: Speech and Drama 402 and 403 and eight courses in an area selected in consultation with an adviser. A student and adviser must agree upon the courses used to establish an area of emphasis before student enrolls in such courses. All courses must be directly related to the building of competence in the area of emphasis. Courses not offered in the option, but offered as regular courses in the University, may be used to establish an area of emphasis in communication.

The required curriculum for majors in the *theater* option consists of: Speech and Drama 402, 435, and a minimum of *eight hours* from each of three areas (Theory/History, Design/Technical, Performance) *plus* one full course or its equivalent from Performance Project (654) and Scenic Arts Project (655). In addition, Senior Seminar I and II (697-698) is required, plus an additional eight hours (distributed or in one area) at the 600-700 level. The courses applicable to each category are available from the student's adviser.

Students interested in majoring in the Department of Speech and Drama should consult with the chairman.

Zoology

The zoology major is designed to prepare students for admission to graduate work, at least two years of which is considered minimal for undertaking professional work in pure or applied zoology. Other students may elect the major, but there will be no reduction in requirements.

The University's location on tidewater and near the open ocean provides an unusual opportunity for study of marine zoology and marine ecology.

Zoology majors must earn grades of C or better in 32 credits of biology (botany, biology, zoology) courses. Minimum requirements for the zoology major are as follows: Chemistry 403-404; organic chem-

istry; calculus (Mathematics 427) or statistics; college physics; Botany 411; Biology 541; Zoology 412, 518, 527, 604, 729, plus an elective. A suggested sequence of courses follows:

Freshman: Zoology 412, Botany 411, Chemistry 403-404, and Math 427 (or INER 528).

Sophomore: Zoology 518 and 527, Biology 541, and Chemistry 545.

Junior: Zoology 604, Physics 401 (and INER 528 if taken in addition or instead of Math 427.)

Senior: Zoology 729, another biological science course in Zoology or other biological sciences department (may be taken earlier than the senior year).

Students who are interested in a zoology major should consult the supervisor, Professor Emery F. Swan.

Bachelor of Science Curricula

The Bachelor of Science curricula permit considerable specialization in preparation for teaching of the Arts or Music while developing the breadth and general culture of the students enrolled in them. Curricula are offered in: art education and music education.

Degree Requirements

These requirements apply to students who enter the College of Liberal Arts between July 1, 1974, and June 30, 1975, and who are seeking a Bachelor of Science degree.

1. 128 semester-hour credits.
 2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
 3. All the University General Education Requirements including English 401 (Pages 22-23.)
 4. Specific Curricula Requirements: These are presented in the detailed listing of the curricula. Note that the curricula have special quality requirements. Courses are to be completed generally in the sequence in which they are arranged.
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Art Education Curriculum

This curriculum is designed to prepare teachers and supervisors of art in the public schools. Completion of this four-year program will satisfy degree requirements; a fifth year internship is necessary for teacher certification. Courses are prescribed to provide a sound back-

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ground in studio and educational practices and to allow enough flexibility so that a student can develop a high degree of competency in a particular studio area. The satisfactory completion of the 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.

Students seeking to transfer to the University of New Hampshire from other accredited colleges must arrange an appointment with the supervisor of the curriculum or the department chairman prior to admission to the curriculum.

FRESHMAN YEAR		FALL	SPRING
Arts 431	Visual Studies	4	
Arts 432	Drawing I		4
Arts 434	Introduction to 3-D Design		4
English 401 or Non-Art Science	Elective	4	
Social Science or Humanities (Non-Art)		4	4
SOPHOMORE YEAR			
Arts 475, 476	Introduction to The Arts	4	4
Education 500	Exploring Teaching	4	
Arts 541	Drawing II	4	
Arts 542	Beginning Oil Painting	4	
Science			4
Social Science or Humanities (Non-Art)			4
Art Education 493	Introduction to Art Education		4
JUNIOR YEAR			
Arts 401	Ceramics	4	
Art Education 452	Contemporary Media	4	
Art Elective			4
Science		4	
Arts 536	Graphic Arts		4
Social Science or Humanities (Non-Art)			4
Two courses from Education 700, 701, 703, 705		4	4
SENIOR YEAR			
Art Education 792	Problems of Teaching Art in Elementary Schools	4	
Arts 544	Water Media	4	
Art Education 791	Problems of Teaching Art in Secondary Schools		4
Social Science or Humanities (Non-Art)		4	4
Elective			4
Remaining 2 courses from Education 700, 701, 703, 705		4	4

Music Education Curriculum

The Bachelor of Science degree program in Music Education is designed to prepare students for careers in public school music at both the elementary and secondary levels. This program is based on the demand for teachers possessing sound musicianship and a broad cultural background in addition to specialized preparation in music education. The Department is affiliated with the Music Educators National Conference and is a member of the National Association of Schools of Music.

To be formally admitted to the program in Music Education, a student must give evidence of a sound musical background by satisfactory performance at an admission audition. Proficiency on the piano is strongly recommended but not required.

A student must declare music education as a major prior to the beginning of the junior year, but it is highly recommended that students declare as early as possible considering the large number of required courses. All music education majors must choose a major instrument or choose to be a voice major before the end of their first semester at the University.

A student's admission to junior standing, the upper level of the degree program, will be subject to review by the Music Department faculty. This review will be based on the student's academic work and progress in performance study. Music education majors must pass a piano proficiency examination before they may be admitted to full junior standing. Students who fail to achieve junior standing may be excluded from upper-level courses in the Music Department, or may be required to take an extra semester of preparation.

The degree requirements in music education include the satisfactory completion of a comprehensive examination covering the fields of music education, music history, and music theory, and a public performance to be given while in residence at the University during the senior year (the minimum senior recital is a half-recital).

The following requirements are based on the Department of Music's current program. In light of the Department of Education's development of five-year programs leading to certification, the Department of Music may reorganize its education program into a four-year Bachelor of Music degree in Music Education. Details concerning requirements for student teaching and certification are available from the Department of Music. Prospective majors in music education are advised to consult with Professor Cleveland Howard, adviser to freshman and sophomore music education majors.

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Course Requirements:

NOTE: All University general education requirements must be satisfied. (See University Academic Requirements)

1. Music Theory: Music 471-472 (to be taken in the freshman year), 571-572, 779.

2. Music History: Music 501-502.

3. Performance Study: 13 semester credits (8 semester credits must be in the student's major instrument or voice) and Music 551-552 (formerly Music 575-576).

4. Music Laboratory: Music Education majors should be members of a major performing group (Concert Choir, Chamber Chorus, The New Hampshiremen, University Symphony, or University Band) each semester in residence.

5. Techniques and Methods: the degree in Music Education is offered with three tracks. The differences in these tracks lie exclusively in the required techniques and methods courses. A student's choice of track and selection of these techniques courses should be done in consultation with his music education adviser. The following are the minimum requirements:

Track I—Instrumental: Music Education 545, 546, or 745 (instrumental majors are strongly advised to take 545 or 546 during the freshman year), and Music Education 747, 749, 751.

Track II—Vocal/Choral: Music Education 540, 741-742, 743.

Track III—Combined Instrumental and Vocal/Choral: all of Track I, Music Education 540, 741.

6. Music Education: Music Education 787, 791.

7. Education: Education 500, 700, 701, 705.

Bachelor of Fine Arts Curriculum

The Bachelor of Fine Arts curriculum is designed to provide training for the student who plans to enter professional graduate school or pursue a professional artist's career. The program consists of 16 courses fulfilling the university academic program requirements and from 14 to 16 courses in the Department of The Arts. The courses in the Department of The Arts comprise a basic program of seven courses to be completed in the freshman and sophomore years, with an additional seven to nine advanced courses in the arts to be completed during the junior and senior years.

The basic program consists of two courses in drawing, one course in two-dimensional design, one course in three-dimensional design, two

introductory courses in art history and one introductory studio course. This basic unit of seven courses is designed to provide a common body of concepts and techniques for all students enrolled in the program and is intended to raise the level of creative achievement in the advanced stages of the program.

During the junior and senior years the student will concentrate on four courses in either the two-dimensional or three-dimensional disciplines in the Department of The Arts. The two-dimensional disciplines of the Department of The Arts are Drawing, Painting, Graphic Arts, Photography, and Weaving. The three-dimensional disciplines are Sculpture, Ceramics, Jewelry and Metalsmithing, and Woodworking. The division of the advanced program into two-dimensional and three-dimensional areas is designed to provide the student with strong conceptual resources in a concentrated area of creative activity without limiting him to a single discipline. The advanced student will also be required to take one elective course in art history, one course in color theory and practice, and two elective courses which may be in the Department of The Arts or in other departments of the University. These courses should be coordinated with the program of the individual student. Finally, the senior student will be required to take a seminar which may concentrate in one of the disciplines of the department or be of a cross-disciplinary nature.

Bachelor of Music Curriculum

The Bachelor of Music degree program is offered to students who wish to develop their talent in performance or composition to a high professional level. The program is recommended to those considering graduate study leading to the M.M. or D.M.A. degrees. Prospective B.M. majors are advised to consult with Professor Donald Steele.

To be formally admitted to the B.M. program, a student must demonstrate significant creative ability or a high degree of competence in a performance medium during an admission audition or examination. The student must declare the B.M. as a degree program prior to the beginning of the sophomore year.

A student's admission to junior standing, the upper level of the degree program, will be subject to review by the Music Department faculty. Admission to junior standing will be based in part on the student's knowledge of music theory and music history, and may involve a special performance before the music faculty. Failure to achieve junior standing may result in the student's exclusion from the Bachelor of Music program.

College of Liberal Arts

The B.M. degree requirements include the satisfactory completion of a comprehensive examination covering the fields of music history and theory, and a public performance to be given during the senior year (for performance majors this must be a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition). A more detailed description is available from the Department of Music.

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).

Requirements for the degree include: 128 semester credits; a minimum 2.0 grade-point average in all courses completed at the University of New Hampshire; selected general education requirements as listed in the following options; specific curriculum requirements as follows. Courses are to be completed generally in the sequence in which they are arranged.

FRESHMAN YEAR	FALL	SPRING
All Options:		
English 401, Freshman English	4	
General Education Requirement		
selected science	4	4
selected social science		4
Music 471-472, Theory I	4	4
Option 1. Music 542, Piano (8 credits).		
Option 2. Music 544, Organ (8 credits).		
Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory—Choral, (2 credits).		
Option 4. Performance Study—major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory—instrumental, (2 credits).		
Option 5. Music 542, Piano (2 credits); Performance Study—brass, (1 credit); Performance Study—woodwind, (1 credit).		
SOPHOMORE YEAR		
All Options:		
General Education Requirements		
selected social science	4	4
selected humanities (Non-Music)	4	4
Music 571-572, Theory II	4	4
Option 1. Music 542, Piano (8 credits).		
Option 2. Music 544, Organ (8 credits).		
Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory—choral, (2 credits).		

Bachelor of Music

- Option 4. Performance Study—major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory—instrumental, (2 credits).
- Option 5. Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); Performance Study—strings, (1 credit).

JUNIOR YEAR

All Options:

- Elective (Foreign language recommended) 4 4
- Option 1. Music 542, Piano (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 455 (455), Piano Ensemble (2 credits).
- Option 2. Music 544, Organ (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 465, Voice Class for Beginners (2 credits); Music Education 741, Techniques and Methods in Choral Music (2 credits).
- Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); 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); Music 501-502, Music History (8 credits); Music 551-552, Conducting (4 credits); Ensemble, (2 credits); Music Laboratory—instrumental, (2 credits).
- Option 5. Music 771-772, Counterpoint (4 credits); Music 775-776, Composition (4 credits); Music 779, Orchestration (4 credits); Music 781, Form and Analysis (4 credits); Music 542, Piano (2 credits).

SENIOR YEAR

- Option 1. Music 542, Piano (8 credits); Music 455 (455), Piano Ensemble (2 credits); Music 735-736, Pianoforte Literature (8 credits); two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.
- Option 2. Music 544, Organ (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.
- Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); two 4-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 4-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. Music 773, Canon and Fugue (2 credits); Music 777-778, Advanced Composition (8 credits); Music 542, Piano (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

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

College of Life Sciences and Agriculture

Harry A. Keener, *Dean*
Avery E. Rich, *Associate Dean*
Emery C. Booska, *Assistant to the Dean*

Departments and Institute

Animal Sciences
Biochemistry
Botany and Plant Pathology
Entomology
Home Economics
Plant Science
Institute of Natural and Environmental Resources

Degrees, Majors, and Specializations

BACHELOR OF ARTS:
Botany and Plant Pathology
Entomology

BACHELOR OF SCIENCE:
Agricultural Engineering*
Animal Sciences
 Animal Science
 Dairy Science
 Poultry Science
 Pre-Veterinary Medicine
Biochemistry
Botany and Plant Pathology
Entomology
General Studies
Home Economics
Occupational Education
Plant Science
Institute of Natural and Environmental Resources
 Community Development
 Environmental Conservation
 Forest Resources (B.S. in Forestry)
 Hydrology
 Resource Economics
 Soil Science
 Wildlife Management

* First two years at the University of New Hampshire, second two years at the University of Maine.

General Information

Purpose and Programs

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

The College offers three undergraduate degrees: the Bachelor of Arts, the Bachelor of Science, and the Bachelor of Science in Forestry.

Advisory System

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

The student may select his major upon entering the College or he may wait until registration for the sophomore year.

Two-Degree Option

See page 25 for requirements for two-degree option.

Honors Program

The College of Life Sciences and Agriculture, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities. Participation in the honors program is by invitation of a faculty member with the approval of the Department concerned and the Dean of the College. It is limited to those students entering the sophomore or junior year with at least a 3.0 grade point average. The recommending faculty member, his department Chairman, and the Dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and College course requirements may be waived for students in the program. The student will complete the same number of credits to graduate as other students in the department.

Student Designed Major

See page 124 for requirements for student designed major.

Minor Option

A minor may be earned in any undergraduate program in the University in which permission to do so can be arranged by the student in consultation with his major adviser. A minor consists of 20 semester

College of Life Sciences and Agriculture

credits with C or better in courses which the adviser in the minor program approves. He should declare his intent to earn a minor as early as possible.

In the student's final semester the adviser for the minor shall certify to the Registrar that the student has completed the minor requirements. Upon graduation the name of the minor shall appear on the student's transcript.

Bachelor of Arts

Students majoring in Botany and Plant Pathology or Entomology may elect to earn either a Bachelor of Arts degree or a Bachelor of Science degree. The degree requirements for the Bachelor of Arts in Life Sciences and Agriculture are the same as in the College of Liberal Arts, see page 32.

Bachelor of Science

Many professional careers are open for graduates of the College. There are opportunities for people trained in resource development and conservation in addition to positions serving in agricultural industries. Emerging countries throughout the world are asking for assistance in all phases of agriculture, including home economics and forestry. In all departments students may prepare for further graduate work in their respective fields of interest.

Following are additional examples of employment agencies and industries and the careers which they offer.

The agricultural industries, food processors, and banks employ graduates as price analysts and managers.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nurserymen, and landscape gardeners.

The Peace Corps and the Foreign Agriculture Service hire farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The federal government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required. In addition the student must complete the University academic requirements found on pages 22-23, obtain a written recommendation for graduation from his adviser and department chairman, and achieve a 2.0 cumulative average for all courses taken at the University of New Hampshire.

Agricultural Engineering

Agricultural Engineering

Under this accredited program, a student completes the first two years of course work at the University of New Hampshire, then transfers to the University of Maine for the junior and senior requirements, receiving a Bachelor of Science degree. Inquiries about the program should be addressed to the Associate Dean of the College of Life Sciences and Agriculture.

Animal Sciences

The animal sciences courses are offered to provide students fundamental scientific training in such specialized areas as genetics, physiology, nutrition, animal hygiene, processing, pathology, and management. The student also has an opportunity to further concentrate his studies in the fields of animal, dairy, or poultry science; pre-veterinary medicine; or animal biology.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research, and responsible technical positions in industry and federal and state agencies. Students interested in production and processing can receive training as production managers, for positions in the feed or equipment industries, marketing organizations, animal breeding associations, sales and service work in allied industries, and other areas of the diversified animal industry.

The department maintains Morgan horses for all phases of class work including riding. Herds of Shorthorn, Hereford, and Angus cattle; Yorkshire swine; and a flock of Dorset sheep are maintained.

The nationally recognized dairy herd, consisting of registered Ayrshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers

College of Life Sciences and Agriculture

for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

Completed new poultry farm facilities are for instruction and research and include laboratories for both teaching and research in poultry genetics, nutrition, diseases, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, gas chromatograph, and electron microscope are available in Kendall Hall to provide the latest scientific training in the field of animal hygiene. Kendall Hall is an entirely new facility with five floors devoted to offices, classrooms, and laboratories for the Animal Sciences Department.

The department works closely with the New Hampshire animal industry and frequent class trips are made to leading farms, industrial concerns, processing plants, etc. where opportunities are presented for viewing industry in action.

Students who contemplate veterinary medicine as a career should confer early with the adviser to preveterinary-medicine students. It should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have some farm experience; and, in fact, it is a prerequisite for admission to some.

Biochemistry

Biochemistry is the study of the chemistry of living things and life-processes. The program in biochemistry provides a fundamental education in chemistry and the biological sciences and includes basic courses in physics and mathematics.

Curriculum options are offered to meet the educational requirements of students with differing professional goals.

Biochemistry Curriculum A provides intensive preparation in chemistry and biochemistry and basic courses in botany, zoology, microbiology, and genetics. This curriculum is recommended for students preparing for graduate study or for admission into professional schools of medicine, dentistry, or pharmacy. Students entering the curriculum should register for Chemistry 405-406, Mathematics 427-428, Botany 411, and Zoology 412 in the freshman year.

Biochemistry Curriculum B provides a fundamental education in chemistry and the biological sciences with enrichment in biochemical specialties including medical, analytical, marine, or food biochemistry. It provides a strong educational background for technical employment

in research and service programs of universities, medical schools, hospitals, research institutes, and industrial or government laboratories. Students entering this curriculum should register for Chemistry 403-404, Biochemistry 402, Botany 411, and Zoology 412 in the freshman year.

Students interested in a biochemistry major are advised to consult with the department chairman as early as possible to assure the most effective curricular planning.

Botany and Plant Pathology

The Botany and Plant Pathology program is designed to explore the fundamental nature of plants. Botany graduates with suitable undergraduate backgrounds may enter the field of secondary education or become research technicians. Those students who have an interest in University teaching and/or research, governmental research, and certain kinds of industrial positions 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) biological oceanography, (6) plant pathology, (7) systematic botany, (8) plant anatomy and morphology, and (9) mycology.

Two Botany and Plant Pathology degrees are offered: Bachelor of Science and Bachelor of Arts. All undergraduate Botany majors are asked to take the following core of Botany courses: 411, General Botany (or equivalent); 503, The Plant World; 566, Systematic Botany; 606, Plant Physiology; and 758, Plant Anatomy or 762, Morphology of the Vascular Plants. Beyond that, the program of each individual student is selected by the student and his adviser to meet his particular needs.

Students interested in becoming Botany and Plant Pathology majors are invited to discuss the matter with Professor Robert Blanchard.

Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms. Many opportunities exist in the areas of crop protection, forestry, conservation, and in public health.

College of Life Sciences and Agriculture

Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take courses in mathematics and chemistry.

Students who major in entomology are expected to complete successfully courses offered by the department, to a total of 32 semester credits, with grades of C or better. Courses in other departments may be counted with the consent of the major supervisor.

A student 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 chairman of the Entomology Department.

General Studies

This curriculum is offered for the student who wishes to secure a broad non-specialized background in *several areas related to the College* without specializing in any particular department. After completing the University general education requirements the student may select courses to fit his specialized or general interests. A student transferring from one major to another may wish to register in the General Studies curriculum until educational objectives have been more clearly defined, or a student may complete the work for the Bachelor of Science degree in the General Studies curriculum provided that the student has a broad interest in the life sciences.

In addition to meeting the University requirements, it is expected that a student would earn a total of at least 32 credits in Life Sciences and Agriculture courses. Courses in closely related fields may be substituted with permission of the adviser. Interested students should consult with the associate dean of the College of Life Sciences and Agriculture.

Home Economics

The objectives of the program in home economics are to provide, through the facilities of the University, a broad general education in the social and natural sciences, the humanities, and the arts, and to provide specialized instruction based on these disciplines as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

Institute of Natural and Environmental Resources

The department provides professional preparation through five programs open to men and women: (1) secondary school education, (2) pre-school education, (3) family services, (4) consumer studies, (2) human nutrition and dietetics.

The department has been approved by the New Hampshire State Board of Education, Division of Vocational and Technical Education, for the preparation of nursery, kindergarten, and secondary school teachers in vocational home economics and family-life programs. The program in human nutrition and dietetics has been approved by the American Dietetic Association. Requirements of some professional programs make it advisable for the student to specify an option as soon as possible, by the sophomore year at the latest.

A candidate for the degree of Bachelor of Science completes 32 courses or a minimum of 128 credits with an average of C or better, distributed as follows: University or general education requirements, 16 courses or 64 credits (see pages 22-23; professional or specialized education requirements, 16 courses or 64 credits (these must be completed with a grade of C or better). The latter must include a minimum of nine courses or 36 credits in home economics. Each undergraduate is required to take a minimum of four credits from each of the three major subject matter areas, i.e. Foods and Nutrition, Family-Child, and Consumer Studies, offered by the Home Economics department. Upon declaring his or her major interest, the student, in consultation with the adviser, will then select the remaining six courses (24 credits) from among those offered in the department, but will particularly consider those courses which relate to his or her particular field of interest. Also included must be three courses or 12 credits in one of the social sciences or natural sciences numbered 500-level or above, and four courses or 16 credits of professional preparation (to be decided upon by the student in consultation with the adviser). These final four courses may help the student meet certification standards for secondary school teaching, pre-school teaching, ADA requirements for a dietetic internship, or other specified objectives. Further information about specific programs may be obtained by contacting the Home Economics Department.

Institute of Natural and Environmental Resources

Community Development

The Community Development Program deals with broad aspects of community problem resolution including economic, social, political, and technical matters. Communities are viewed as systems subject to meaningful analysis. Resolution of community problems requires knowl-

College of Life Sciences and Agriculture

edge and skills of considerable breadth. The curriculum takes an interdisciplinary approach, and includes field experience as a vital component, along with classroom and independent study. Students will conduct independent projects under Resource Economics 795, 796—Investigations in Resource Economics.

While this program is suitable for preparing any citizen for more effective leadership in his community, employment opportunities are available in the United States, Canada, and in emerging nations. Many federal and state agencies are now undertaking community assistance programs and need personnel who are trained to apply the arts and sciences to the problems of communities. Similarly, many private and local groups are concerned with community planning and development.

Students interested in a Community Development major or minor may consult with the program coordinator, Dr. Edmund F. Jansen, Jr., James Hall, or with the director of the Institute.

Required Courses to Satisfy University Academic Requirements

IN BIOLOGICAL AND PHYSICAL SCIENCES AND MATHEMATICS

Biology	401	Human Biology: Elementary Physiology or
Botany	411	General Botany
Math	415	Mathematics of Business and Economics or
	420	Fundamental Mathematics

IN ARTS, HUMANITIES, AND SOCIAL SCIENCES

Res. Econ.	401	Macro- and Environmental Economics
Res. Econ.	402	Economics of Resource Use and Growth
Pol. Sci.	631	Local Government and Politics
Soc.	400	Introductory Sociology

OUTSIDE MAJOR DEPARTMENT

Eng.	401	Freshman English
Eng.	501	Expository Writing
Speech	403	Communications II

Required Core Courses in Community Development

Soc.	500	Social Psychology
Res. Econ.	507	Introduction to Community Development
Res. Econ.	508	Applied Community Development
Res. Econ.	795, 796	Independent investigation in field analysis of a specific problem in a community in the region

AT LEAST FOUR OF THE FOLLOWING:

Admin.	712	Behavior in Organizations
Bio.	641	General Ecology
INER	702	Natural Resources Policy
Res. Econ.	705	Structure and Planned Change in Non-urban Communities
INER	528	Applied Statistics
Res. Econ.	717	Law of Community and Regional Planning
S & W S	709	Soil Interpretation and Community Planning
Soc.	560	Rural-Urban Sociology

Environmental Conservation

This program is intended to give a broad background for understanding environmental and resource problems and their solutions. Man's economic activity within our biological ecosystems requires understanding of both subject-matter areas. The development of policies and planning is essential to resolving environmental problems.

Students must develop an *option* related to career goals. The option consists of eight courses selected with the assistance of the faculty adviser from the offerings of the University. Options center on a variety of conservation-related areas, such as land-use planning, ecological education, pollution control, writing on natural resources, etc. In addition, a student must complete the 10 courses listed below, which make up the core of the environmental conservation program.

A minor of five courses in Environmental Conservation is available for students majoring in other areas.

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, pages 22-23.

The following 10 courses are required of all majors:

1. Botany 411 (General Botany) ;
2. Zoology 412 (Principles of Zoology) ;
3. and 4. Ecology electives: two of the following: Biology 541 (General Ecology), Botany 741 (Ecosystem Analysis), Botany 742 (Physiological Ecology), Forest Resources 527 (Silvics), Forest Resources 634 (Wildlife Ecology), Forest Resources 672 (Ecological Energetics) ;
5. Resource Economics 401 (Environmental and Resource Economics) or Resource Economics 402 (Economics of Resource Use) ;
6. An advanced course in the economics of resources or community development.
7. INER 635 (Contemporary Conservation Issues) ;
8. INER 702 (Natural Resources Policy) ;
9. Soil and Water Science 504 (Fresh Water Resources) ;
10. Senior practicum: 4 credits. This practicum will be an independent project involving field work on an actual conservation activity during the senior year. A written report will be required. The project may be developed with any faculty member in the Institute of Natural and Environmental Resources.

College of Life Sciences and Agriculture

Students interested in a major or minor may consult with the Program Coordinator, Dr. Oliver Wallace, Pettee Hall, or with the Director of the Institute.

Forest Resources

The objectives of this program are to combine a basic education with a forestry technical education to meet the needs of the professional forester. The Forest Resources program is accredited by the Society of American Foresters.

Graduates are employed in a variety of forest-land management and administrative positions. Some graduates work with natural resource protection, utilization, and the development of environmental quality. Others are employed in the production of raw materials, while still others concentrate on wildlife, grazing, watershed, and recreation.

Managerial and administrative skills are required of most forestry graduates. The program gives a strong foundation in both biological knowledge and managerial skills, with elective freedom for the student to cultivate his special abilities and interests. The curriculum leads many students into graduate studies.

Students majoring in Forest Resources complete 134 credit-hours for the degree of Bachelor of Science in Forestry. The University general education requirements (pages 22-23) are met by taking the required courses below and by choosing electives from the following: four courses in arts, humanities, or social sciences; and four courses other than those listed under Forest Resources.

In addition to the normal University fees and tuition, Forest Resources students are required to meet transportation and meal charges in connection with regularly planned field sessions.

FRESHMAN YEAR		FALL	SPRING
For. Res. 425, 426	Dendrology; Wood Technology	4	4
English 401	Freshman English	4	
Botany 411	General Botany	4	
Math 427	Calculus I	4	
Economics 401	Principles of Economics		4
Advanced English	Writing or Speaking Development		4
Elective			4
		16	16

Institute of Natural and Environmental Resources

SOPHOMORE YEAR		
Science Elective (one semester)	Chem. 403, Earth Sci. 401, Physics 401, or Zool. 412	4 or 4
Elective	Forest Pathology (Bot. 753)* or Forest Entomology (Ent. 506)	4 or 4
For. Res. 527	Silvics	4
INER 528	Applied Statistics	4
S & W 501	Soils and the Environment	4
For. Res. 544	Forest Economics	4
Computational Elective	Math 403 or INER 511	2
Electives		4-8 4-8
		18 16
SPRING FIELD SESSION		
For. Res. 542	Forestland Surveying	2
JUNIOR YEAR		
For. Res. 629	Silviculture	4
For. Res. 644	Biometrics	4
For. Res. 660	Forest Protection	2
Electives		12 12
		16 18
SENIOR YEAR		
For. Res. 745, 798	Forest Management, Forest Resources Seminar	4 4
For. Res. 754	Wood Products Manufacturing and Marketing	4
Electives		12 8
		16 16

*Bot. 753 requires junior class standing.

Prior to the junior year, each student must choose a single area of concentration from the five-course options listed below, and must elect five courses with that option.

Forest Management Option: One course in accounting, management, or administration in WSBE; and four courses in advanced forestry, wild-life, hydrology, soils, resource management, or administration.

Forest Science Option: Chem. 404, General Chemistry; Biochem. 501, Biological Chemistry, and Pl. Sci. 606, Plant Physiology, or Chem. 651-652, Organic Chemistry; and two courses in advanced Plant Science, Botany, or Entomology.

Wood Science Option: Chem. 404, General Chemistry; Math. 428, Calculus II; two courses in For. Res. 695 (Sec. 3), Investigations in Forest Utilization; and one course in advanced Mathematics, Science, or Engineering.

Quantitative Science Option: Math. 428, Calculus II; Math. 527, Differential Equations, or Math 528, Multidimensional Calculus; Math 640, Linear Algebra; a course in probability or statistics; and a course in advanced mathematics, statistics, or computer science.

Students interested in the Forest Resources program may consult with the program coordinator, Dr. Otis Hall, James Hall, or with the Institute Director.

Resource Economics

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

The student in resource economics is trained primarily in the science of economics and its use in problem-solving by individuals, households, business firms, communities, and administrators of governmental agencies. In addition, the student satisfies University requirements (pages 22-23) leading to a broad university education. Those majors who are interested in the economic or business aspects of agriculture will be expected to take courses in the departments of Animal Sciences and Plant Science.

Students majoring in the social sciences and Life Sciences and Agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics. In this manner their basic training can be supplemented in a specific area of interest, such as: farm management and agricultural marketing for agricultural majors, or resource development and natural-resource policy for social science majors.

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. There is currently a strong demand by private business, public institutions, and government agencies for specialists trained in agricultural, fisheries, and forestry marketing; conservation resource development, community development, and land-use policy; extension-work resident teaching; and farm management. In many cases the student may wish to improve his qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Required Courses for Resource Economics Majors

1. All of the following:

English 401	Freshman English
Res. Econ. 401	Macro- and Environmental Economics
Res. Econ. 402	Economics of Resource Use and Growth
Soc. 400	Introductory Sociology
Bot. 411	General Botany*
Zool. 412	Principles of Zoology*
S. & W. 501 or 504	Introductory Soils* Fresh Water Resources*
Math 420 or 427	Fundamental Mathematics or Calculus
Econ. 605	Intermediate Economic Analysis
Econ. 611	National Income Analysis
Econ. 641	Public Finance
INER 528	Applied Statistics I
Res. Econ. 756	Regional Economic Analysis

2. At least four of the following:

Res. Econ. 506	Population, Food and Resource Use in Developing Countries
Res. Econ. 507	Introduction to Community Problems
Res. Econ. 504	Management of Farm and Related Resource Based Business
INER 676	Economics of Water Use
Res. Econ. 706	Economics of Resource Development
INER 701	Statistical Methods I
Res. Econ. 795 or 796	Investigations in Resource Economics

*or equivalent to satisfy University science requirement.

Students interested in a major or minor in this program may consult with the program coordinator, Dr. James Bowring, James Hall, or with the Institute Director.

Soil and Water Sciences

The subject matter of this program relates the physical sciences to the environment. It includes knowledge of the outermost layer of the earth's crust and that portion of the hydrologic cycle pertaining to the fate of water falling on the earth's surface. Knowledge concerning soil and water is important to persons working in the plant sciences, geology, geography, meteorology, natural resource management and pollution control, and certain aspects of engineering. Students interested in soil and water science must select one of the two majors described below by the end of the sophomore year.

Soil Science: This major helps the student develop an understanding of the nature and properties of soils as well as their importance to modern society. It includes the study of the chemical and physical properties of soils, their formation, classification, conservation, and management. Soils are evaluated as a resource in urban and rural community planning.

College of Life Sciences and Agriculture

Listed below are the core courses expected of majors. Electives permit freedom to tailor training to a student's specific interests:

Chem. 403, 404 General	S&WS 501 Soils and the Environment
Chem. 517 Quantitative	S&WS 502 Intro. Soil-Plant Rel.
Physics 407, 408 General	S&WS 602 Chemical Analysis of Soil
Math 410 Digital Computer	S&WS 702 Chemistry of Soils
Math. 427, 428 Calculus	S&WS 704 Soil Classification
Geology 401, 402 Principles	S&WS 795, 796 Independent Work
Botany 411 General	Micro 503 General Microbiology
Botany 606 Plant Physiol.	Micro 708 Microbial Biogeochemistry

Students interested in the soil science major should consult with Professor Nobel Peterson or with the Institute Director.

Hydrology: This is the science underlying development and control of water resources on and beneath the earth's surface. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources.

Core courses for this major are listed below:

Chem. 403, 404 General	Botany 411 General
Physics 407, 408 General	Geog. 473 Weather
Math. 410 Digital Computer	S&WS 501 Soils and the Environment
Math. 427, 428 Calculus	S&WS 703 S&W Engineering
Geology 401, 402 Principles	S&WS 705 Principles of Hydrology
Geology 561 Geomorphology	S&WS 710 Ground Water Hydrology
Geology 662 Glacial	S&WS 795, 796 Independent Work

Students interested in the hydrology program may consult with the program coordinator, Dr. Francis Hall, James Hall, or with the Institute Director.

Wildlife Management

This curriculum is for students whose interest is in the production, management, and utilization of game and other forms of wildlife. 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.

Field work is carried out during the academic year on wildlife areas near the campus. In June each year, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. Majors are encouraged to obtain summer employment related to their career objective.

Institute of Natural and Environmental Resources

The degree earned is a Bachelor of Science with a major in wildlife management. The program is administered in the Institute of Natural and Environmental Resources and is a cooperative program with the departments of Animal Sciences, and Zoology. Inquiries should be addressed to the Institute of Natural and Environmental Resources, James Hall.

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

Students majoring in wildlife management are required to complete 132 credits for the bachelor's degree. In completing the curriculum which follows, the student will meet the University general education requirements (see pages 22-23). These requirements should be met by choosing electives as follows: four courses in arts, humanities, or social sciences; and four courses from the other University requirements. In addition, two electives should be chosen from the following: Forest Resources: 544, Forest Economics; 629, Silviculture; 644, Forest Biometrics; 745, Forest Management; Soil and Water Science; 501, Introductory Soils; 502, Soil-Plant Relationships; 504, Fresh Water Resources; and INER: 702, Natural Resource Policy, 712, Sampling Techniques, 797, Forest Recreation Seminar.

FRESHMAN YEAR		FALL	SPRING
Bot. 411	General Botany	4	
Zool. 412	Principles of Zoology		4
For. Res. 425	Dendrology	4	
Math. 420	Fundamental Mathematics		4
Eng. 401	Freshman English	4	
Res. Econ. 401	Macro- and Environmental Economics		4
Elective		4	4
		16	16
SOPHOMORE YEAR			
An. Sci. 501	Animal Anatomy and Physiology	4	
INER 635	Contemporary Conservation Issues	4	
Chem. 403-404	General Chemistry	4	4
INER 528	Applied Statistics I		4
Zool. 542	Ornithology		4
Elective		4	4
		16	16
SPRING FIELD SESSION (JUNE)			
For. Res. 542	Forest Land Surveying	2	
		2	

College of Life Sciences and Agriculture

JUNIOR YEAR

Biochem. 501	Biological Chemistry	4	
Zool. 712	Mammalogy	4	
Biol. 541	Principles of Ecology	4	
For. Res. 634	Wildlife Ecology		4
An. Sci. 614	Disease and Parasites of Wildlife		4
Pol. Sci. 402	Introduction to Political Science		4
Math. 403 or	Computer Programming	2	
INER 511	Computational Methods in Natural Resources		
Electives		4	4
		<hr/>	<hr/>
		18	16

SENIOR YEAR

For. Res. 737, 738	Game Management	4	4
Zool. 711	Natural History of Cold-blooded Vertebrates	4	
Zool. 772	Fishery Biology		4
Electives		8	8
		<hr/>	<hr/>
		16	16

Students interested in the Wildlife Management program may consult with the program coordinator, Dr. William Mautz, Pettee Hall, or with the Institute Director.

Occupational Education

The Occupational Education curriculum provides professional preparation for teachers of Vocational-Technical Education and County Cooperative Extension personnel. Flexibility is maintained among individual programs with up to 30 credits being allowed for qualified students under the Occupational Competency Testing and Evaluation option.

Career options are varied with graduates teaching in nearly all areas of vocational-technical education and career education. Students also prepare for adult education positions through participation in field experiences in addition to course work.

Students desiring to major or minor in this program should consult with the Program Chairman Professor W. H. Annis.

Plant Science

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may take a major or minor in plant science. A core curriculum of physical and biological sciences is required. Selected courses then relate these sciences to the individual's

specific area of interest. Two curriculum options, the science option and the general option, are offered to plant science majors.

The science option requires additional courses in chemistry, physics, and mathematics. Students are prepared for advanced study leading to careers in research or teaching.

Because of the diversity of employment possibilities, the general option curriculum is flexible. Minor programs in administration, economics, English (journalism), parks and recreation, or occupational education are possible to accommodate specialized interests and complement fundamental requirements. 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 interested in a plant science major or minor may consult with the Department Chairman, Professor L. C. Peirce.

College of Technology

Richard S. Davis, *Dean*

Tenho S. Kauppinen, *Assistant Dean*

Donald A. Moore, *Assistant to the Dean,*
Director of Center for Industrial and
Institutional Development

Departments

Chemical Engineering

Chemistry

Civil Engineering

Earth Sciences

Electrical Engineering

Mathematics

Mechanical Engineering

Physics

Programs of Study

BACHELOR OF SCIENCE:

Chemical Engineering

Chemistry

Civil Engineering

Electrical Engineering

Geology

Mathematics

Mathematics Education

Mechanical Engineering

Physics

BACHELOR OF ARTS:

Chemistry

Chemistry and Physics Teaching

Earth Science Teaching

Geology

Mathematics

Physics

Science

General Information

The College of Technology seeks to provide 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 eight primary disciplines leading to the Bachelor of Science, and a broad liberal education coupled with a major 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 the social sciences.

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

The 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 (pages 22-23) and the specific departmental requirements for graduation. A minimum grade-point average of 2.0 must be achieved. Graduation credit requirements established by the departments range from 128-134. Since there is a core of courses which are similar in each Bachelor of Science curriculum, it is possible for a student to change his field of study during the sophomore year with little effect on the time required for graduation.

The Bachelor of Arts Programs

Programs leading to a Bachelor of Arts degree are offered in Chemistry, Geology, Mathematics, and Physics. These programs provide a broad liberal education along with a major in one of these physical sciences or mathematics. Students interested in science, but undecided about the field, may enter the College as a science major.

A candidate for the Bachelor of Arts in the College of Technology must complete at least 32 credits of major course work with grades of "C" or better. The student may choose either a *departmental major* or a *science major with a departmental concentration*.

In the *departmental major*, at least 32 credits of course work must be taken within the major department. Up to 12 credits may be required in related departments. (See individual departmental write-ups for specific requirements.)

College of Technology

In the *Science Major with Departmental Concentration*, 20-24 credits are taken within the department of concentration with the additional credits required taken in other science courses approved by the department of concentration. (See individual departmental write-ups for specific requirements.)

In addition to the departmental requirements, a candidate for the Bachelor of Arts in the College of Technology must meet the University General Education Requirements (pages 22-23) and the following B.A. requirements. Mathematics 427-428 or the equivalent in transfer credits or advanced placement approved by the Mathematics Department is required by all departments of the College for their majors.

Bachelor of Arts Degree Requirements

Satisfaction of these requirements ensures satisfaction of the University general education requirements.

1. 128 credits.
2. At least a 2.0 cumulative average in all courses completed at the University of New Hampshire.
3. Four courses in sciences and/or mathematics *outside the major department*, from those offered in biochemistry; biology; botany; chemistry; entomology; earth science; mathematics; microbiology; physics; zoology; Animal Science 400; Plant Science 421, 706, 708, 762, 769, 773; and Soil and Water Science 501 and 504. (Courses must be of at least three credits each.)
4. Two courses in humanities, selected from those offered in arts, English (beyond 401), foreign languages (beyond 401-402), humanities, music, philosophy, and speech and drama, *outside the major department*. (Courses must be of at least three credits each.)
5. Two courses in social sciences from those offered in anthropology, economics, geography (excluding physical geography), history, political science, psychology, Recreation and Parks 400, resource economics (excluding 501 and 504), sociology, and social science, *outside the major department*. (Courses must be of at least three credits each.)
6. Two additional humanities or social sciences courses, *outside the major department*. (Courses must be of at least three credits each.)
7. Six additional courses, *not in a student's major department*, selected from all courses offered by the University. English 401 must be taken in the freshman year as one of these courses, unless the student is exempted. Students exempted from English 401 must substitute a course *not in the major department*, to make up a total of six courses in this category. (Courses must be of at least three credits each.)
8. Foreign Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college-level course is required of all students. 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 foreign languages numbered 501 or above, if eligible. This requirement must be satisfied by the end of the sophomore year.

9. **Major Requirements:** A student must complete at least 32 credits of major course work with grades of C or better. The major department may require a senior paper or project, and/or a comprehensive examination.

Minor

A student in the College of Technology may earn a minor in any discipline in the University. A minor consists of 20 semester hours with grades of "C" or better in courses that the minor department approves. Courses taken on a Pass/Fail option may not be used for a minor. No more than eight credits used by the student to satisfy major requirements may be used for the minor. Students wishing a minor should plan programs in consultation with the major adviser and an adviser from the minor department. During the final term, students should apply to the Dean to have the minor recorded on the transcript.

Interdisciplinary Minors

Interdisciplinary minors have been developed in ocean engineering and bioelectronics engineering. These programs will enable students to obtain experience in the specialized area and to retain identification with their major professional area.

OCEAN ENGINEERING

The ocean-engineering minor program consists of core courses which are directly concerned with some aspect of ocean engineering. Successful completion of the minor requires that a student complete a minimum of five core courses. All courses constituting the program shall be elected by the student in consultation with the adviser in the ocean engineering program.

Core courses in the ocean engineering program are as follows: C.E. 796—Independent Study; Earth Science 501—Introduction to Oceanography; Earth Science 756—Chemical Oceanography; Earth Science 758—Physical Oceanography; Earth Science 759—Geological Oceanography; E.E. 781—Ocean Instrumentation Project; E.E. 785—Underwater Acoustics; M.E. 751—Naval Architecture in Ocean Engineering; M.E. 752—Submersible Vehicle Systems Design; M.E. 757—Coastal Engineering and Processes; Tech. 610—Introduction to Ocean Engineering; (C.E. 695, Ch.E. 695, 696, E.E. 695, M.E. 695, 696)—Engineering Projects.

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Normally the five required core courses chosen from this list will include two courses from the science area. As experience and demand dictate, courses may be added or deleted from the above listings.

A student is encouraged to declare the intention to enter the program as early as possible but no later than the end of the junior year. During the final term, the student should apply to the Dean to have the minor shown on the transcript.

BIOELECTRONICS ENGINEERING

Technology students, having an interest in applying their engineering training to problems relating to the health and welfare of our growing population, may wish to participate in the Bioelectronic Engineering Minor. In order to qualify for this minor, the student must choose five of the elective courses from an approved list of courses in consultation with the adviser.

The opportunity exists for students to participate in courses and research projects which involve the Departments of Zoology, Animal Science, Plant Science, Physical Education, Psychology, Forestry, Soil and Water Science, and Departments within the College of Technology.

Listed below are courses which may be elected by the student for this program. The list will be changed as new courses become available.

695—Engineering Projects (E.E., M.E., Ch.E., C.E.); E.E. 784—Bioelectronics; E.E. 757—Fundamentals of Communications; E.E. 758—Communications Systems; Tech. 683—Technology—Its Role and Function in Society; Zoology 507—Human Anatomy and Physiology; Zoology 508—Human Anatomy and Physiology; Chem. 545—Organic Chemistry; Psychology 788—Brain and Behavior; Physical Education 620—Physiology of Exercise; Zoology 726—General Physiology; and Plant Science 706—Plant Physiology.

Exceptions may be made to the above list in special cases. Students will normally begin this program during their sophomore year. During the final term, application should be made to the Dean to have the Minor shown on the transcript.

Dual Major Option

A student may earn two majors in any discipline in the University which awards the Bachelor of Arts degree if authorized by the major departments and the College Dean(s). No more than 8 credits used to satisfy major requirements for one major may be used as major requirements for the other. A student should declare the intent to earn two majors as early as possible and no later than the end of the junior year. The student should plan the program in consultation with advisers from both majors.

Dual Degree Programs

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, scholastic, and other requirements for each degree. It is expected the student will complete five years of academic work. A second degree may not be earned in a closely allied major field. If a student plans to enter the dual degree program, the respective departments should be contacted as early as possible. See page 25 for specific requirements.

Student Designed Major

See page 124 for requirements for a student designed major.

Independent Study and Projects

All departments within the College offer courses in independent study or in projects. The content of these courses varies with the current scientific and technological needs as well as with student and faculty interest.

Permission of the instructor and/or the department chairman is required. (See the Course Descriptions for the independent study and projects courses and for specific requirements.) The initiative for an independent study course 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 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 04.31 (s). Waiver of Requirements in a Prescribed Curriculum.)

The above rule offers students the opportunity to develop a somewhat individualized plan of study with intellectual incentives and opportunities beyond those offered in a regular curriculum.

In addition, upon the recommendation of the department chairman, 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 student has been admitted to the master’s program.

Research Opportunity

The talents and expertise of the faculty in all departments is reflected in the number of on-going research projects. Undergraduate students are included in many of these research projects. The intent is to discover and to foster the creative talents of students. In funded research projects, there may be an opportunity for students to be paid while learning.

College of Technology

Some flavor of the multiplicity of the research programs is reflected in special facilities a few of which are listed below:

Analog Computer Facility, Antenna Systems Laboratory, Bioelectronics Laboratory, Center for Industrial and Institutional Development (CIID), 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 through the Center for Industrial and Institutional Development. CIID undertakes client-sponsored professional projects in management and technical areas for business, industry, and state and local governments.

Preparing for Teaching

Students interested in Mathematics Education, Chemistry and Physics Teaching, or Earth Science Teaching should refer to the material on Preparing for Teaching that begins on page 29 and the appropriate department description of the requirements.

Chemical Engineering

Stephen S. T. Fan, *Chairman*

Chemical engineering is concerned with the analysis and design of processes and systems that involve the transfer and transformation of energy and matter.

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

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

The curriculum is designed to provide adequate training for the student to enter the diverse areas of employment or graduate study.

Chemical Engineering

The considerable number of electives in the curriculum provides flexibility to individual students to design a program that fulfills individual needs and interests. This also provides opportunity for students to elect minor options in their programs.

A minimum of 132 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering. There are 10 electives in the chemical engineering curriculum in addition to the two technical electives. Six of these are for arts and humanities and social science requirements. Among the remaining four electives, two should be chosen from chemical engineering courses.

		FALL	SPRING
FRESHMAN YEAR			
English 401	Freshman English	4	
Math. 427-428	Calculus I and II	4	4
Phys. 407-408	General Physics I and II	4	4
Chem. 405	General Chemistry	4	
Ch.E. 410	Current Topics in Chemical Technology		4
Elective			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	4	
Math. 403	Introduction to Digital Computer Programming	2	
Ch.E. 501-502	Introduction to Chemical Engineering	2	4
Electives (2)		4	4
Tech. Elective			4
		17	17
JUNIOR YEAR			
Chem. 545	Organic Chemistry	4	
Chem. 546	Organic Chemistry Laboratory	2	
Ch.E. 601	Fluid Mechanics and Unit Operations	4	
Ch.E. 602	Heat Transfer and Unit Operations		4
Ch.E. 603	Applied Mathematics for Chemical Engineering	4	
Ch.E. 604	Chemical Engineering Thermo-dynamics		4
Electives (2)		4	4
Tech. Elective			4
		18	16
SENIOR YEAR			
Ch.E. 605	Mass Transfer and Stagewise Operations	4	
Ch.E. 606	Chemical Engineering Kinetics	4	
Ch.E. 608	Chemical Engineering Design		4
Electives (5)		8	12
		16	16

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Chemistry

A. R. Amell, *Chairman*

The student interested in chemistry may major in one of four programs offered in the department. The choice of program depends upon the student's 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, or even to another major.

Bachelor of Science in Chemistry

This curriculum is intended to prepare the student for the career of a professional chemist and to provide a strong foundation for graduate study in chemistry or in interdisciplinary areas of science calling for a strong background in chemistry. It requires a greater depth in chemistry and physics than do the other degree programs.

Requirements:

1. All University requirements must be satisfied (see pages 22-23).
2. Language requirement: Much of the chemical literature is in German or Russian, and has not been translated. The student must demonstrate a proficiency in *one* of these languages by completing a year's course in that language. The choice is up to the student.
3. The student should register for Physics 407 in the second semester of the first year.
4. Chemistry requirements: 405, Introductory Chemistry; 406,407, Quantitative Analysis; 547,549, Organic Chemistry; 548,550, Organic Chemistry; 683, Physical Chemistry I; 684, Physical Chemistry II; 685, 686, Physical Chemistry Laboratory; 697, Chemical Literature; 698, Seminar; 755,756, Advanced Organic Chemistry; 762,763, Instrumental Methods of Chemical Analysis; 774-775, Inorganic Chemistry; 776, Physical Chemistry III; Chemistry 699, Senior Thesis; and one advanced chemistry or other approved science course, elected by the student.
5. Mathematics requirements: 427, Calculus I; 428, Calculus II; and 403, Introduction to Digital Computer Programming. Math 527 (Differential Equations) and 528 (Multidimensional Calculus) are recommended but not required.
6. Physics requirements: 407, General Physics I; 408, General Physics II; and 506, General Physics IV.

Bachelor of Arts, Chemistry Major

This curriculum offers the student interested in chemistry the opportunity to combine a chemistry major with other interests. There are fewer required courses in chemistry and physics, and the student has

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. All University requirements must be satisfied (see pages 22-23).
2. All requirements for the Bachelor of Arts degree must be satisfied (see pages 76-77).
3. Chemistry requirements: 405, Introductory Chemistry, or 403-404, General Chemistry; 406,407, Quantitative Analysis; 547-548 and 549-550, Organic Chemistry; 683-684 and 685-686, Physical Chemistry I and II; 762 and 763, Instrumental Methods of Chemical Analysis; and two advanced chemistry courses elected by the student.
4. Physics requirements: 407, General Physics, or 401-402, Introduction to Physics I and II.
5. Math requirements: 427, Calculus I, and 428, Calculus II.

Bachelor of Arts, Science Major, Chemistry Concentration

This curriculum is for the student interested in chemistry, but wishing a broader exposure to other disciplines than is obtained in a chemistry major. Students interested in interdisciplinary science or in chemistry as a cultural subject can satisfy their interests in this degree program. It is not intended to prepare professional chemists but rather as the basis for a broad liberal education.

Requirements:

1. All University requirements must be satisfied (see pages 22-23).
2. All requirements for the Bachelor of Arts degree must be satisfied (see pages 76-77).
3. Chemistry requirements: 405-406 and 407, Introductory Chemistry and Quantitative Analysis, or 403-404, General Chemistry; and four other chemistry courses (each at least three credits) chosen from at least two different areas of chemistry.
4. Math requirements: 427, Calculus I, and 428, Calculus II.
5. Additional Major requirements: three approved courses in science or mathematics (each at least three credits) over and above those used to satisfy University requirements.

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 many

College of Technology

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.

In each of the above programs the student should register for the following courses in his first year: Chemistry 405 (1st semester), Introductory Chemistry; Chemistry 406 (2nd semester), Quantitative Analysis; Mathematics 427 (1st semester), Calculus I; Mathematics 428 (2nd semester), Calculus II; and Physics 407 (2nd semester), General Physics I.

Requirements:

1. All University requirements must be satisfied (see pages 22-23).
2. All requirements for the Bachelor of Arts degree must be satisfied (see pages 76-77).
3. Chemistry requirements: 405, Introductory 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; 506, General Physics IV; 605, Experimental Physics I; and Physics 406, Introduction to Modern Astronomy, strongly recommended.
5. Math requirements: 427, Calculus I, and 428, Calculus II.
6. All education courses in Teacher Preparation Program (see page 29).

Civil Engineering

Robert P. Vreeland, *Chairman*

The Civil Engineer is concerned with the planning, design, and construction of public and private facilities including those for: transportation; the control, purification, and distribution of water; the collection and treatment of waste products; and residential and industrial purposes. Facilities 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. Since many of the clients are governmental agencies, the civil engineer must secure the approval of the citizens involved or their elected representatives.

The curriculum rests upon the twin bases of the sciences and the liberal arts. The properties of the substances with which he will work (construction materials, soils, and water) are derived from the science

Civil Engineering

base in a series of courses in the middle years of the curriculum. In the senior year, electives are provided to allow the student to pursue in greater depth any of the major branches of civil engineering (structures, soils and foundations, transportation and urban systems planning, water use and control, environmental and sanitary engineering, surveying and mapping).

The program will permit the graduate to enter professional practice or to pursue further studies either in Civil Engineering or in one of its associated fields (architecture, planning, land development, government service, etc.).

A minimum of 134 credits is required for graduation with the degree of Bachelor of Science in Civil Engineering. The student, with the assistance of the adviser, should plan a program based on the following suggested distribution of courses which averages 17 credit-hours per semester.

FRESHMAN YEAR		FALL	SPRING
Chem. 403 (or 405)	General Chemistry	4	
C.E. 400	Civil Engineering Lectures	0	
Engl. 401	Freshman English	4	
Math. 403	Introduction to Digital Computer Programming	2	
Math. 427-428	Calculus I and II	4	4
C.E. 404	Engineering Computer Applications		2
Phys. 407	General Physics I		4
Electives (3)	Arts, Humanities, or Social Science	4	8
		18	18
SOPHOMORE YEAR			
C.E. 523-524	Mechanics I and II	4	4
C.E. 505	Surveying	4	
Math. 527	Differential Equations	4	
Phys. 408	General Physics II	4	
C.E. 508	Engineering Graphics		2
Math Elective (or Tech 601)			4
Electives (2)	Arts, Humanities, or Social Science		8
		16	18
JUNIOR YEAR			
C.E. 622	Engineering Materials	4	
C.E. 681	Structural Analysis I	4	
C.E. 642	Fluid Mechanics	4	
E.E. 533	Electronics and Instrumentation for Engineers	4	
C.E. 665	Soil Mechanics		4
C.E. 643	Sanitary Engineering I		4
C.E. 682	Structural Design Concepts		4
C.E. 621	Transportation Planning and Design	4	4
		16	16

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SENIOR YEAR

C.E. 685	Indeterminate Structures	4	
Elective (1)	Arts, Humanities, or Social Science		4
Free Electives (2)	Any Department except C.E.	4	4
C.E. Electives (3)		4	8
Approved Elective (1)		4	
		<hr/>	<hr/>
		16	16

Earth Sciences

Herbert Tischler, *Chairman*

The courses offered in the Department of Earth Sciences cover the broad spectrum of geology and oceanography. They encompass a group of related studies that are 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 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 essential mineral resources, by man's increased concern with intelligent management of his environment, and by expansion of research in both oceanography and extra-terrestrial geology. In addition, the demand for well-trained secondary school teachers of earth science has steadily increased over the past few years.

Four undergraduate degree programs are offered through the Department of Earth Sciences.

Bachelor of Science in Geology

This program represents the strongest 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 a student may, in consultation with his/her academic adviser, orient the program toward a particular facet of the earth sciences (e.g. mineralogy-petrology, oceanography, geomorphology, paleontology-stratigraphy, etc.).

Requirements:

1. Satisfy the University requirements.
2. Satisfactorily complete Mathematics 427-428, Chemistry 403-404, and Physics 407-408.
3. Complete a minimum of 12 courses in Earth Science, which should include: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; E.S. 512, Descriptive and Determinative Mineralogy; E.S. 613, Principles of Mineralogy, and/or E.S. 614, Petrog-

raphy; E.S. 531, Structural Geology; E.S. 561, Geomorphology; E.S. 652, Invertebrate Paleontology; E.S. 754, Sedimentation-Stratigraphy; and three approved Earth Sciences electives.

4. Complete Mathematics 527-528 or approved electives.
5. Complete two additional approved electives.

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 a student can prepare for graduate school, business, or industry.

Requirements:

1. Satisfy the University requirements (see pages 22-23).
2. Satisfy the requirements for the Bachelor of Arts degree (pages 76-77).
3. Complete a minimum of eight courses in the department (with a grade of "C" or better) which should include: E.S. 401-402, Principles of Geology; E.S. 512, Descriptive and Determinative Mineralogy; and five upper level Earth Science courses, two of which must be selected from courses numbered 700 or above.
4. Math requirements: 427, Calculus I, and 428, Calculus II.

It is strongly advised that students complete, as early as possible, a year each of college chemistry and physics.

It is also suggested that students include History 521-522, History of Science, in their program.

Bachelor of Arts, Science Major, Earth Sciences, Concentration

This program is for the student who wants a liberal education with a scientific slant to it. It is not designed to produce professional scientists but rather combines the liberal arts with a reasonable exposure to science in general and to earth sciences in particular.

Requirements:

1. Satisfy the University requirements (see pages 22-23).
2. Satisfy the requirements for the Bachelor of Arts degree (pages 76-77).
3. Complete: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; and three approved Earth Sciences electives.
4. Math requirements: 427, Calculus I, and 428, Calculus II.
5. Additional major requirements: three approved courses in science over and above those used to satisfy University requirements.

College of Technology

Bachelor of Arts, Earth Science-Teaching Major

This program is specifically designed to prepare the student to teach earth science in secondary school. Upon graduation from this program students receive full teacher certification which is recognized in most states.

Requirements:

1. Satisfy the University requirements (see pages 22-23).
2. Satisfy the requirements for the Bachelor of Arts degree (pages 76-77).
3. Complete: E.S. 401-402, Principles of Geology; E.S. 501, Introduction to Oceanography; Geog. 473, The Weather; Chem. 401-402, General Chemistry; Phys. 401-402, Introduction to Physics; Phys. 406, Introduction to Modern Astronomy; plus 12 approved elective credits from intermediate and/or advanced Earth Sciences courses.
4. Math requirements: 427, Calculus I, and 428, Calculus II.
5. Satisfy the secondary-school Teacher-education Program. (See "Preparing for Teaching," page 29.)

Electrical Engineering

Joseph B. Murdoch, *Chairman*

During the 1970's, electrical engineers will design systems for investigating the ocean, for monitoring medical procedures, and for processing information from outer space. They will develop electronic instrumentation for environmental protection, design mini and micro computers for industry, and use their knowledge to help solve major societal problems such as transportation, pollution, and health care delivery.

At UNH, the keynote of the Electrical Engineering program is the involvement of the student in the solution of real-world problems. During the freshman and sophomore years, the student takes basic courses in mathematics and physics, learns how to use the computer, and receives introductory experience in electric circuits, logic design, and electronics.

In the junior year, the student concentrates in electrical engineering courses in preparation for a nearly completely elective senior year. As a senior, the student can choose several application-oriented courses in Electrical Engineering, build a minor in ocean engineering or bio-electronics, or complete an option in Communications Systems, Computer Engineering, or Instrumentation and Control. The year features many opportunities for individual or group projects.

The Electrical Engineering curriculum prepares the student for graduate work in electrical engineering, immediate employment as an

Electrical Engineering

electrical engineer, and for graduate work in related areas such as business administration. It is well-suited to the dual degree programs described on page 25).

Basic Curriculum for Bachelor of Science in Electrical Engineering

1. For students who will be juniors and seniors in the fall of 1974: 131 credits required for graduation.

JUNIOR YEAR		FALL	SPRING
E.E. 503	Electrical Circuit Theory	4	
E.E. 510-511	Linear and Nonlinear Electronic Circuits	4	4
E.E. 509	Electromagnetic Fields	4	
E.E. 520	Energy Conversion		4
E.E. 517-518	Electrical Lab I and II	1	4
Electives (2)		4	4
		17	16
SENIOR YEAR			
E.E. 605	Electronic Properties of Materials Devices	4	
M.E. 503	Thermodynamics		4
Electives (6)*		12	12
		16	16

*At least two electives in the senior year will be technical courses. These will be two electrical engineering 700-level courses (or acceptable substitutes) taken after the student has completed Electrical Engineering 511, Electrical Engineering 518, and Electrical Engineering 520.

2. For students who will be freshmen and sophomores in the fall of 1974: 129 credits required for graduation.

FRESHMAN YEAR		FALL	SPRING
Math. 427-428	Calculus I and II	4	4
Phys. 407-408	Physics I and II	4	4
Chem. 403*	General Chemistry		4
English 401	Freshman English	4	
E.E. 401-402	Introduction to Electrical Engineering I and II	1	4
Electives (1)		4	
		17	16
SOPHOMORE YEAR			
Math. 527	Differential Equations	4	
Two specified ME courses†		3	3
E.E. 541-542	Electrical Circuits I and II	3	3
E.E. 543	Introduction to Digital Systems	3	
E.E. 544	Signal Processing Fundamentals		3
E.E. 548	Electronics I		3
Electives (2)		4	4
		17	16

College of Technology

JUNIOR YEAR

E.E. 551-552	Electronics II and III	3	3
E.E. 603-604	Electromagnetic Fields and Waves I and II	3	3
E.E. 607	Electrical Circuits III	3	
E.E. 654	Energy Conversion		3
One specified M.E. course	in either semester†	(3)	(3)
E.E. 608	Introduction to Communications and Control		3
Electives (2)		4-8	4-0
		<hr/>	<hr/>
		16-17	15-16

SENIOR YEAR

E.E. 609	Electronic Materials and Devices	3	
Electives	The student may arrange his senior electives in any manner, provided that he satisfies all University requirements (pages 22 and 23) and elects at least three electrical engineering 700-level courses or approved substitutes.		

*A student with a satisfactory SAT Achievement test score in Chemistry may substitute an elective for this course.

†These courses will cover statics, dynamics, strength of materials, thermodynamics, heat transfer, and fluid mechanics.

Minors and Options

Students in Electrical Engineering, while fulfilling the basic curriculum requirements for a major in E.E. may in addition complete one of two interdisciplinary minors or one of four Electrical Engineering elective options. The minors are in ocean engineering and bioelectronics engineering and are described on pages 77-78.

Three of the elective options are specific technical areas of Electrical Engineering and the fourth is student designed. Each option requires four courses, two specified and two elective, in addition to the core Electrical Engineering curriculum. Either an option or a minor can be completed without exceeding 129 credits. Descriptions of the options follow:

COMMUNICATIONS SYSTEMS OPTION: R. R. CLARK, ADVISER.

This area of specialization is designed to provide the student with the fundamentals of communication theory and signal processing as they relate to communications systems. Included are the techniques of Fourier analysis, amplitude and frequency modulation, detection, system noise considerations, and digital and sampled data signals. An introduction into such areas as information theory, coding, and optimal communications systems is included and designs of communication systems, RF amplifiers, modulators, detectors, receivers, antenna systems, and multiplexers are covered as applications of communication theory.

Required Courses: E.E. 757, Fundamentals of Communications; E.E. 758, Communication Systems.

Elective Courses (any 2) : E.E. 695, Electrical Engineering Projects; E.E. 701, Applied Electromagnetic Fields; E.E. 714, Minicomputer Applications Engineering; E. E. 741, Fundamentals of Acoustics; E.E. 782, Control Systems; E.E. 785, Underwater Acoustics. Math 646, Analysis for Applications; Math 647, Complex Analysis for Applications; Math 710, Advanced Programming Systems (cannot be elected if E.E. 714 is elected) ; Math 735, Probability.

COMPUTER ENGINEERING OPTION: J. L. POKOSKI, ADVISER

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 the electrical engineer to design or specify the purchase of the computer and integrate it into larger systems. This requires a knowledge of both hardware (circuits) and software (programming) concepts. In this option, the student will learn to design, build, and test systems involving digital computers.

Required Courses: E.E. 712, Logical Design of Digital Computers; E.E. 714, Minicomputer Applications Engineering.

Elective Courses (any 2) : E.E. 695, Electrical Engineering Projects; E.E. 711, Digital Systems; Math 710, Advanced Programming Systems; Math 711, Programming Languages and Compiler Construction; Math 753, Numerical Methods and Computers; Math 754, Numerical Methods and Computers.

INSTRUMENTATION AND CONTROL OPTION: A. L. WINN, ADVISER

Electrical Engineers are frequently required to develop electro-mechanical, thermoelectric, or electrochemical measuring devices for monitoring and collecting physical data and amplifying and modifying the electrical signals representing such data to a form suitable for recording and analysis. Such systems are called instrumentation systems, the design of which involves a background in computer hardware and software and electronic devices and circuits. When the output from such an instrumentation system is used in a feedback loop to control a process or plant, electrical engineers are often required to use mathematical techniques to determine and regulate the dynamic response of the system. This necessitates a knowledge of control system theory. The student in this option will analyze, design, construct, and test typical instrumentation and control systems including the computer manipulation of data.

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Required Courses: E.E. 781, Ocean Instrumentation Project; E.E. 782, Control Systems.

Elective Courses (any 2): E.E. 695, Electrical Engineering Projects; E.E. 727, Power Systems; E.E. 714, Minicomputer Applications Engineering. M.E. 741, Control of Physical Systems. Math 645,646, Analysis for Applications; Math 735, Probability; Tech 601, Statistical Methods in Engineering and Physical Science; Res. Ec. 715, Linear Programming Methods.

STUDENT DESIGNED OPTIONS D. W. MELVIN, ADVISER

This program is for the student whose goals do not coincide with the other Electrical Engineering options. Such students will be expected to arrange with their advisers a set of four elective courses that best meet their goals and interests. At least three of these elective courses will be E.E. 700-level courses. This program provides the opportunity to gain a broad background in E.E. or to prepare for work in areas other than those specified by the other options. Such areas include solid state electronics, business management, applied mathematics, illumination, acoustics, and electrical utility engineering.

Mathematics

M. E. Munroe, *Chairman*

There are five undergraduate degree programs offered through the Department of Mathematics. Normally a student will enter one of these specific programs. However, if the following Mathematics courses are taken during the first two years, a student is fully prepared to satisfy the Mathematics requirements in any one of these programs and so may change degree programs at the end of the sophomore year: Math 427, Calculus I; Math 428, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; and Math 531, Introduction to Abstract Mathematics.

In some programs there are courses outside Mathematics that should be completed in the sophomore year. These are noted in the detailed lists of requirements that follow.

Bachelor of Science in Mathematics

This program represents the strongest concentration in Mathematics of any of the programs offered by the department. Included among the required courses are those usually required for admission to graduate work in Mathematics. Through a judicious choice of electives the stu-

dent may construct a stronger pre-graduate program or he may slant his program toward a career in business or industry.

Requirements:

1. University requirements must be satisfied and Physics 407-408 must be included among the science courses.
2. Language requirement: The student must demonstrate proficiency in one of the three languages: French, German, or Russian. This may be done by achievement test or by courses as outlined in the College requirements for the Bachelor of Arts degree.
3. Mathematics requirements: Math 427, Calculus I; Math 428, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Analysis; Math 784, Topology; Math 788, Complex Analysis; and three approved Mathematics electives.

Bachelor of Arts, Mathematics Major

This program offers an opportunity for a broader liberal education than do any of the Bachelor of Science programs. However, by a careful choice of electives the student can shape his major into a preparation for graduate school, business, or industry.

Requirements:

1. University requirements must be satisfied (see pages 22-23).
2. Requirements for the Bachelor of Arts degree must be satisfied (pages 76-77).
3. Mathematics requirements: Math 427, Calculus I; Math 428, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Analysis; and three approved Mathematics electives.

Bachelor of Arts, Science Major, Mathematics Concentration

This program is for the student who wants a liberal education with a scientific slant to it. It is not designed to produce professional scientists but rather combines the Liberal Arts with a reasonable exposure to Science in general and Mathematics in particular.

Requirements:

1. University requirements must be satisfied (see pages 22-23).
2. Requirements for the Bachelor of Arts degree must be satisfied (pages 76-77).
3. Mathematics requirements: Math 427, Calculus I; Math 428, Calculus II; Math 510, Mathematical Computer Problems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra, or Math 767, One-dimensional Analysis; and one approved Mathematics elective.
4. Additional major requirements: Three approved courses in science over and above those used to satisfy University requirements.

Bachelor of Science in Mathematics-Education

This is a professional degree program to prepare the student for teaching mathematics at the elementary or secondary level. The program is coordinated with the education department's five-year, teacher-certification program. A student may complete the degree requirements in four years; however, to receive full teacher certification a year-long teaching internship in the fifth year is required. (The internship can be coupled with other graduate work leading to a master's degree.) See "Preparing for Teaching," page 29.

Requirements:

1. University requirements must be satisfied.
2. Education requirements: Education 500, Exploring Teaching; Education 700, Educational Structure and Change; Education 701, Human Learning and Development; Education 703, Alternative Teaching Models; Education 705, Perspectives on the Nature of Education.

ELEMENTARY OPTION

3. *Mathematics requirements:* Math 419, Evolutions of Mathematics; Math 427, Calculus I; Math 428, Calculus II; Math 410, Digital Computer Systems; Math 636, Probability and Statistics; Math 657, Geometry; Math 621, 622, 623, Number Systems, Geometry, and Topics in Mathematics for Elementary School Teachers; Math 703, Mathematics Education, K-6; Math 791, Mathematics-Education; one approved mathematics elective.

4. *Additional major requirements:* Physics 406, Introduction to Modern Astronomy; Education 706, Introduction to Reading.

SECONDARY OPTION

3. *Mathematics requirements:* Math 427, Calculus I; Math 428, Calculus II; Math 510, Mathematical Computer Problems; Math 527,

Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 636, Probability and Statistics; Math 657, Geometry I; Math 698, Senior Seminar; Math 761, Abstract Algebra; Math 791, Mathematics-Education; and two approved mathematics electives.

Bachelor of Science (Interdisciplinary Programs in Mathematics and Its Applications).

These programs are designed to prepare the student for employment in various areas of Applied Mathematics. Certain of them also lead to graduate work in appropriate fields (e.g. chemical physics, computer science, economics). In this program the major may consist of Mathematics combined with any one of the following disciplines: Chemistry, Computer Science, Economics, Electrical Science, Control Theory, Fluid Dynamics, Mechanics, Thermodynamics, and Physics.

Requirements:

1. University requirements must be satisfied.
2. Core mathematics requirements: Math 427, Calculus I; Math 428, Calculus II; Math 510, Mathematical Computer Problems, or Math 410, Digital Computer Systems; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; and Math 645, Analysis for Applications I.

3. Additional Mathematics requirements:

In Mathematics-Computer Science: Four approved Mathematics electives. Proper choice of these depends heavily on the student's career objectives. These electives should be chosen only in consultation with a faculty adviser designated by the Mathematics Department.

In Mathematics-Economics: Math 735, Probability; Math 736, Statistics; and two approved Mathematics electives.

In all other options: Math 646, Analysis for Applications II; Math 647, Complex Analysis for Applications; and two approved Mathematics electives.

4. Requirements in other disciplines: Each interdisciplinary major consists of 10 Mathematics courses (see above) plus five courses in the other discipline. Specific requirements follow. If more than five courses outside Mathematics are required or elected, the excess over five may be used to satisfy appropriate University requirements.

MATHEMATICS-CHEMISTRY OPTION

Chem. 405—Introductory Chemistry; Chem. 683—Physical Chemistry I and Chem. 685—Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem. 684—Physical Chemistry II and Chem. 686—Physical Chemistry Laboratory (these two courses regarded

College of Technology

as a single unit); Chem. 776—Physical Chemistry III; *either* Physics 701—Introduction to Quantum Mechanics *or* Chem. 775—Inorganic Chemistry.

Note: Chem. 547-548, Organic Chemistry, suggested as elective for those planning to do graduate work in chemical physics. Chemistry 405 should be taken no later than the sophomore year.

MATHEMATICS—COMPUTER SCIENCE OPTION

A total of five of the following courses, including at least one from each of the following three groups: Group 1: Math 611, Assembler Language Programming; Math 612, Data Structures and Processes; Math 710, Advanced Programming Systems; Math 711, Programming Languages and Compiler Construction. Group 2: Math 753-754, Numerical Methods and Computers. Group 3: E.E. 531, Elements of Digital Systems; E.E. 711, Digital Systems; E.E. 712, Logical Design of Digital Computers; E.E. 714, Minicomputer Applications Engineering.

MATHEMATICS—ECONOMICS OPTION

Economics 401-402—Principles of Economics (Macro, Micro); Economics 605—Intermediate Economic Analysis; Economics 611—National Income Analysis; and any two of the following three courses: Economics 727—Introduction to Econometrics; Economics 728—Statistical Decision-Making; Administration 705—Operations Research.

Note: Economics 401-402 should be taken no later than the sophomore year.

MATHEMATICS—ELECTRICAL-SCIENCE OPTION

E.E. 541-542, Electrical Circuits I and II; E.E. 603-604, Electromagnetic Fields and Waves I and II; and any two of the following four courses: E.E. 701, Applied Electromagnetic Fields; E.E. 706, Advanced Network Theory; E.E. 757, Fundamentals of Communications; E.E. 782, Control Systems.

MATHEMATICS—CONTROL-THEORY OPTION

E.E. 541-542—Electrical Circuits I and II; *either* M.E. 503—Thermodynamics I; *or* M.E. 523—Solid Mechanics I; M.E. 741—Control of Physical Systems; E.E. 782—Control Systems.

MATHEMATICS—FLUID-DYNAMICS OPTION

M.E. 503—Thermodynamics I; M.E. 508—Fluid Dynamics; M.E. 523—Solid Mechanics I; M.E. 707—Analytical Fluid Dynamics; M.E. 708—Gas Dynamics.

MATHEMATICS—MECHANICS OPTION

M.E. 503—Thermodynamics I; M.E. 523-524—Solid Mechanics I and II; any two of the following three courses: M.E. 723—Advanced Dynam-

Mechanical Engineering

ics; M.E. 724—Introduction to Vibrations; and M.E. 727—Advanced Mechanics of Solids.

MATHEMATICS—THERMODYNAMICS OPTION

M.E. 503—Thermodynamics I; M.E. 508—Fluid Dynamics; M.E. 523—Solid Mechanics I; and any two of the following three courses M.E. 701—Macroscopic Thermodynamics; M.E. 702—Statistical Thermodynamics; M.E. 703—Heat Transfer.

MATHEMATICS—PHYSICS OPTION

Physics 407-408—General Physics I and II; Physics 505-506—General Physics III and IV; and *either* Physics 701—Introduction to Quantum Mechanics, and Physics 702—Atomic and Nuclear Physics; *or* Physics 703-704—Electricity and Magnetism I and II.

Note: Physics 407-408 should be taken no later than the sophomore year.

Mechanical Engineering

William Mosberg, *Chairman*

Mechanical engineering is a challenging profession encompassing a broad spectrum of activity. It contributes to the 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 curriculum in mechanical engineering is designed to prepare the prospective graduate either for more advanced studies or for beginning a professional engineering career. To accomplish these objectives, the program of study provides a foundation in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Flexibility in the curriculum enables the student to gain competence in any of these specific areas, developing his abilities in analysis, experimentation, and engineering design. The curricula includes elective courses in the arts, the humanities, and the social sciences to provide a liberal education.

The program in mechanical engineering is further designed to develop the student's creative potential to enable him to meet the increasingly complex needs of industry, government, and education, while appreciating the role of technology in a modern society.

College of Technology

The student, with the assistance of his adviser, should plan a program based on the following distribution of courses which average 16 credit hours per semester but totaling not less than 130 credits.

The outline which follows is to be considered as being typical only in terms of format. Within the constraints of satisfying all of the requirements and having all necessary prerequisites, an individual student's schedule may vary from the following. Such variation will in general be caused by scheduling needs or student preference.

All elective courses will be chosen, in consultation with a departmental adviser, from courses which will lead to a balanced program in the student's chosen area of interest. The free electives are entirely the student's own choice and are without constraint.

FRESHMAN YEAR		FALL	SPRING
Engl. 401*	Freshman English (or "Free" elective)	4	
Chem. 405	General Chemistry	4	
Math. 427, 428	Calculus I and II	4	4
Physics 407-408	General Physics I and II	4	4
M.E. 441	Engineering Graphics		4
Elective (1)	Arts and Humanities or Social Science		4
		16	16
SOPHOMORE YEAR			
Math 528	Multidimensional Calculus		4
Math 527	Differential Equations	4	
M.E.	Courses to be specified	5	5
M.E. 523-524	Mechanics I and II	4	4
Electives (2)	Arts and Humanities or Social Science	4	4
		17	17
JUNIOR YEAR			
M.E. 503	Thermodynamics I	4	
M.E. 508	Fluid Dynamics		4
M.E. 561	Introduction to Materials Science	4	
Electives (2)	Electrical Science	4	4
Elective (1)	Technical		4
Electives (2)	Arts and Humanities or Social Science	4	4
		16	16
SENIOR YEAR			
Free Electives (2)		4	4
Technical Electives (5)		8	12
Elective (1)	Arts and Humanities or Social Science	4	
		16	16

* A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted on the basis of a written English proficiency examination.

Physics

John E. Mulhern, Jr., *Chairman*

Physics is concerned with the properties of matter and the laws which 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 diagnostic medical techniques, transistors, and air pollution 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 atomic spectroscopy using laser sources to astrophysical studies of the solar system using space probes. These experiences have proven very beneficial to engineering as well as physics students alike. The student-faculty ratio in Physics is quite low so that considerable faculty contact with students is encouraged. Strong efforts are being made to utilize the IBM 360 remote access terminals in undergraduate courses at all levels. The department also has its own library which provides a comfortable, inviting atmosphere for study and relaxed reading.

The suggested programs below 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 which might utilize the fundamental knowledge of physics.

The following undergraduate degree programs are offered through the Department of Physics.

Bachelor of Arts, Science Major, Physics Concentration

This is the most flexible degree offered by the Department. It is not designed to produce a professional physicist, but rather to provide an opportunity for interdisciplinary combinations with emphasis on physics.

Requirements:

1. University requirements must be satisfied (pages 22-23).
2. Requirements for the Bachelor of Arts degree must be satisfied (pages 76 and 77).
3. Physics requirements: six courses approved by the department.
4. Math requirements: 427, Calculus I, and 428, Calculus II.

College of Technology

5. Any three approved courses in science not used to satisfy other University requirements.

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 the student in a restricted area in physics in conjunction with other disciplines or other less technical applications in the field of physics.

Requirements:

1. University requirements must be satisfied (pages 22-23).
2. Requirements for the Bachelor of Arts degree must be satisfied (pages 76-77).
3. Physics 401-402 or 407-408; 505; 506. Note that Mathematics 427-428 are prerequisites for some of the courses.
4. Four additional courses in Physics approved by the department, any two of which must be at the 500 level or above.
5. Math requirements: 427, Calculus I, and 428, Calculus II.

Bachelor of Arts, Chemistry and Physics Teaching

Please see pages 83 and 84 for information.

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. University requirements must be satisfied (pages 22-23).
2. Requirements for the Bachelor of Science degree must be satisfied (page 75).
3. One course in English is required in addition to the University requirement.
4. Language Requirement: The student is strongly advised to demonstrate proficiency in French, German, or Russian.
5. Minimum Physics Requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 506, General Physics IV; 605, Experimental Physics I; 606, Experimental Physics II; 609, Experimental Physics III (normally taken senior year); 616, Physical Mechanics I (normally taken second semester sophomore year); 617, Physi-

cal Mechanics II; 701, Quantum Mechanics; and 703-704, Electricity and Magnetism I and II (should be taken in the junior year).

6. Additional Physics courses may be selected from the following: 510, Cosmology; 602, Thermal Physics; 607, Physical Optics; 610, Experimental Physics IV; 613-614, Special Topics; 695-696, Independent Study; and 702, Atomic and Nuclear Physics.

7. Chemistry: 403 and 404 or Chemistry 405.

8. Mathematics: 427-428, 527-528, plus two approved electives.

School of Health Studies

Basil J. F. Mott, *Dean*

Departments and Programs

Communication Disorders
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

Programs of Study

BACHELOR OF ARTS:
Communication Disorders*

BACHELOR OF SCIENCE:
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

*This program has recently been transferred from the College of Liberal Arts. It is anticipated that it will be revised and lead to a B.S. degree.

General Information

The School of Health Studies, which was established in 1968, is one of the newest academic components of the University. It was created in response to the growing need for programs of higher education that prepare young men and women for health and health-related careers. A major purpose of the School is development of the University's resources relating to the field of health. Currently the School offers undergraduate instruction leading to Bachelor of Science degrees in Medical Technology, Nursing, Occupational Therapy, Physical Education, and Recreation and Parks. The Communication Disorders program has recently been transferred from the College of Liberal Arts. It is anticipated that it will be revised from a B.A. to a B.S. degree. Each program has been designed to enable students to obtain a broad cultural background in the humanities and social sciences as well as basic knowledge and skills essential to the practice of their chosen professions.

Degree Requirements

Each candidate for a degree must satisfy all general University requirements for graduation as listed on pages 22-23, earn at least 128 credits, including the courses required in one of the curricula described below; and achieve a minimum grade-point average in his curriculum as prescribed. Generally, courses are to be completed in the sequence in which they are arranged.

An undergraduate student may select a major upon entering the school or declare a major in the school no later than the end of the sophomore year.

Minor Option

A minor may be earned in other undergraduate disciplines in the University contingent upon approval of both the major and minor departments. A minor consists of 20 credits, with C or better, in courses which the adviser in the minor discipline approves. No more than 8 credits used by the student to satisfy curriculum requirements in the major may be used for the minor. Courses taken on the Pass-Fail basis may not be used for a minor. The intention to earn a minor should be declared as early as possible and no later than the end of the junior year. During the final term application should be made to the Dean to have the minor shown on the transcript.

Dual Degree Programs

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, scholastic, and other requirements for each degree. It is expected five years of academic work

School of Health Studies

will be needed. A second degree may not be earned in the same or closely allied field. See page 25 for specific requirements.

If a student plans to take one of the two degrees in the College of Technology, he should register as a freshman in that College. Otherwise, he may register in any of the other Colleges or Schools. When a student is accepted as a two-degree candidate, supervisors for each major will be appointed. Students who wish to be in this program should confer with the appropriate dean(s) as early in their college careers as possible.

Student Designed Major

See page 124 for requirements for student designed major.

Communication Disorders

Communication Disorders is the profession devoted to helping people overcome disabilities of speech, language, or hearing. The undergraduate program in Communication Disorders is a pre-professional program. The first two years are spent broadening the student's cultural background and taking courses in psychology, sociology, biology, human development, and linguistics. Specialization in Communication Disorders begins in the junior year. Students learn about speech, language, and hearing disorders in the usual classroom setting and then become involved in clinical practice. This opportunity is provided in an on-campus clinic and in schools and community rehabilitation clinics off-campus.

A student's professional education should be continued at a college or university offering a graduate program leading to a master's degree and to subsequent certification by the American Speech and Hearing Association. Certified clinicians can find excellent employment opportunities in hospitals, schools, community speech and hearing clinics, or private practice.

Students in the Communication Disorders Program must: 1) complete a course in statistics, 2) obtain at least a C and two B's in their first three Communication Disorders courses, and 3) maintain a minimum 2.75 overall grade-point average. The required curriculum for majors in Communication Disorders consists of: 520, Survey of Communication Disorders; 521, Anatomy and Physiology of the Speech and Hearing Mechanism; 524, Applied Phonetics of American English; 631, Speech Pathology I; 632, Speech Pathology II; 634, Clinical Practice in Speech Pathology; 638, The Acquisition of Language; 704, Basic Audiology.

Students interested in this program should consult with the chairman, Dr. F. Harry Tokay.

Medical Technology

Medical Technology is a challenging and rewarding health profession for students interested in laboratory medicine. Working with pathologists and other physicians, the medical technologist is a vital member of the health team and performs various medical laboratory procedures and provides the diagnostic assistance required in modern patient care. The medical technologist may also become a member of a research team at medical or hospital centers.

Students who are interested in this field should register in the curriculum in medical technology. In this program students will take their freshman, sophomore, and junior years' work at the University and their last year's work at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. After satisfactorily completing the courses at the School of Medical Technology (Medical Technology 761-762), the student is awarded 32 credits toward the Bachelor of Science degree.

This program also qualifies the student for the examination for the medical technologist's certificate administered by the Registry of Medical Technologists of American Society of Clinical Pathologists. Thus, a student can obtain the B.S. degree from the University and the M.T. certificate in a four-year period. Students who complete this curriculum are well qualified for work in any hospital or medical laboratory.

Costs for the senior year include a University charge of \$800 and a maintenance charge of \$1,000 (includes room and board) at the Mary Hitchcock School of Medical Technology.

Students in the medical technology curriculum must obtain grades of C or better in 24 semester credits from the following courses: Zoology 507-508; Microbiology 503, 702, 705; Chemistry 517, 545; and Biochemistry 656.

Students interested in the curriculum in medical technology are advised to consult with the supervisor of the program.

FRESHMAN YEAR		FALL	SPRING
Engl. 401	Freshman English	4	
Zool. 507-508	Human Anatomy and Physiology	4	4
Chem. 403-404	General Chemistry	4	4
Math. 420	Fundamental Mathematics		4
Med. Tech. 401	Introduction to Medical Technology		0
*Electives (2)		4	4
		16	16

School of Health Studies

SOPHOMORE YEAR			
Microb. 503	General Microbiology	4	
Microb. 702	Pathogenic Microbiology		4
Chem. 517	Introductory Quantitative Analysis	4	
Chem. 545	Organic Chemistry		4
*Electives (4)		8	8
		16	16
JUNIOR YEAR			
Bio. Ch. 656	Physiological Chemistry and Nutrition		4
Microb. 705	Immunology and Serology	4	
*Electives (6)		12	12
		16	16
SENIOR YEAR			
Med. Tech. 761-762	Clinical Laboratory Methods†	16	16

* Students must select courses to satisfy the University general education requirements.

† This course starts about July 6, at the Mary Hitchcock Memorial Hospital School of Medical Technology and includes lecture and laboratory work in microbiology, blood bank and serology, clinical chemistry, hématology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. The credits are awarded in time for graduation in June of the following year after receipt of an official transcript of the grades obtained at the School of Medical Technology and certification by the director of this school and the supervisor of the curriculum that the work has been successfully completed.

Nursing

Professional nursing is a service which requires commitment to and accountability in assisting individuals or groups to attain, maintain, and accept their optimal health states and is an essential component of the total health system. The practice of professional nursing is an intellectual and interpersonal process which includes nursing assessment, nursing diagnosis, nursing intervention, and evaluation.

The professional nurse functions as an advocate for the client and as a member of the health team. She shares and may coordinate and lead in planning for, implementing, and evaluating the health care of individuals and groups.

Students in the B.S. program in nursing will receive preparation in professional education with an emphasis on the humanities and social, physical, biological, and nursing sciences. The student, upon completion of requirements, will receive a Bachelor of Science degree and will be eligible to take state board examinations to become a registered nurse. The program is accredited by the National League for Nursing.

Graduates of this baccalaureate program will be prepared to assume beginning positions in professional nursing and to pursue graduate study

Occupational Therapy

in nursing. Baccalaureate education is the minimum preparation for the practice of professional nursing.

Hospitals and many community health-related agencies are used for learning experiences. Students are responsible for their own transportation to the clinical laboratories as well as for purchase of uniforms to be worn there. A physical examination and selected immunizations, at student expense, are required within six months prior to the first clinical nursing course.

R.N.'s may receive academic credit for demonstrated knowledge through the mechanism of challenge examinations in both general and nursing education.

Individuals interested in the program may contact the chairman of the Department of Nursing.

A curriculum change is in process for the classes of 1977 and 1978 based on findings of a federally funded curriculum study initiated in 1971. For this reason, program information for the freshman and sophomore years is not included in the catalog but will be available through the department. The junior- and senior-year program, cited below, applies only to the classes of 1975 and 1976.

JUNIOR YEAR		FALL	SPRING
Nursing 601-602	Family Nursing	6	6
Nursing 603-604	Medical-Surgical Nursing	6	6
Elective		4	4
		<hr/>	<hr/>
		16	16
Nursing 621* or	Mental Health—Psychiatric Nursing	8	or 8
Nursing 631*	Community Nursing	8	or 8
Nursing 701-702	Contemporary Problems & Issues in Nursing Practice	4	4
Elective		4	4
		<hr/>	<hr/>
		16	16

*Students will register for Nursing 621 or Nursing 631 each semester.

Occupational Therapy

The occupational therapist is a professional member of the medical and community health-care team. Through a systematic application of a knowledge of human functioning and of functional activity, the occupational therapist assists in the prevention and correction of physical, social, and emotional disabilities.

The current curriculum was fully accredited in 1972 by the American Occupational Therapy Association and the Council on Medical Edu-

School of Health Studies

cation, American Medical Association. Two years of pre-professional study and two years of professional study constitute the prescribed program leading to the Bachelor of Science degree. The program includes theoretical studies in biological and medical sciences, in psycho-social science, in the evaluation of patient and activity, and in the planning and administration of treatment, as well as the development of practical skills in a wide range of therapeutic media. Preclinical observation and guided practice of patient treatment in local clinical situations are incorporated in the course requirements. Following completion of the four-year academic program, the student spends a minimum of nine months in supervised clinical practice. A certificate of completion of professional study is then awarded, and the student is certified as eligible to sit for the national registration examination.

Admission to the program is primarily at the freshman level. When enrollment permits, students may enter by declaration at the end of the freshman year or by transfer into the sophomore class.

A student must have achieved a 2.2 overall cumulative average by the end of the first semester, sophomore year. The student also must have completed two one-week preclinical experiences and have obtained a grade of C or better in Psych. 401, 545, 575; Zool. 507, 508; and OT 400, 412, and 510 by the end of the sophomore year in order to continue in the program.

Graduation requirements include participation in three one-week preclinical experiences, a 2.5 cumulative average in the courses prescribed in the major, and a grade of "C" or better in P.E. 606, 652; and OT 582, 583, 624, 633, and 634.

Upon satisfactory completion of the four-year degree program the department will schedule a minimum of nine months of supervised clinical practice for each student. These affiliations will be scheduled in centers which have established educational programs approved by this curriculum. The affiliations are divided in three-month periods as follows: OT 711, General Medicine, Surgery, and Pediatrics; OT 712, Psychiatry; OT 713, Physical Disabilities and Rehabilitation. Students pay the affiliation fee (resident \$95; non-resident \$200) and register for these affiliations prior to graduation. Owing to a scarcity of affiliation opportunities, the University will accept responsibility for scheduling affiliations only once for each student.

Students should be prepared to provide uniforms as required and to meet all living and traveling expenses during the affiliation period. At times the centers may provide maintenance but this cannot be assured. A physical examination with a tuberculin test is required prior to affiliating.

Eligible graduates make application for the June or January national registration examination through the department. A \$25 fee is

Occupational Therapy

charged by the American Occupational Therapy Association for this examination.

Students interested in this program are encouraged to consult the chairman of the department, Professor Ann Ury.

FRESHMAN YEAR		FALL	SPRING
Engl. 401	Freshman English	4	
Psych. 401	Introductory Psychology	4	
Psych. 575	Child Development		4
Electives (5)		8	12
		16	16
SOPHOMORE YEAR			
Soc. 500*	Social Psychology	4	
Zoo. 507-508	Human Anatomy and Physiology	4	4
O.T. 400	Pre-Clinical I	1	
O.T. 412	Activity Analysis		2
O.T. 510	Occupational Therapy Theory I		4
O.T. 531	Group Process	2	
Art 425*	Woodworking	4	
Psych. 545	Clinical Methods		4
Elective			2
		15	16
JUNIOR YEAR			
O.T. 515	Treatment Media	4	
O.T. 581	Introduction to Medical Concepts	4	
P.E. 652	Kinesiology	4	
O.T. 582	Developmental Concepts in Rehabilitation Medicine		4
O.T. 583	Occupational Therapy Theory II		4
O.T. 588	Pre-Clinical II		1
P.E. 606	Neurology		4
Electives (2)		4	4
		16	17
JUNE 1—AUGUST 30			
O.T. 711 or 712	First Affiliation		0
SENIOR YEAR			
O.T. (624)	Occupational Therapy Theory III —Psychosocial Treatment Methods	4	
O.T. 633	Occupational Therapy Theory IV	4	
O.T. 634	Occupational Therapy Theory V —Advanced Physical Disabilities		4
O.T. 698§	Senior Seminar		4
Art 419*	Weaving		2
Electives (GER)		8	6
		16	16

School of Health Studies

CLINICAL AFFILIATIONS

O.T. 711 or	General Medicine, Surgery, and Pediatrics	0	0
O.T. 712	Psychiatry	0	0
O.T. 713	Physical Disabilities and Rehabilitation	0	0

American Occupational Therapy Association
Registration Examination Last Friday of June.

* May be taken Pass-Fail.

§ Course extends over two semesters—grade being assigned at the end of the second semester.

Physical Education

The Department of Physical Education offers two programs of study for major students: the Non-Teacher Certification Degree Option and the Teacher Certification Program.

The Non-Teacher Certification Degree Option is designed for those students who are interested in pursuing intensive study in the art and science of human movement. It is assumed that students following this program will continue into graduate study. Students majoring in the option must earn a grade of C or better in each of eight courses (32 credits) in Physical Education; furthermore, students will be encouraged to develop a strong minor in a related discipline or collateral area.

The Teacher Certification Program is designed to provide individuals with a specialized professional background and a broad general education. A student may elect to pursue coursework to prepare as a generalist (all grade levels), or as either an elementary or secondary specialist in physical education. The program provides an opportunity for students to teach physical education, prior to graduation, under supervision in nearby schools. A cumulative grade-point average of 2.2 and a grade-point average of 2.5 in all physical education courses are required to be eligible for student teaching.

Students who wish to minor in Physical Education must complete 20 credits of coursework which have been approved by a Department minor adviser.

Students who are interested in either majoring or minoring in Physical Education should consult with the chairman of the department, Professor Robert Kertzer. The major curricula are open to those students who have been approved by the Department.

All students majoring in Physical Education must complete the following Core courses:

Physical Education

		CREDITS
P.E. 620	Physiology of Exercise	4
P.E. 625	Dynamics of Human Movement	4
P.E. 775	Perceptual Motor Learning	4

One of the following:

P.E. 633	Social Foundations of Sport and Physical Activity	4
P.E. 635	Contemporary Literature in the Socio-Cultural Aspects of Sport and Play	4
P.E. 637	An Ethological Theory of Play	4

During the freshman year, students interested in majoring in Physical Education should complete the following coursework:

FRESHMAN YEAR	FALL	SPRING
Engl. 401	4	
P.E. 481, 489; 498, (*)	1, 1	1, 1
P.E. 481, 479; 482, (*)	1, 1	1, 1
P.E. 500	4	
Psych. 401	4	
Soc. 400 or 411		4
Electives (2)		8

*One course from P.E. 445, 446, 447, 449, 520, 527.

Non-Teacher Certification Degree Option

In addition to the Core and the recommended freshman-year courses, students pursuing this program must complete the following required coursework as upperclassmen:

		CREDITS
P.E. 489-498 sequence	Physical Education Activities for Men	4
P.E. 479-488 sequence	Physical Education Activities for Women	4

One of the following:

Psych. 601	Statistics and Methodology in Psychology	4
Res. Econ. 701	Applied Statistics	4
Soc. 602	Statistics	4

One of the following:

P.E. 510	Medical Aspects of Sports and Physical Education	4
P.E. 540	Motor Efficiency and Impairment in Children and Adolescents	4
P.E. 780	Psychological Factors in Sport	4

Or, any course(s) in the Core not taken by the student to fulfill the Core requirements.

P.E. 696	Independent Study (To be taken in the senior year)	4
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School of Health Studies

Teacher Certification Program

In addition to the Core and the recommended freshman-year courses, students wishing to obtain public school teaching certification in Physical Education must complete the following required course-work as upperclassmen:

TEACHER PREPARATION COURSES		CREDITS
P.E. 489-498 sequence	Physical Education Activities for Men	6
P.E. 479-488 sequence	Physical Education Activities for Women	6
P.E. 668	Measurement Procedures in Physical Education	4

One of the following:

P.E. 563	The Theory of Teaching Physical Education in the Secondary School (required for the generalist and secondary specialist)	4
P.E. 692	The Theory of Teaching Physical Education in the Elementary School (required for generalist and elementary specialist)	4

One of the following:

H.E. 525	Human Development	4
P.E. 540	Motor Efficiency and Impairment in Children and Adolescents	4
Psych. 575	Development of the Normal and Exceptional Child	4

EDUCATION COURSES

H.E. 525 or	Human Development	4
Ed. 500 and	Exploring Teaching	4
Ed. 701	Human Learning and Development	4

STUDENT TEACHING SEMESTER

Ed. 700	Educational Structure and Change	4
Ed. 705	Alternative Perspectives on the Nature of Education	4
Ed. 694	Directed Teaching of Physical Education	6
P.E. 697	Senior Seminar on Physical Education	4

Recreation and Parks

The undergraduate program in Recreation and Parks prepares graduates for service in recreation administration and in park management. The courses of study in each area are designed to provide a base in the fundamentals of professional specialization and an exposure to the current leisure trends and needs of a rapidly changing economy and society.

Professional Curriculum Options

Professional options in Recreation Administration and Park Management are offered which lead to a Bachelor of Science degree in Recreation and Parks.

Interested students are advised to consult with Gus C. Zaso, chairman of the program.

Recreation Administration

This specialization is designed to identify and develop the abilities which will prepare the student for administrative and programming supervisory positions in the recreation fields. Students selecting this option are required to complete 128 credit hours for the degree.

FRESHMAN YEAR		FALL	SPRING
Pol. Sci. 401	Introduction to Political Science	4	
Biol. 402	Man and His Environment		4
Res. Econ. 401	Environmental and Resource Economics	4	
RP 455	Intro. to Recreation and Park Services	4	
RP 457	Dynamics of Leadership and Programming		4
Electives (3)	University Academic Requirements	4	8
		16	16
SOPHOMORE YEAR			
Micro. 501	Public Health and Sanitation	4	
Pol. Sci. 631	Local Government and Politics	4	
Pol. Sci. 630	State Government and Politics		4
Res. Econ. 507	Introduction to Community Problems	4	
RP Elective (1)	Recreation and Parks		4
Electives (3)	University Academic Requirements	4	8
		16	16
SUMMER			
RP 564	Field Work in Recreation and Park Services		8
			8
JUNIOR YEAR			
Adm. 517	Survey of Managerial Accounting	4	
Res. Econ. 508	Applied Community Development		4
RP 663	Recreation and Park Administration	4	
RP 667	Recreation Resource Planning	4	
RP Electives (2)	Recreation and Parks	4	4
Electives (2)	University Academic Requirements		8
		16	16

School of Health Studies

SENIOR YEAR

Pol. Sci. 731	Urban and Metropolitan Politics	4	
Pol. Sci. 730	Administrative Process		4
Res. Econ. 717	Law of Community and Regional Planning	4	
RP 671	Legal and Financial Aspects of Leisure Services		4
RP 698	Seminar in Leisure Problems, Trends, and Research		4
Elective (1)	University Academic Requirements	4	
		12	12

Park Management

This specialization is concerned with economics, planning, and supervision including the identification, acquisition and allocation, development, and maintenance of land and water resources for recreational purposes. Students selecting this option are required to complete 128 credit hours for the degree and are allowed very little flexibility in course electives.

FRESHMAN YEAR

		FALL	SPRING
Biol. 402	Man and His Environment		4
RP 455	Intro. to Recreation and Park Services	4	
Res. Econ. 401	Macro- and Environmental Economics	4	
RP 661	Recreation Resources Management		4
Electives (4)	University Academic Requirements	8	8
		12	16

SOPHOMORE YEAR

Micro 501	Public Health and Sanitation	4	
Plant Sci. 522	Environment and Plant Response		4
Civ. Eng. 501	Surveying	4	
Adm. 517	Survey of Managerial Accounting		4
RP Electives (2)	Recreation and Parks	4	4
Electives (2)	University Academic Requirements	4	4
		16	16

SUMMER

RP 564	Field Work in Recreation and Park Services		8
			8

JUNIOR YEAR

H.A. 655	Management for Transient, Leisure, and Indigent Services	4	
RP 663	Recreation and Park Administration	4	
RP 667	Recreation Resource Planning	4	
RP 668	Designing and Engineering Facilities and Areas for Recreation		4
INER 676	Economics of Water Use and Quality Management		4
INER 702	Natural Resources Policy		4
Electives (2)	University Academic Requirements	4	4
		16	16

Recreation and Parks

SENIOR YEAR			
INER 797	Forest Recreation Seminar	4	
Res. Econ. 795,796	Investigations in Resource Economics		4
Res. Econ. 706	Economics of Resource Development		4
RP 671	Legal and Financial Aspects of Leisure Services	4	
RP 698	Seminar in Leisure Problems, Trends, and Research		4
Elective (1)	University Academic Requirements	4	
		12	12

Whittemore School of Business and Economics

Jan E. Clee, *Dean*
Lawrence P. Cole, *Associate Dean*
John R. Haskell, *Assistant Dean*
Michael Kole, *Staff Associate*
Thomas McCarron, *Assistant to the Dean*
Donald A. Moore, *Director of*
Center for Industrial and
Institutional Development
Jeannette Rozene, *Undergraduate*
Counselor

Program Directors

ADMINISTRATION:

Donald Marschner, *Professor*

ECONOMICS:

Robert Puth, *Assistant Professor*

HOTEL ADMINISTRATION:

Mel Sandler, *Associate Professor*

Programs of Study

BACHELOR OF ARTS:
Economics

BACHELOR OF SCIENCE:
Administration
Hotel Administration

General Information

The Whittemore School of Business and Economics was established as a separate degree-granting school July 1, 1962.

The basic purpose of the School in its undergraduate curricula is to combine the breadth of liberal education with the depth of professional training in administration, economics, and hotel administration. Undergraduate students enrolled in Whittemore School programs are required to take a substantial part of their course work in other colleges of the University. In particular, students will be encouraged to elect courses in the social sciences, mathematics, the natural sciences, the arts, and the humanities. The student who completes the program in administration or economics will find that he is prepared for advanced study at the graduate level in these and related disciplines.

Another purpose of the School is to serve the needs of other undergraduate students in the University for whom selected courses in administration, economics, and hotel administration are essential or desirable for the completion of their various curricula. Hence, most Whittemore School courses are open to non-majors who have the necessary background.

Requirements for Degrees

The Whittemore School offers the degrees of Bachelor of Arts and Bachelor of Science. Students concentrating in economics will be candidates for the Bachelor of Arts degree, and students concentrating in the other curricula will be candidates for the degree of Bachelor of Science. Each candidate for a degree must satisfy the general education requirements and all other University requirements for graduation, and achieve a minimum grade-point average as prescribed by the individual programs.

The several curricula in the Whittemore School are subject to revision and modification from year to year. Students are subject to and responsible for such changes as they may be introduced. Entering students may anticipate, however, that a curriculum as presented, or as subsequently modified, will permit their graduation in four years, assuming that normal academic loads are carried and normal progress is made.

An undergraduate student entering the school will be required to declare a major not later than the end of the sophomore year. The new catalog becomes effective on July 1 of each year. For information concerning advanced degrees, see the Graduate School catalog.

Advising System

Undergraduate advising in the Whittemore School is carried out by an Undergraduate Counselor who is available in the Dean's office to assist students with program planning, pre-registration, academic requirements,

Whittemore School of Business and Economics

etc., and for counseling of a general academic nature, and by the faculty for course, program, and career counseling according to their own experience, expertise, and interests. In that connection, students are provided with a faculty profiles booklet which contains relevant information about each faculty member's professional background and current scholarly pursuits. This is intended to enable students and faculty to develop an advisory relationship according to their mutual interests. While faculty signatures are still required on some documents, most form-signing is done in the office of the Undergraduate Counselor.

Independent Study

A junior or senior student in the Whittemore School of Business and Economics may elect the opportunity for independent study. The credits allowed range from four semester hours for juniors to 12 semester hours for seniors. To be eligible, a student must ordinarily submit, prior to registration, a plan for independent study that has the approval of the adviser and the instructor involved to the Whittemore School Executive Committee for its information. The student pursuing an independent-study program must meet all general Whittemore School requirements. The student may petition to substitute independent-study credits in whole or in part for required-course credits in the economics curriculum or for elective credits in the hotel administration curriculum.

The student taking an independent study program will arrange for a member of the faculty in the area of interest to be the supervisor. It is expected that the program will normally take the form of an independent research paper, although programs calling for another form will be considered.

Learn and Earn Experiences

The Whittemore School provides juniors and seniors with some assistance in locating part-time and summer job opportunities that will enable students to sample the business and/or institutional world and to apply on the job what they are learning in the classroom.

Minor Program

A minor is not required in the economics, administration, and hotel administration curricula. A student in any one of three curricula may, however, apply for permission to pursue a minor program of study in any discipline in which sufficient courses are offered at the University. Permission to participate in a minor program may be granted only by the Executive Committee of the Whittemore School with the concurrence of the particular department involved. Consideration shall be given to the student's major area of concentration and proposed minor before granting such permission. Successful completion of such a program is recorded on a student's academic transcript.

Administration Program

A minor shall comprise at least 20 semester hours with grades of C or better in courses which count for major credit in the department in which the minor is to be earned. No more than eight credits used to satisfy major requirements shall count toward a minor. Courses counting toward a minor may not be taken on a Pass/Fail basis.

Student Designed Major

See page 124 for requirements for student designed major.

Dual Major Option

A student may petition to earn two majors in any disciplines awarding the Bachelor of Arts degree. No more than eight credits used to satisfy requirements for one major may be used for the other. A student should declare the intent to earn two majors as early as possible and no later than the end of the junior year, and should plan the program in consultation with advisers from both majors.

Dual Degree Programs

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, college, scholastic, and other requirements. Anyone interested in such a program of study should confer with the deans of the colleges in which the degrees are to be earned as early in an academic career as possible and, if approved for the program, should expect to work closely with faculty advisers from the college involved. See page 25 for requirements.

Administration Program

The Administration Program prepares young men and women for managerial or administrative careers in business or in public or private institutions.

Since most graduates of the Program elect to embark upon business careers, the major thrust 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 considerably to include all types of administration, rather than business only.

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, the typi-

Whittemore School of Business and Economics

cal student achieves a well-rounded education by selecting courses in the liberal arts and the sciences from other colleges and schools in the University.

All students enrolled in the program must complete a five-course core of basic administrative tools and skills. Most students will then go on to take three prescribed courses in functional areas and two elective courses from administration or economics. Some students, however, will be permitted to fulfill the requirements of the program by building on to the core a specially designed package of five courses which suit the individual's needs and which may include only one or none of the functional area courses. Such a proposal needs the approval of the Administration Program Director. In either case, a student must achieve a grade-point average of at least 2.0 in the program in order to graduate. Transfer students must complete at least five courses toward the administration major while at UNH. In addition, credit toward the administration major is not normally given for upper-level courses in this Program which are taken at the first- or second-year-level elsewhere.

An internship is available to a limited number of seniors in their final semester who can obtain a faculty sponsor for an out-of-class project which involves a private firm or institution and a non-routine work experience. More information about this for-credit opportunity may be had from the Undergraduate Counselor.

Students not majoring or minoring in administration are encouraged to consider courses in accounting, organizational behavior, finance, marketing, production, etc. as relevant supplements to their own program of study. Advice concerning courses appropriate to various career goals may be obtained from members of the Administration faculty.

A suggested plan of study is given below:

FRESHMAN AND SOPHOMORE YEARS

Economics 402, Principles of Economics (Micro)

Administration 411, Behavior in Organizations

Administration 424, Quantitative Analysis

Administration 502, Financial Accounting

JUNIOR AND SENIOR YEARS

Administration 650, Operations Management

Administration 651, Marketing

Administration 653, Financial Management

Administration and/or Economics electives (2)

SEMESTER II—SENIOR YEAR

Administration 700, Management Policy

A minor in administration is available to students in the arts and sciences and in technical or professional programs who may want to become managers or administrators in their own fields, or who want to generally enhance their employability. The minor in administration

consists of: Economics 402, or in some cases, Economics 401, but not both; Administration 411 or 424; and Administration 502 or 517, but not both; and two electives.

For more information about the minor, see the WSBE Undergraduate Counselor.

Economics

Economics is the study of the allocation of scarce resources among competing uses. Such allocation may be accomplished by conscious public policy or by impersonal market forces. Among other things, economic analysis enables the policymaker to select the most efficient method of allocation consistent with the goals of society. The purpose of the Economics program is to introduce the student to the tools of economic analysis with application to a variety of areas and problems.

Undergraduate training in economics does not qualify a student as a professional economist, so those students who intend to become economists should plan on doing graduate work in the discipline. Nevertheless, undergraduate training in economics does provide an excellent background for graduate work not only in economics but in related disciplines, such as business administration, political science, and law and for employment in business and government service.

Students planning to pursue graduate study in economics should consult with their advisers early in their academic program. This consultation should facilitate entrance into graduate school.

Courses in economics, including a minor program, are open to non-majors. Students in other disciplines may find certain economics courses useful complements to their own programs. Political science majors, for example, may be interested in Economic Development, Comparative Study of Economic Systems, Public Finance, and Government Regulation of Business. Technology students should find Statistical Theory, Introduction to Econometrics, and Statistical Decision Making beneficial in their own career preparation. Non-economics majors with questions about the nature of various courses should feel free to seek answers from members of the Economics faculty.

Economics majors must complete seven full courses in economics with a grade point average of 2.0 or better. Moreover, the intermediate theory courses at the core of the program, namely Economics 605 and 611, must be passed with at least a grade of "C." Major credit towards Economics 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 seven economics courses at UNH.) All Economics

Whittemore School of Business and Economics

majors must satisfy the foreign language proficiency requirements established by the College of Liberal Arts for all Bachelor of Arts candidates (page 33).

A suggested plan of study for the economics major is given below:

FRESHMAN AND SOPHOMORE YEAR

Economics 401, 402, Principles of Economics
Mathematics 416, Mathematics for Business and Economics
Economics 525, Introduction to Economic Statistics

JUNIOR YEAR

Economics 605, Intermediate Economic Analysis
Economics 611, National Income Analysis

SENIOR YEAR

Economics electives (2)

A minor in economics consists of: Economics 401, 402; Economics 605 or 611; and Two economics electives.

Hotel Administration

The objective of the Hotel Administration program is to prepare students to perform in managerial-level jobs in enterprises and institutions of the services sector of the economy which have major food service and lodging components.

The services sector includes lodging, food service, tourism and recreation industries, and institutions such as hospitals and schools.

In addition to the general education requirements of the University, students receive an extensive foundation in administration and economics. The Hotel Administration courses complement coursework in these areas to provide the specialized knowledge needed for effective performance as managers.

Experience in and exposure to the services industry is provided by the following requirements:

1. One summer, or the equivalent, of approved on-the-job experience. A variety of work is desirable which should include experience in quantity food preparation.
2. Projects and work-observation periods in operations as an integral part of the courses in Lodging and Food Service and Institutional Management, Management of Physical Structures, and Markets and Promotion of Public Services.
3. Planning, marketing, preparation, and service of large-scale gourmet dinners as part of the course Functional Management.
4. Attendance at a series of lectures by representatives of service-sector businesses and institutions.

Hotel Administration

Students in the hotel administration program must obtain a grade point average of 2.0 or better in the required courses given in the Whittemore School. A graduate of this program, who is qualified for and interested in further allied studies, is well prepared for advanced degree programs in business or institutional administration.

A suggested plan of study is given below:

FRESHMAN YEAR

Hotel Administration 403, Elements of Institutional Administration
Administration 411, Behavior in Organizations
Economics 402, Principles of Economics (Micro)

SOPHOMORE YEAR

Administration 424, Quantitative Analysis
Administration 517, Survey of Managerial Accounting
Hotel Administration 518, Financial Analysis and Control
Hotel Administration 556, Management of Physical Structures

JUNIOR YEAR

Administration 651, Marketing
Hotel Administration 655, Lodging, Food Service, & Institutional Management

SENIOR YEAR

Hotel Administration 667, Functional Management
Hotel Administration 666, Markets & Promotion of Public Service

Pre-Professional, Interdisciplinary, and Experimental Programs

The Teaching/Learning Council established by the University Senate with financial support from the Danforth Foundation is charged with encouragement of excellence and innovation in undergraduate teaching. To this end, the Council is exploring many approaches—colloquia, videotape equipment, teaching awards, and so on—which may lead to improvement in teaching. In cooperation with the Teaching/Learning Committee in each of the University's colleges, the Council supports development of new approaches to teaching in existing or new courses, and promotes development of experimental and interdisciplinary courses and programs by faculty members and other qualified persons.

Courses under Council sponsorship are normally offered for one semester, though some have been repeated. The Independent Work Study courses described below are a continuing offering.

Independent Work-Study, Inter-College, 598 (off-campus), 599 (on-campus). These courses are for students who wish to pursue a semester of independent study in disciplines not within the purview of a particular department. Students select the problem area in which they wish to work, create their own bibliography for reflection, and find their own channels to actively pursue the problem. Students must write a proposal identifying the manner in which they intend to pursue the study and obtain the sponsorship of a faculty member. The proposal should be submitted to the Teaching/Learning Committee of the appropriate college, via the college office. For information, please consult Dr. Phyllis Forbes, Assistant to the Vice-Provost of Academic Affairs, Thompson Hall, and Dr. Arthur C. Borror, Room 203, Spaulding Building, chairman of the Teaching/Learning Council. 4 to 16 credits.

The Student Designed Major

Under special circumstances a student may design his own major. This option is offered in response to the highly motivated and independently disciplined student who wishes a course of study which is not available through existing programs at the University. It allows the student, with the close supervision of a faculty member, to cross

Interdisciplinary and Experimental Programs

department and college lines, and to create individual educational experiences on and off campus as part of his program.

The program is administered by a committee of elected faculty which operates through the Office of the Vice Provost for Academic Affairs. Students who want to design their own major are expected to give the committee evidence of careful thought and planning in a detailed proposal. Guidelines for this proposal are available in the Office of the Vice Provost for Academic Affairs.

Pre-Law

Students who intend to apply for admission to law school are not required to follow a specific undergraduate curriculum. There are goals which the student ought to pursue in the planning of the undergraduate experience. Law schools expect the student to follow a program of study which develops breadth of view, facility of expression, and analytical capacity. They urge the student to acquire a background of information concerning the society in which one lives, and the forces which have shaped modern institutions. The competent use and understanding of the English language in writing and speaking are essential achievements for those who plan to attend law school.

Students should choose courses of study which allow them to develop the capacities specified. Specific course selection can be discussed individually by student and adviser, but some general guidelines may be offered. Helpful courses are those which develop skill in written and oral expression and those which deal with man's political, economic, and analytical thinking and provide an understanding of the human mind.

Students who hope to enter law school should contact a member of the University Pre-Law Committee to discuss courses of study, and other matters related to admission to law school. Those who are considering taking the Law School Admission Test should schedule the examination in October or December of the senior year, and should discuss the examination with a member of the Pre-Law Committee before undertaking it. Members of the Pre-Law Committee are: Lawrence W. O'Connell, chairman, Political Science Department, Richard V. Desrochers, Spanish and Classics, John R. Kayser, Political Science, and Samuel R. Reid, Whittemore School of Business and Economics.

Premedical-predental Program

Students considering a career in medicine or dentistry should become familiar with the minimum course requirements as early as possible, so that specific courses needed for application to medical and dental schools can be incorporated into their programs. The premedical-predental option is not a major with a rigidly prescribed curriculum; rather, it is the acknowledgment of a student's professional in-

Interdisciplinary and Experimental Programs

tion. Although a majority of students in the past have elected zoology as a major, there is a trend, particularly in premedicine, away from exclusive concentration in a single area of science. In recent years students from UNH have chosen to major not only in sciences such as zoology, microbiology, biochemistry, and chemistry but also in such fields as history, English, psychology, and political science.

Each student will choose a major subject based on his own interests and aptitude and will be assigned an appropriate faculty adviser from that department or school. The responsibility of the Premedical-Pre dental Advisory Committee is to offer information about medical and dental admission requirements and procedures and to provide 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 in order that a student may be considered for admission: biological sciences, physics, general chemistry, and organic chemistry, all two semesters each with laboratory; and mathematics through calculus. Proficiency in English and a foreign language is strongly recommended. An appropriate group of courses from among the offerings at the University of New Hampshire would be the following: Zoology 412, 518; Physics 401-402 (or 407-408); Chemistry 403-404 and 651-652; and Mathematics 427, 428. Some dental schools require a semester of quantitative analysis (Chemistry 517) and are less demanding about a mathematics requirement.

Courses which qualify an individual for consideration as a premedical or pre dental student should be completed by the time the application to a professional school is submitted, usually at the end of the junior year. Inasmuch as the 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 option.

Interested students should enroll with Professor Paul R. Jones, Chemistry Department, chairman of the Premedical-Pre dental Advisory Committee, as early as possible.

Genetics

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. For courses offered in the Program, some of which may be taken by the undergraduate, refer to the Graduate Catalog. Undergraduates interested in preparing for graduate work in Genetics at UNH or elsewhere should contact the Chairman of the Genetics Program early in their undergraduate program for advice on courses which will aid in this preparation.

Interdisciplinary and Experimental Programs

International and Foreign Area Studies Minor

This minor is designed to meet the needs of students who wish to pursue their studies with an international or an area focus. It provides an interdisciplinary support for the student's major interest. Students interested in this minor should consult the minor requirements in their respective colleges. The program will be administered by an International Studies Minor Supervisor.

A minor in International and Foreign Area Studies consists of 20 credits (normally five courses) and knowledge of a foreign language. Courses which may be applied toward this minor are listed in the Bulletin for International and Foreign Area Studies Minors available from the International Studies Minor Supervisor. For approval of the minor the student must meet the following requirements:

1. Complete a minimum of one and a maximum of two courses from a list of general international courses.

2. Select a foreign area from among the six offered (Asia, West Europe, Soviet and East Europe, Africa and the Middle East, Canada, Latin America) and complete a minimum of three and a maximum of four courses from among those listed for that area.

3. Demonstrate knowledge of a foreign language relevant to the selected geographic area. This requirement will ordinarily be met by either:

a. Successful completion of the following courses in a language relevant to the area: Dutch (see c below); French 504, 506, or 514; German 502 or 508; Italian 504; Portuguese (see c below); Russian 502; or Spanish 504.

b. Successful completion of courses taught in the relevant language above the level of the courses listed in "a."

c. Certification by the language department concerned. Students who select an area in which no relevant language is currently being offered or students with a knowledge of a foreign language not offered in University language programs should contact the International Studies Minor Supervisor.

4. No more than two courses from any one department may be applied toward the minor.

5. With approval of the International Studies Minor Supervisor, courses taken during the junior year abroad (Salzburg, Austria; Dijon, France; or Valencia, Spain) can be counted towards the minor.

For further information students may contact: Professor B. Thomas Trout, Department of Political Science, International Studies Minor Supervisor.

Interdisciplinary and Experimental Programs

Computer Courses

The University has an IBM 360/50 computer with a number of teletype terminals located around the campus. Many science and engineering courses involve assignments which the student is expected to work out on the computer.

The Electrical Engineering Department offers courses and an option in computer design (page 91) and the Mathematics Department offers courses in programming and numerical analysis. There is an interdisciplinary major in Mathematics-Computer Science described on page 96 of this catalog.

Oceanography and Ocean Engineering at the University

The coastal waters of the Atlantic Ocean and the nearby Great Bay estuary system form a natural and versatile setting for oceanographic study and research at the University. Biological, chemical, geological, and physical oceanography as well as ocean engineering constitute the major areas in which intensive work in the oceans is going on. Supporting facilities include the Jackson Estuarine Laboratory, the Shoals Marine Laboratory, the Engineering Design and Analysis Laboratory (EDAL), the research vessel, "Jere A. Chase," as well as several smaller boats.

OCEANOGRAPHY

Students who wish to prepare themselves for a career in oceanography should be well founded in the basic sciences. As a minimum, they should elect Chemistry 403-404, Mathematics 427-428, and Physics 407-408. Students should also enroll as a major in one of the established science disciplines closest to his principal area of interest. Those students interested in chemical, geological, or physical oceanography should consult with Dr. Franz E. Anderson or Dr. Theodore Loder in the Department of Earth Sciences. Students with interests in the area of the Biological oceanography should contact Dr. Philip J. Sawyer in the Department of Zoology, Dr. Arthur C. Mathieson in the Department of Botany, or Dr. Galen E. Jones in the Department of Microbiology. Usually additional work at the graduate level is necessary in the field of oceanography.

In addition to the courses necessary to attain a degree in a specific discipline, students should, in consultation with their advisers, consider some of the following courses which are available to undergraduates: 1) Botany: Introduction to Phytoplankton Ecology and Marine Botany, and Marine Algology Ecology; 2) Earth Sciences: Introduction to Oceanography, Geological Oceanography, Physical Oceanography, Mineralogy of Clays, Principles of Geochemistry, Chemical Oceanography, Sedimentation-Stratigraphy, Estuarine and Marine Sedimentation, Applied Geophysics; 3) Microbiology: Public Health and Sanitation, General Microbiology, Environmental Microbiology, Marine Microbiology, and

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Microbial Biogeochemistry; and 4) Zoology: Principles of Zoology, Ornithology, Principles in Genetics, Introductory Invertebrate Zoology, Comparative Endocrinology, Natural History of Cold-Blooded Vertebrates, Animal Behavior, Natural History of Marine Invertebrates (summer only), Marine Parasitology, Histology and Microtechnique, Fisheries Biology, Introduction to Marine Science (offered at the Isles of Shoals during summer only), and Principles of Ecology.

COOPERATIVE EDUCATIONAL PROGRAMS IN MARINE SCIENCE

Two cooperative programs in marine science are offered entitled "An Introduction to Marine Science."

One program is a cooperative summer offering with Cornell University and the State University of New York. It is a general introduction to marine science, aimed primarily at undergraduates, drawing on the professional backgrounds of more than twenty-five faculty and nearly as many, captains, fishermen, and others whose living is associated with the sea. Prerequisite: at least one full year of college biology. Daily lectures, laboratory, and field work are taught on the Isles of Shoals. No formal examinations; grades are P or F; (pass or fail). The program meets in June, July, and August. Zoology 774: Introduction to Marine Science, 5 credits. For further information please contact Dr. John Kingsbury, Cornell University, Room 204, Plant Science Building, Ithaca, N.Y. 14850, or Director of the Jackson Estuarine Laboratory at UNH.

The second program is a multidisciplinary, team-taught course under the auspices of the New Hampshire College and University Council. Topics and units include: physical, geological, and chemical oceanography; biological oceanography, marine phycology; marine invertebrates; and field trips. Prerequisite: approval of the campus representative of the Marine Science Committee of the New Hampshire College and University Council. Fall and spring semester courses. The course meets on Saturdays only.

Earth Science 403, 4 credits. A summer course is offered for the more advanced student and has included courses in marine chemistry, marine botany, marine geology, etc., in the past. A student must take two courses offered simultaneously during a six-week summer session held off campus. Tuition scholarships may be available. Earth Science 603, 8 credits.

The campus representative for these courses is Dr. Theodore Loder.

OCEAN ENGINEERING

Study and research in the application of engineering to ocean exploration and exploitation are centered in the Engineering Design and Analysis Laboratory (EDAL). EDAL is an interdisciplinary faculty group, mainly from the College of Technology. Early in its history,

Interdisciplinary and Experimental Programs

this group chose to make ocean-oriented engineering its principal, but not exclusive, interest. The stated purpose of EDAL is to involve both faculty and students in realistic and challenging engineering projects. In projects, thus far accomplished, EDAL-associated faculty and students have participated in advanced ocean-oriented engineering.

An Ocean Engineering Minor Program is available to undergraduate students. Students who elect this program are given suitable recognition on their transcripts. Additionally, undergraduates who wish to become more intensely involved in ocean engineering activities, may do so by associating themselves with professors and graduate students who are engaged in ocean projects.

Information on the Ocean Engineering Minor Program is given on page 77 of this catalog.

Consortium (NHCUC) Student Exchange Program

Under the Student Exchange Program of the New Hampshire College and University Council (NHCUC), UNH students may 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. NHCUC schools include: Colby College of New Hampshire, Franklin Pierce College, Mt. Saint Mary College, New England College and its Arundel Branch in England (limited enrollment), Notre Dame College, Rivier College, St. Anselm's College, and UNH (Durham, Keene, Plymouth). 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 Kathy Forbes, assistant to the registrar, Thompson Hall (862-1502) or Nancy Deane, assistant dean, College of Liberal Arts, Murkland Hall (862-2062), the UNH-Durham Consortium representative.

Associate in Arts Degree

The Associate in Arts degree gives students an opportunity to obtain a general, two-year college education; elect career-training course work in several fields; and earn college credits in supervised work experience with cooperating employers.

The Division of Continuing Education designed the program to be equally accessible to both full- and part-time students. In doing so, the Division assures a wide range of University credit courses available during the late afternoon and early evening hours and during the daytime.

For full-time A.A. students, cooperative field work can mean alternating semesters of full-time study and full-time employment (with pay) in one of several careers. For part-time students who already hold full-time positions, it can mean an opportunity for new on-the-job experiences for college credit. Each field experience is arranged by the Division's career option coordinator on an individual basis, depending on the needs of the student and the requirements of the employer.

The Associate in Arts degree can be complete in itself, or it can be a half-way mark toward a bachelor's degree. Credits earned as an A.A. degree candidate are transferable into bachelor's degree programs at the University of New Hampshire and other colleges and universities.

Degree Options

Within the Associate in Arts degree program, students may elect course work in one or more of the following concentrations:

General Studies: The general studies option gives students maximum flexibility in obtaining educational goals within the Associate in Arts degree program. After completing the general education requirements, the student may complete degree requirements in liberal arts subjects and obtain a broad, general education. Or the student may elect a variety of career-training courses to meet individual needs.

Accounting: Accounting is the second largest profession for men in the United States today, and in recent years many women have also taken advantage of the career opportunities in the field. Increasing government regulations—ranging from new tax laws to wage and price controls—require the expertise of a greater number of qualified accountants and auditors. This career option, offered in cooperation with New Hampshire

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College Portsmouth Center, provides students with the degree of specialization required to qualify for responsible jobs in accounting and will aid them in pursuing a more advanced degree at a later time in their careers. Accounting courses: Adm. 502, Adm. 503, C.E. 460, C.E. 506, and selected courses from New Hampshire College.

Banking: The career course work in the banking option meets a need expressed by top-level banking management and associations for employees specifically trained in this field. Combined with the general education requirements of the A.A. degree program, these core courses give the student the knowledge and skills which top management is continually seeking. Students can supplement money-and-banking courses with electives in management, business law, accounting, and economics to obtain a solid business background. Banking courses: C.E. 440, C.E. 441, C.E. 540, C.E. 541, and C.E. 506.

Criminal Justice: A career in criminal justice is one of the most challenging occupations for men and women today. The orderly processes of the law make it possible for Americans to live in harmony and enjoy the personal freedom established under the Constitution. Careers in criminal justice extend beyond the "police beat." There are, for example, positions in various agencies of law enforcement at the municipal, county, state, and federal levels of government, and in private industry. This career option is offered in cooperation with the Department of Criminal Justice at St. Anselm's College. Criminal Justice courses: C.E. 550, C.E. 551, C.E. 552, C.E. 506, Pol. Sci. 635, and selected courses from St. Anselm's College.

Health Care Administration: The demand for trained health-care administrators is growing rapidly because of the increase in number and size of health care facilities. A.A. degree graduates in this concentration can expect to find jobs at the assistant administrator level in nursing homes, hospital business offices or related departments, group-practice clinics, health related associations and agencies, and comprehensive health planning agencies. Health care training is divided into two phases. First, the student must complete a satisfactory academic program, then serve an internship under qualified administrative supervision in a health care agency. Health Care Administration courses: C.E. 500, C.E. 501, C.E. 502, C.E. 503, C.E. 430, C.E. 431, and C.E. 506.

Insurance: The core courses in the insurance option can assist students who wish to qualify for an agent's and/or broker's license. A.A. graduates who complete the insurance option may find a higher level of job entry and increased promotional opportunities with both large and small insurance firms. This career option may also be supplemented with electives in management to offer a solid educational background for the

individuals planning to start their own businesses. Insurance courses: C.E. 420, C.E. 421, C.E. 422. and C.E. 506.

Library Science: Through basic courses in library services this career option trains the library technician to support the professional librarian. Employment opportunities for library technicians exist at public, school, and college libraries, and at specialized libraries maintained by commercial and industrial firms, government agencies, and other organizations and institutions. Students may enroll in up to two semesters of elective library work for eight credits in supervised on-the-job training. This option is offered in cooperation with the University's Merrimack Valley Branch. Library Science courses: (MVB) L.S. 401, L.S. 402, L.S. 403, L.S. 501, L.S. 502, L.S. 503, and practicum.

Management: Careers in management exist at many levels and this career option is designed to assist students gain entry and promotional opportunities in the field. The career-training course work emphasizes and develops the skills needed in management functions. Competent personnel at the assistant managerial level will continue to be needed for business, sales, purchasing, personnel, accounting, and public relations, to name a few. Individuals now planning or running their own business will also find the practical emphasis of this career option very helpful. Management courses: C.E. 430, C.E. 431, C.E. 530, C.E. 531, C.E. 532, and C.E. 506.

Merchandising: Careers in merchandising represent a significant segment of New Hampshire's economy and many functions within the field require specific knowledge and skills. The career training course work in merchandising begins with the fundamentals and expands to specific techniques in promotion and advertising, retailing, and credit management. Employment opportunities exist not only in large industries but also in department stores, retail operations, discount stores, supermarkets, mail order operations, and smaller variety stores in the resort areas. Merchandising courses: C.E. 410, C.E. 411, C.E. 510, C.E. 511, and C.E. 506.

Real Estate: The career training course work in the real estate option can help students who wish to qualify for a state license. A.A. graduates who concentrate on the real estate option may often find a higher level job entry and increased promotional opportunities with both large and small real estate firms. Supplemented with elective courses in management, this option can also offer a solid educational background for the individual planning to establish a business. Real Estate courses: C.E. 425, C.E. 426, C.E. 427, and C.E. 506.

Recreation and Parks: Careers in recreation and parks may be found in municipal, industrial, and church recreational programs; with

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state and federal agencies; in camping and outdoor education; with youth agencies; and on college and university campuses. After completing the A.A. degree, students may continue study toward a bachelor's degree at the University of New Hampshire in Recreation Administration or in Park Management. This career option is offered in cooperation with the Merrimack Valley Branch. Courses R&P 454, R&P 455, R&P 457, R&P 564, R&P 643, R&P 644, and R&P 661.

Secretarial Studies: Secretarial skills will always be in demand for business, industry, government, and education. This career option trains the prospective secretary in the advanced skills necessary to compete successfully. In addition the general education offered in the Associate in Arts degree program will help the secretary work more efficiently as an administrative assistant with competent understanding of current business, social, and cultural problems. A.A. graduates in this career option may enter the secretarial profession or pursue a higher degree at a four-year college of business. This option is offered in cooperation with McIntosh College in Dover. Secretarial courses: Sec. 401-402, 407-408, C.E. 506, and selected courses from McIntosh College.

Admissions Requirements

For the Associate in Arts degree program, the University accepts candidates who have demonstrated ability and motivation for learning 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 New Hampshire residents.

Associate in Arts degree graduates 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 assure that their planned programs meet the specific requirements for the selected major at the college or university awarding the bachelor's degree.

Applications for admission may be obtained from the Office of Admissions, Thompson Hall. After being admitted to the A.A. degree program, candidates will be referred to a permanent adviser in the Office of Academic Counseling, Division of Continuing Education.

Degree Requirements

1. The completion of 64 credit hours with a minimum grade-point average of 2.0 based on a 4.0 scale.
2. General education requirements:
 - a. English 401 or its equivalent
 - b. A minimum of three courses of at least three credits each in sci-

ences or mathematics, chosen from applicable 400- or 500-level courses (or, by petition, chosen from 600-level and 700-level courses) from the following departments or programs:

Animal Science	Health Studies
Biochemistry	Institute of Natural
Biology	and Environmental Resources
Botany	Mathematics
Chemical Engineering	Mechanical Engineering
Chemistry	Microbiology
Civil Engineering	Physics
Earth Sciences	Plant Pathology
Electrical Engineering	Plant Science
Entomology	Technology
Genetics	Zoology

c. A minimum of two courses of at least three credits each in the arts or humanities, chosen from applicable 400- and 500-level courses (or, by petition, chosen from 600- and 700-level courses) from the following departments or programs:

Arts	Music
English	Philosophy
French and Italian	Spanish and Classics
German and Russian	Speech and Drama
Humanities	

d. A minimum of three courses of at least three credits each in the social sciences, chosen from applicable 400- and 500-level courses (or, by petition, chosen from 600- and 700-level courses) from the following departments or programs:

Administration	Home Economics
Economics	Political Science
Education	Psychology
Geography	Sociology and Anthropology
History	

3. The remaining courses or credits may be earned in career option and/or elective general education courses.

4. The last 16 hours of credit must be completed through the Division of Continuing Education at UNH unless permission is granted to transfer part of this work from another institution.

Academic Regulations

Associate in Arts degree candidates are subject to the academic requirements established by the University.

Pass-Fail: While earning an Associate in Arts degree, the pass-fail option for grading may be carried in a maximum of two courses outside the courses required in the student's chosen career option. To utilize this option, an associate degree candidate must have completed a minimum

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of 16 credits at the University of New Hampshire on a regular graded basis of A to F.

Financial Aid

Guidelines are being developed to expand the financial aid opportunities for Associate in Arts degree candidates. For information on grants, scholarships, loans, and college work-study, contact the Division's academic counselors.

A.A. students who do not qualify under the University financial aid regulations may still be considered for Division of Continuing Education grants, on the basis of demonstrated financial need. See page 140.

Career Training Courses

The courses which constitute the core of the career options are drawn from: existing courses of the schools and colleges at the University, courses developed and sponsored by the Division of Continuing Education and the Merrimack Valley Branch, and specialized courses offered by cooperating institutions of higher learning.

Because these career-training courses have different "homes," they are listed in different sections in the back of this catalog. Courses designated by C.E. are listed under Division of Continuing Education (90); courses designated MVB are listed under Merrimack Valley Branch (91); Adm. courses are listed under Administration (30); R&P courses under Recreation and Parks (41); and Sec. courses under Secretarial Studies (33).

For information on courses offered by cooperating institutions, contact the Division of Continuing Education Office.

Counseling and Tutoring

Program planning and other counseling services are provided by the professional staff of the Division. Academic counselors are available from 8 a.m. to 5 p.m. daily and during evening hours on an appointment basis.

Tutoring services are also available for Division of Continuing Education students, including veterans under the provisions of the GI Bill.

For More Information

For further information on any of the Division's programs, write or visit the Division of Continuing Education, University of New Hampshire, Durham, N.H. 03824. (603-862-2015).

The Thompson School of Applied Science

Lewis Roberts, *Director*

The Thompson School of Applied Science offers two-year, technical-level programs leading to an Associate in Applied Science degree. Instruction, a "learning-by-doing" educational approach, trains graduates for employment as technicians, professional assistants, supervisors, and mid-management personnel in industry, organizations, and agencies.

Programs currently offered include: 1) Applied Animal Science, 2) Applied Business Management, 3) Applied Plant Science, 4) Civil Technology, 5) Food Services Management, and 6) Forest Technology.

Thompson School graduates will have the necessary skills and experience to obtain satisfactory employment at the end of two years; they also have the option to continue their education at the baccalaureate level. Most colleges accept Thompson School graduates at the junior-year level. Others, including most UNH baccalaureate programs, accept Thompson School graduates as second-semester sophomores.

Thompson School students are eligible for on-campus housing.

Admission Requirements

High school graduates are not required to be in the upper two-fifths of their graduating class. However, prospective students who lack real interest in the work covered by a particular curriculum, or who are unwilling to practice the necessary self-discipline required for satisfactory progress, should do some serious self-evaluation before deciding to apply.

High school applicants must take the College Board Scholastic Aptitude Test during their senior year. Applicants not high school graduates must be 18 years of age, have a minimum of two years of high school or its equivalent, and be able to demonstrate through aptitude tests their ability to handle course work. Applicants wanting to prepare for careers as Forest or Civil Technicians must present two years of college preparatory mathematics for admission.

For a Thompson School catalog and/or specific information write or call Director, Thompson School of Applied Science, UNH, Barton Hall, Durham, N.H. 03824 (603-862-1025).

Division of Continuing Education

Edward J. Durnall, *Director*

Carmita A. Murphy, *Associate Director*

Merna E. Johnson, *Assistant Director, Counseling*

Margaret B. Soper, *Assistant Director, Conferences*

The Division of Continuing Education provides access to higher education for all New Hampshire residents under conditions which 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, conferences, short courses, or certificate programs, at other times by enrollment in credit courses and degree programs.

The faculty of the Division of Continuing Education are drawn from the teaching staffs of the University, from the faculties of neighboring colleges and universities, and from the ranks of business, professional, and community leaders who speak with authority in their respective fields of specialization.

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 each semester.

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See Associate in Arts Degree Chapter, page 131.

Special Student Status

Special students—those who are not formally admitted into a degree program at the University of New Hampshire, Durham—may enroll in many University credit courses each semester through the Division of Continuing Education.

Undergraduate courses. Special students must meet one of the following requirements: 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 its equivalent from an approved college or university.

Division of Continuing Education

Prerequisites. All students are responsible for satisfying course prerequisites, if any. Instructors may require a student to withdraw from a course if the student is not adequately prepared for the level of work.

Short Courses and Mini-Courses

Throughout the year, the Division offers non-credit courses to the community. These courses may provide opportunities for individual development; or they may provide continuing educational services to business, labor, government, or the professions.

Short courses run for about 10 weeks, depending on course objectives, and typically offer individual or professional development.

Mini-courses run for only five weeks and usually deal with recreational and other leisure-time interests.

Certificate Programs

Each certificate program consists of a specifically developed sequence of courses to provide a sound balance of theory, fundamentals, and specialized training. Certificates awarded by the Division have earned professional acceptance as evidence of increased knowledge in basic principles and techniques. Certificate programs offered include: Credit Union School (summers only), Day Care, Nursing Home Administrator Relicensure, Public Library Techniques (summers only), Banking, Health Care Administration, Insurance, Management, Merchandising, and Real Estate.

Conferences

The Division's Conference Department assists in planning and developing educational programs for groups and organizations. These programs range from one-day workshops and seminars to residential conferences and institutes lasting several days or weeks.

Throughout the academic year, the Conference Department makes full use of the facilities of the University of New Hampshire and the New England Center for Continuing Education adjacent to the campus, in conjunction with off-campus lodging for residential programs. During the summer months, the University's residence and dining halls are available to serve even the largest of groups. For more information, please contact the Conference Department.

Summer Session

Please see following chapter.

Division of Continuing Education

Course Charges

Students who enroll in credit courses through the Division pay on a per-credit basis, depending on residency status and student classification. These course charges are listed in the DCE credit course schedule published prior to each semester. The course charges for non-credit courses and for conferences, workshops, and institutes vary according to the scope of individual programs.

Financial Aid

Course charge grants. Students who enroll in the Division of Continuing Education may be considered for grants in varying amounts, awarded on the basis of financial need and only for course charges in credit courses offered through the Division. Preference will be given to New Hampshire residents and those applicants who have been admitted to degree candidacy with the Division. Application for course-charge assistance must be filed with the Division at least one month prior to the start of classes for each term for which assistance is requested. Application forms are available from the Division Office.

Other financial aid. For information on other sources of financial assistance, such as Senior Citizen Scholarships, military and veterans aid, Law Enforcement Educational Program (LEEP), and private grants and scholarships, contact the Division counselors.

Class Schedule

While students may enroll in morning and afternoon classes through the Division, many courses offered each semester are scheduled in the late afternoon and early evenings to accommodate part-time students.

Division Publications

Specific information on course offerings, registration procedures, and academic requirements can be found in individual publications describing each program. For more information about the Division's programs, write: Division of Continuing Education, University of New Hampshire, Durham, N.H. 03824. (603-862-2015).

Summer Session

Edward J. Durnall, *Director*

The University of New Hampshire offers students the opportunity to continue their studies on a year-round basis through four- and eight-week sessions during the summer months. The summer courses are 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.

Undergraduate courses are open to college undergraduate students, 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 Director).

Graduate courses are open to graduate students and other individuals with a bachelor's degree or its equivalent from an approved college or university.

Admission to Summer Session classes does not necessarily imply admission to degree candidacy.

Other Summer Session offerings include non-credit courses and certificate programs; workshops and seminars for business, industry, and the professions; and residential conferences and academic programs.

For more information. A separate Summer bulletin is published each year in February and is available from: Summer Session Office, University of New Hampshire, Durham, N.H. 03824 (603-862-2015).

The Graduate School

William H. Drew, Acting Dean

Roland B. Kimball,

Acting Assistant Dean

John A. Lockwood,

Acting Assistant Dean

Kenneth O. Freer, Assistant to the Dean

Master of Science

Animal Sciences

Biochemistry

Biology

Botany and Plant Pathology

Chemical Engineering

Chemistry

Civil Engineering

Earth Sciences

Electrical Engineering

Entomology

Genetics

Home Economics

Mathematics

Mechanical Engineering

Microbiology

Music Education

Natural and Environmental Resources

Physical Education

Physics

Plant Science

Zoology

Master of Arts

Economics

English

French

German

History

Music

Political Science

Psychology

Sociology

Spanish

Master of Arts in Teaching

Department of Education

Master of Science for Teachers

Chemistry

English

French

Mathematics

Physics

Spanish

Master of Occupational Education

Department of Occupational Education

Master of Business Administration

Whittemore School of Business and Economics

Master of Education

Department of Education

Master of Public Administration

Department of Political Science

Doctor of Philosophy

Biochemistry

Botany and Plant Pathology

Chemistry

Economics

Engineering

English

Genetics

History

Mathematics

Mathematics Education

Microbiology

Physics

Plant Science

Psychology

Sociology

Zoology

Graduate School

The Graduate School offers a wide range of programs leading to the master's degree and a number of programs leading to the Ph.D. degree. Graduate programs have been developed gradually and systematically with the goal of achieving academic excellence by careful utilization of institutional resources and regional opportunities. A highly qualified graduate faculty supervises graduate 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 the student the opportunity to work closely with the faculty in his 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 utilize fully the available opportunities and to demonstrate the maturity and self discipline necessary for sound scholarship.

A number of programs and facilities such as the Genetics Programs, Jackson Estuarine Laboratory, Ritzman Animal Nutrition Laboratory, Center for Industrial and Institutional Development, The Space Science Center, Resource Development Center, Water Resources Research Center, Engineering Design and Analysis Laboratory, Bureau of Educational Research and Testing, and Public Administration Service, provide opportunities to engage in interdisciplinary research.

Admission to the Graduate School may be granted to graduates of colleges and universities of approved standing, provided that the applicant's undergraduate record is satisfactory. An applicant's race, religion, color, national origin, or sex are not considered in the admissions process. The official application for admission and the Graduate Catalog containing detailed descriptions of graduate programs may be obtained from the Dean of the Graduate School, Social Science Center, University of New Hampshire, Durham, New Hampshire 03824.

Financial Aid

Graduate Assistantships are available in most departments. These involve part-time work in connection with the University's instructional activities. University sponsored awards, such as tuition scholarships, UNH Fellowships, and Martin Luther King awards, and Dissertation Fellowships, are available to qualified students. A number of fellowship programs sponsored by such outside agencies as the National Science Foundation, Department of Health Education and Welfare, U. S. Office of Education, and the U. S. Public Health Service may be available.

Merrimack Valley Branch

Roger Bernard, *Dean*

The Merrimack Valley Branch (MVB) of the University of New Hampshire offers credit and non-credit courses during the day and evening in Manchester, N.H. Classes are held in a church, schools, and other facilities throughout the city.

MVB offers: a commuter college to students not otherwise able to continue their education; gives business and industry personnel opportunities for upgrading and advancement; makes continuing education accessible to area residents and provides special short-term activities, conferences, institutes, and programs of professional and general interest.

As a commuter college the Branch provides quality education at a minimum cost to students. Cooperative Education with work experience in business, industry, government, and social agencies will be a major future development of the Branch.

Associate in Arts and in Applied Science degree programs include options in Library Science, Parks and Recreation, Real Estate, Business Management, Insurance and Health Care. These degree programs are pre-baccalaureate or career oriented and form the foundation for selected baccalaureate degree programs for those who wish to continue their studies. Students receiving an A.A. degree from the Branch will be awarded 64 semester hours of credit upon entry into a baccalaureate degree program within the University System.

Some upper-level undergraduate and graduate courses are also offered at the Branch.

The Merrimack Valley Branch undergraduate credit-courses are open to individuals who are high school graduates or are 18 years of age and have a high school equivalency certificate.

Further information on courses and programs being offered at the Merrimack Valley Branch of UNH may be obtained by writing, visiting, or calling: the Merrimack Valley Branch Administrative Offices, St. Mary's Bank Building, 200 McGregor Street, Manchester, N.H. 03102, (603-668-0700).

School of Continuing Studies

Maynard C. Heckel, *Dean*

The School of Continuing Studies fulfills the historic educational outreach mission of the land grant university by moving beyond the classroom walls and campus boundaries, by building flexible programs of learning, and by making use of new and largely untapped community resources for learning and teaching. The School is responsible for all off-campus educational programs of the University System, offering to the adult learner, alternative forms of higher education in conjunction with traditional course offerings. Students may participate in courses offered by the School and conducted in local schools and businesses and at UNH system institutions without being admitted to degree candidacy.

Bachelor of General Studies Degree. The School of Continuing Studies administers the B.G.S., which differs in design and intent from traditional baccalaureate degree programs. The B.G.S. offers to the mature, motivated individual a unique opportunity for specialized study. The adult student may develop, with professional assistance, a program specifically related to career or personal goals. Students may enroll in courses applicable to the B.G.S. degree at any college in the University System or throughout the state through the School. Degree candidates may also enroll for courses in private institutions of higher education. Specific admission requirements are listed in the School's bulletin.

The School also offers courses which may be applied toward the Associate in Arts degree and is developing a cooperative associate degree program with the Vocational-Technical College in Berlin, N.H.

Calendar. The calendar is flexibly designed to meet the needs of adults and may vary from University System calendars. Further information may be obtained by contacting the office of the School of Continuing Studies, Taylor Hall, UNH, Durham, N.H. 03824.

Description of Courses

IBM Key Codes

The following numbers are used extensively in machine-processed data to identify both undergraduate and graduate programs offered at the University. An asterisk preceding the number identifies those departments which offer graduate programs.

College of Liberal Arts

- 58 Liberal Arts non-departmental
- 59 The Arts
- 60 Biology
- *61 Education
- *62 English
- *63 French
- 64 Italian
- 65 Geography
- *66 German
- 67 Russian
- *68 History
- 69 Humanities
- *70 Microbiology
- *71 Music
- *72 Music Education
- 73 Philosophy
- 74 Physical Science
- *75 Political Science
- *76 Psychology
- *77 Spanish
- 78 Classics
- 79 Greek
- 80 Latin
- 81 Social Science
- *82 Sociology
- 83 Speech and Drama
- *84 Zoology
- 85 Anthropology
- 86 Social Service

School of Health Studies

- 37 Medical Technology Program
- 38 Nursing
- 39 Occupational Therapy
- *40 Physical Education
- 41 Recreation and Parks
- 42 Communication Disorders
- 43 Health Studies

Division of Continuing Education

- 90 Career Options

Merrimack Valley Branch

- 91 Library Science

College of Life Sciences and Agriculture

- *17 Animal Science
- *18 Biochemistry
- *19 Botany and Plant Pathology
- *20 Entomology
- *21 Forest Resources (INER)†
- *22 Home Economics
- *23 Occupational Education
- *24 Plant Science
- *25 Resource Economics (INER)†
- *26 Soil and Water Science (INER)†
- 27 Inst. of Nat. & Envir. Resources

† INER—Institute of Natural and Environmental Resources

College of Technology

- 45 Technology non-departmental
- *46 Chemical Engineering
- *47 Chemistry
- *48 Civil Engineering
- *49 Earth Science
- *50 Electrical Engineering
- *51 Mathematics
- *52 Mechanical Engineering
- *53 Physics
- *54 Ph.D. Engineering

Whittemore School of Business and Economics

- *30 Administration
- *31 Economics
- 32 Hotel Administration
- 33 Secretarial Studies

Separate Departments and Programs

- 96 Intercollege
- *97 Genetics Program
- 98 Military Science
- 99 Aerospace Studies

Thompson School of Applied Science

- 14 400-level T.S.A.S. courses

Explanation of Arrangement

The title and the Arabic numeral designate the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses normally offered in the second semester. The course description is followed by the prerequisites, if any, and the number of semester credits the course will count in the total required for graduation. Laboratory periods are usually two and one-half hours in length, lectures either 50 minutes or 80 minutes in length.

NLG or Credit/Fail following the description indicates that the course carries *no letter grade*, being marked "Cr" for credit, "F" for failure.

All courses (unless otherwise marked) are open to students who have passed the prerequisites. An elective course may be given only when there is a minimum of five students registered.

If the course numerals are connected by a hyphen, the first semester, or its equivalent, is a prerequisite to the second semester. If the numerals are separated by a comma, properly qualified students may take the second semester without having had the first.

Students must register for the number of credits or within the range of credits shown in the catalog description of a course.

The system of numeric designation of courses is as follows:

200-299 Courses in the Thompson School of Applied Science.

300-399 Non-credit courses, e.g., Mathematics 301.

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. (Under some conditions these courses may be taken for graduate credit by non-majors only.)

700-799 Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)

800-899 Courses which carry graduate credit only. (Descriptions will be found in the Graduate School catalog.)

Aerospace Studies

Aerospace Studies (99)

PROFESSOR OF AEROSPACE STUDIES: Colonel Vincent S. Cahill, Jr., USAF

LECTURERS: Major Darrel D. Lynch, USAF

ADMINISTRATIVE: Technical Sergeant Jerome P. Barton, USAF; Technical Sergeant Thomas W. Wassmann, USAF; Staff Sergeant Herbert Campbell, USAF

415. **ORGANIZATION FOR NATIONAL SECURITY I**
Introduction to the organization, mission, and doctrine of the U.S. Air Force. The role of the Air Force in relation to other branches of the armed forces. Emphasis is on civilian control of the military and our strategic offensive forces. 1 credit.
416. **ORGANIZATION FOR NATIONAL SECURITY II**
Introduction to major Air Force commands and the functions of each. The roles of separate operating agencies. Emphasis is on the organization, systems, and operations of strategic defense, general purpose, and aerospace support forces. 1 credit.
541. **EVOLUTION OF MANNED FLIGHT I**
The development of manned flight from its beginning through WW II. Development of various concepts of employment of air power; factors which have prompted research and technological change. Events and elements in the history of air power are stressed, especially where these provide significant examples of the impact of air power on strategic thought. 1 credit.
542. **EVOLUTION OF MANNED FLIGHT II**
The development of manned flight from the post WW II era to the present time. Development of various concepts of employment of air power; factors which have prompted research and technological change. Events and elements in the history of air power are stressed, especially where these provide significant examples of the impact of air power on strategic thought. 1 credit.
651. **NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY I**
The institutions and interests that shape and administer American foreign policy, including their historical development, with special attention to the President and his National Security Council; the Congress; and the major agencies involved both here and abroad. (Given as Political Science 673.) 4 credits.
652. **NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY II**
Defense and deterrence considerations among the United States and other major powers, including consideration of levels of armed violence affecting international politics and changes in the nature of war, including impact of modern weapons systems and corollary arms-limitation problems. Development of defense policy; the role of armed-force establishments in shaping defense policy in the U.S. and elsewhere. (Given as Political Science 776.) 4 credits.
661. **MANAGEMENT OF DEFENSE RESOURCES**
General theory and practice of management. Information systems; quantitative approaches to decision making; resource control techniques used by successful managers. Problem-situation exercises and field trips. Oral and written student reports will be made. Whittmore School faculty members may participate in selected presentations. 4 credits.

662. LEADERSHIP IN THE DEFENSE ENVIRONMENT

The meaning of military professionalism, responsibilities of the profession, responsibilities of the professional officer and his role in the military service. Emphasis is on development of leadership skills in student-led seminars. Discussion of the military justice system. Whittemore School faculty members may participate in selected presentations. 4 credits.

Administration (30)

Program Director: Donald C. Marschner

PROFESSORS: Carroll M. Degler, *emeritus*; Arthur W. Johnson, *emeritus*; Robert F. Barlow, Jan E. Clee, John A. Beckett, Stephen L. Fink, Herman Gadon, John Korbel, Dwight R. Ladd, Donald C. Marschner, Samuel R. Reid, Robin D. Willits, Dwayne Wrightsman

ASSOCIATE PROFESSORS: Allan Braff, Allen R. Cohen, James O. Horrigan, R. Stephen Jenks, Richard L. Mills, Linda G. Sprague, William E. Wetzel, Jr.

ASSISTANT PROFESSORS: John R. Haskell, Fred Kaen, George Miaoulis

INSTRUCTORS: J. Patrick Bovino, Donald D. Wells

LECTURERS: Clyde R. Coolidge, Joseph E. Michael, Jr.

411 (411). BEHAVIOR IN ORGANIZATIONS

Designed to provide students with exposure to appropriate behavioral science concepts and the opportunity to apply them. Emphasis is on factors influencing an individual's behavior in a small group, on factors influencing small group functioning, and factors influencing the relations between small groups—all in the context of a larger organization. The class is treated as a real organization with attention to roles, norms, rewards, and leadership. Students are expected to take responsibility for the effect of their behavior on their learning environment. 4 credits.

(424) 424. QUANTITATIVE ANALYSIS

Elementary survey of quantitative methods for decision making; presentation and summarization of data; probability and inference. Course provides sufficient quantitative background for all other required undergraduate administration courses, but not for upper-division electives in quantitative methods in the Whittemore School. Prerequisite: successful completion of a proficiency examination in high school level algebra. 4 credits.

(502) 502. FINANCIAL ACCOUNTING

A general introduction to the concepts, procedures, and tools of analysis involved in the selection, quantification, and communication of economic events affecting the financial condition and progress of organizations. (Not open to students who have had Continuing Education 460.) 4 credits.

503. MANAGERIAL ACCOUNTING

General introduction to the concepts, procedures, and tools of analysis employed by managers in gathering and interpreting information for planning and control purposes. Prerequisite: Administration 502 or Continuing Education 460. 4 credits.

517 (517). SURVEY OF MANAGERIAL ACCOUNTING

A general survey of the concepts, conventions, and processes involved in financial accounting and cost accounting. Primary emphasis on the usefulness and limitations of accounting data in decision making and in analyses of past results. For students minoring but *not* majoring in administration. (Not open to students who have had Continuing Education 460.) 4 credits.

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Administration

602. VALUES IN A MANAGERIAL SOCIETY

A critical examination of the values which appear to underlie our managerial society and of the processes by which such values are formed and modified. For example, such basically eighteenth-century ideas as pursuit of self-interests, desirability of material progress, and individualism are attitudes which have loomed large among our American values. How these ideas relate to our present managerial society will be discussed, and some emerging alternatives to these long-accepted values will be considered. The course is based primarily on discussions of cases and readings. There are a few lectures. Prerequisite: Administration major or permission of instructor. 4 credits.

614. ORGANIZATIONAL THEORY

In contrast to Administration 411, this course focuses on the characteristics of the organization. An attempt is made to draw on existing theory to provide the student with a conceptual framework useful in analyzing and administering various types of organizations: e.g. business, educational, medical, and social. Participation in class discussions of cases and written commentary on theoretical readings are required. Occasional field work may be anticipated. Prerequisite: Administration 411 or permission of instructor. 4 credits.

630. INVESTMENTS

The problems of investment; investment characteristics of stocks and bonds; public utility, railroad, industrial, and government securities; protection of the investor; investment banking; and related problems. Prerequisite: Economics 401-402 and junior standing. 4 credits.

639. THE PHILOSOPHY OF MANAGEMENT SCIENCE

A study of management from a systems point of view. 4 credits.

642. MANAGEMENT INFORMATION SYSTEMS

An orientation in concepts, design, and implementation of management information systems. 4 credits.

647-648. COMMERCIAL LAW I, II

The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Prerequisite: at least junior status and permission of instructor. 4 credits.

650. OPERATIONS MANAGEMENT

Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. Prerequisite: Administration 424 and 502 or permission of instructor. 4 credits.

651. MARKETING

A study of the marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Attention is paid to the optimal blending of the ingredients in the "marketing mix," including product design, product line policies, packaging, branding, pricing, promotion, preliminary consumer behavior, and selection of the channels of distribution. Prerequisite: Economics 402 and permission of instructor. 4 credits.

653. FINANCIAL MANAGEMENT

A study of the firm's uses and sources of funds with emphasis on working capital management, capital budgeting, and the administration of debt and equity. Prerequisite: Economics 402 and Administration 502 or permission of instructor. 4 credits.

695-696. INDEPENDENT STUDY

Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from Undergraduate Counsellor and proposed project instructor. Permission will be granted only to students who have demonstrated unusual individual initiative. 4-12 credits per semester.

700. BUSINESS POLICY

A capstone, integrative course, interrelating and applying specialized courses; using cases of companies, firms; supplemented by economic and other information from published industry, company, and other sources. Prerequisite: Administration major with senior standing. 4 credits.

705. OPERATIONS RESEARCH

Mathematical programming, game theory, inventory, queuing, and scheduling problems; dynamic programming. Prerequisite: permission of instructor. 4 credits.

711. CORPORATIONS

The role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combinations, and concentration. Prerequisite: Economics 401, 402. 4 credits.

712. ORGANIZATIONAL CHANGE

Examination of the process of change in organizations. Consideration of change strategies, the role of the change agent, and his relation to the client system. The bases of resistance to change and the problems encountered by internal and external change agents. Readings include theoretical material and cases in areas relevant to organizational change. Prerequisite: permission of instructor. 4 credits.

713 (713). INTERPERSONAL AND GROUP DYNAMICS

Intensive experiential study of the dynamics of small groups through the use of the class itself as a laboratory study group. Students examine their own behavior and its effects on others through use of the Laboratory Training Group (T-group) as the major learning tool. The course develops both conceptual ability and behavioral skill in this area. Students review readings in group dynamics, interpersonal relations, and sensitivity training. Prerequisite: permission of instructor. Lab fee. 4 credits.

717. ADVANCED FINANCIAL ACCOUNTING

Accounting theory and practice as they contribute to the significance and limitations of the financial statements by which business communicates financial status to interested outsiders. Prerequisite: permission of instructor. 4 credits.

718. COST AND MANAGEMENT

The effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Topics considered include analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital expenditure analysis. Prerequisite: permission of instructor. 4 credits.

730. INVESTMENTS ANALYSIS

An evaluation of capital markets and of analytical techniques useful for security appraisal. The following subjects will be covered: securities characteristics, market institutions, yield structures, price change patterns, intrinsic value analysis, investment timing, and portfolio management. Lectures, outside readings, and security analysis research projects are the main tools of the course. Prerequisite: permission of instructor. 4 credits.

732. EXPLORATIONS IN ENTREPRENEURIAL MANAGEMENT

The past and probable future role of the entrepreneur in the economic and social development of the U.S. is examined. Emphasis is placed upon differences between entrepreneurial and administrative management. Topics include the mythology of the

Administration

“American Dream,” the entrepreneur as a change agent, entrepreneurial motivation and behavior patterns, the venture-capital markets, and the role of the entrepreneur in non-profit institutions. Prerequisite: permission of instructor. 4 credits.

741. TRANSPORTATION ECONOMICS

The wide range of problems surrounding the American transportation system. The basic economic structure of the transportation industries with particular emphasis on competition among the several modes. Such public policy questions as merger of transportation enterprises and cost-benefit analysis of transportation facilities are considered. While principal emphasis in the course is on freight transportation, the problems of passenger transportation, especially in urban areas, are discussed. Limited attention is given to distribution as a specific function of business enterprise. Lectures and discussions of cases. Two or three short papers and a term paper are required. Prerequisite: permission of instructor. 4 credits.

747 (747). FEDERAL TAXATION

Current federal-income, estate, and gift taxes and their impact on corporation, partnerships, and individuals. Prerequisite: permission of instructor. 4 credits.

750. MARKETING MANAGEMENT

The practical application of the theories taught in Administration 651 or 808. Topics covered include the planning, organization, and control of marketing activities in large corporations and in small businesses, with special emphasis on new-product planning and development; laboratory, field, and market testing; pricing policies; selection of channels of distribution; brand management; and the interrelationships between marketing, production, and finance. Principles which underlie sound policy formulation and decision making are established through the analysis of real-life cases, several of which are based upon current marketing problems of nearby New Hampshire firms. Prerequisite: a basic marketing course. 4 credits.

751. ADVERTISING AND PROMOTION

How the modern firm employs advertising, personal selling, and other promotional tools to help solve marketing problems with special emphasis on advertising as a medium of communications and as a social-cultural force in the western world. Prerequisite: Administration 651 or permission of instructor. 4 credits.

752. MARKETING RESEARCH

The search for and analysis of information relevant to the identification and solution of marketing problems. The study of the techniques used in this search—their strengths and limitations—together with the environment in which the search is conducted. The primary aim is to enable one to better understand the problems that arise in this search and to better evaluate the results of such research. Prerequisite: Administration 424 and 651 or their equivalent. 4 credits.

754. CONSUMER BEHAVIOR

The consumer-firm relationship studied in terms of concepts drawn from contemporary social science findings, particularly small group studies. Learning, memory, cognition, motivation, emotion, and perception concepts as related to present and prospective marketing activities of a business organization. Prerequisite: permission of instructor. 4 credits.

755. ADVANCED FINANCIAL MANAGEMENT I

A study of financial policy of the firm with emphasis on solutions to complex problems of capital, leverage, optimal capital structure, capital budgeting, and working capital management. Prerequisite: permission of instructor. 4 credits.

756. ADVANCED FINANCIAL MANAGEMENT II

A study of the long-term financial decisions of the firm, with emphasis on solutions to problems of dividend policy, optimum capital structure, and capital budgeting under conditions of uncertainty and risk. Prerequisite: permission of instructor. 4 credits.

798. SEMINAR IN ADMINISTRATION

Special topics in business administration. This course may be repeated. Prerequisite: consent of adviser and instructor. Credit to be arranged (4 credits maximum).

Animal Sciences (17)

Chairman: Winthrop C. Skoglund

(Animal, Dairy, Poultry, Pre-Veterinary)

PROFESSORS: Kenneth S. Morrow, *emeritus*; Loring V. Tirrell, *emeritus*; Nicholas F. Colovos, *emeritus*; C. Hilton Boynton, *emeritus*; Winthrop C. Skoglund, Fred E. Allen, Walter M. Collins, William R. Dunlop, Harry A. Keener, Richard C. Ringrose, Samuel C. Smith, Richard G. Strout

ASSOCIATE PROFESSORS: Herbert C. Moore, *emeritus*; Alan C. Corbett, Thomas P. Fairchild, James B. Holter, Gerald L. Smith, Larry Stackhouse

ASSISTANT PROFESSORS: Frank Repka, Edward Squires, Thomas Wight

LECTURERS: Dwight Barney, Janet C. Briggs, Robin Culver, James O'Connor, Jr., Elizabeth C. Smith

400. ANIMALS, FOODS, AND MAN

Historical, biological, economic, social, and political role of animals, and foods derived from them, in the evolution of civilizations and societies composed of man as a biological entity. Open to all students. Mr. S. C. Smith. 3 lectures; 1 laboratory; 4 credits.

401. INTRODUCTION TO THE ANIMAL SCIENCES

To acquaint the beginning student with the development, economic importance, and problems facing the livestock industry. The commercially important classes of farm animals are discussed with emphasis on dairy cattle, poultry, beef cattle, horses, sheep, and swine. The place of the biological sciences in the rapidly changing animal agriculture is stressed. The course is intended to be the introduction to subsequent specialized courses and gives the student an insight into opportunities in the animal agriculture field. Mr. Skoglund and staff. 3 lectures; 1 laboratory; 4 credits.

402 (402). HORSEMANSHIP

Instruction in riding using University-owned horses under supervision of a riding instructor. A limited number of students may stable their horses at the University. Sections are available for beginning, intermediate, and advanced riders. A fee of \$70 is charged. Ms. Briggs. 1 lecture; 3 hours of riding per week; 2 credits.

404. INTRODUCTION TO LIGHT HORSE SCIENCE

A survey course covering the entire field of light horse science including breeds, feeding, genetics, stable management, diseases, and other practical aspects. Mr. Barney and staff. 3 lectures; 1 laboratory; 4 credits.

501. ANIMAL ANATOMY AND PHYSIOLOGY

The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 lectures; 1 laboratory; 4 credits.

Animal Sciences

502. FUNDAMENTALS OF ANIMAL HEALTH

The prevention, control, and treatment of the bacterial and parasitic diseases of domestic animals. Mr. Allen. Prerequisite: Animal Sciences 501 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

503. ABATTOIR MANAGEMENT

Licensing requirements, sanitation procedures, inspection facilities, and functional use of the slaughterhouse. Field trips to visit operating plants will be taken. Mr. G. L. Smith and Mr. Barney. Permission of instructor is required. 1 lecture; 1 laboratory; 2 credits.

504. MEAT AND ITS PRODUCTS

Slaughtering, cutting, and identification of beef, lamb, pork, and poultry. Trips are taken to wholesale and retail meat outlets. Mr. G. L. Smith. 3 lectures; 1 laboratory; 4 credits.

506. PRINCIPLES OF NUTRITION

A study of the fundamental principles underlying the nutrition of man and animals; the functions of the various nutrients in the maintenance, growth, and production of the animal body and the metabolic disorders resulting from their deficiency; the digestion, absorption, intermediary metabolism, and excretion of individual nutrients will be discussed within this framework. Mr. Repka. 3 lectures; 1 laboratory; (Also offered as Home Economics 506.) 4 credits.

507 (507). THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE

The physiological development, control, and education—stressing biting, longeing, and collection. Ms. Briggs. Prerequisite: Animal Science 402 or equivalent and permission of instructor. 1 lecture; 1 laboratory; 2 credits.

508. MILK AND ITS PRODUCTS

The composition and properties of milk, both chemical and bacteriological. The producing, making, handling, and marketing of milk and its products. 3 lectures; 1 laboratory; 4 credits. (Not offered 1974-75.)

601-602. ANIMAL SELECTION

601-1 Livestock: Mr. Barney; 602-2 Dairy: Mr. Fairchild; 602-3 Poultry: Mr. Collins. The principles of selection based on production performance, pedigree, and type evaluation. Elective only after consultation with instructor in charge. The student may repeat the course and select any or all of the specialized areas listed above. 1 lecture; 1 laboratory; 2 credits.

603. APPLIED ANIMAL NUTRITION

Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Mr. G. L. Smith and other staff members. 3 lectures; 1 laboratory; 4 credits.

605. EQUINE DISEASES AND PARASITES

A study of hygienic practices that relate to the control of many common bacterial, viral, and parasitic diseases of the horse. Mr. O'Connor. 3 lectures; 1 laboratory; 4 credits.

606. SMALL ANIMAL DISEASES

Common disease problems in domestic small animals frequently owned as pets; species include dogs, cats, monkeys, rodents, caged birds, and aquarium fish. Mr. Stackhouse and Mr. Dunlop. 3 lectures; 1 laboratory; 4 credits.

612. AVIAN HEALTH AND SANITATION

A survey of the diseases of domestic fowl. Emphasizes the fundamentals of disease control including bacterial, fungus, helminths, and protozoan parasites; and avian diseases caused by virus entities. Serological tests, virus isolation, and propagation in

avian embryos and tissue culture will be conducted in the laboratory. Mr. Corbett and Mr. Strout. 3 lectures; 1 laboratory; 4 credits. (Not offered in 1974-75.)

614. DISEASES AND PARASITES OF WILDLIFE

A survey of the diseases and parasites of fishes, birds and game, and fur-bearing animals. Discusses control of diseases as influenced by management practices, the effect of pesticide on wildlife, and the relationship of wildlife diseases to human health. Autopsy techniques, the proper handling of specimens, and the use of state laboratory facilities will be stressed in laboratory. Mr. Strout and other staff members. Permission of instructor necessary. 3 lectures; 1 laboratory; 4 credits.

616. EQUINE PODOLOGY

The structure and function of the appendicular skeleton will be studied with particular emphasis placed upon the conformation of each segment of normal and abnormal limbs. Mr. O'Connor. 3 lectures; 1 laboratory; 4 credits.

617-618. LIGHT HORSE CLINIC

The theory and practice of bandaging and restraint as used in modern light horse management will be taught. Actual clinical problems in the University herd will be selected for discussion. May be elected for two semesters. Mr. O'Connor. 1 lecture; 1 laboratory; 2 credits.

651-652. MANAGEMENT OF THE DOMESTIC ANIMALS

651-1 Light Horses: Mr. Squires; 651-2 Dairy: Mr. Holter; 652-3 Livestock: Mr. G. L. Smith; 652-4 Poultry: Mr. Skoglund. A study of the economic and management factors involved in the production of the various species of domestic animals. The student can select any or all of the specialized areas listed above. Elective only after consultation with the instructor in charge. 3 lectures; 1 laboratory; 4 credits.

653-654. PRINCIPLES OF TEACHING EQUITATION

The techniques and procedures of teaching equitation. Application of the theories of riding and training with emphasis on dressage instruction. Opportunity will be given to teach riding theory and techniques to college students under the supervision of the head instructor. Must be taken for both semesters. Prerequisite: Animal Science 402, 507, and 651-1. Permission of instructor required. Ms. Briggs. 3 lectures; 1 laboratory; 4 credits.

697 (697). ANIMAL SCIENCE SEMINAR

A survey of recent literature and research in the animal sciences. Staff. 2 credits.

701. PHYSIOLOGY OF REPRODUCTION

A study of physiology, embryology, endocrinology, reproduction, and lactation in domestic animals. Mr. Strout and Mr. Stackhouse. 3 lectures; 1 laboratory; 4 credits.

702. PHYSIOLOGY OF MILK SECRETION

A study of the anatomical, physiological, and biochemical aspects of lactation including their interrelationships as they are involved in the normal and abnormal development, maintenance, and functioning of the mammary gland. Consideration will be given to environmental and physiological factors affecting lactation and to the ontogeny and phylogeny of the mammary gland. Staff. 3 lectures; 1 laboratory; 4 credits. (Not offered 1974-75.)

709. BIOCHEMISTRY OF NUTRITION

An in-depth study of the intermediary metabolism of nutrients with emphasis on energy metabolism. Coverage includes transport mechanisms, biological oxidations, interrelationships of carbohydrate, fat, and protein metabolism in normal and abnormal states, obesity, and control of hunger and appetite. Mr. Repka. (Also offered as Home Economics 709.) 3 lectures; 1 laboratory; 4 credits.

The Arts

710. RUMINANT NUTRITION

Feeding and management of dairy animals, calf feeding, raising young stock, and feeding for economical milk production. Mr. Holter. 3 lectures; 1 laboratory; 4 credits.

711. COMPARATIVE ANIMAL GENETICS

Consideration of how heredity affects domesticated animals, poultry, other mammals, and fish. Emphasis will be at the level of the organism; but the population, quantitative inheritance, principles of selection, and genetics of resistance to disease will be studied. Statistical and experimental techniques will be discussed. Prerequisites: 4 credits of genetics or permission of the instructor. Mr. Collins. 3 lectures; 1 laboratory; 4 credits.

712. ANIMAL BREEDING AND IMPROVEMENT

Principles of population genetics and selection with emphasis on the application of these principles to effect genetic improvement in dairy cattle, livestock, and horses. Prerequisite: Animal Science 711. Mr. Fairchild. 3 lectures; 1 laboratory; 4 credits (Alternate years, not offered 1974-75.)

795-796. INVESTIGATIONS IN DAIRY, LIVESTOCK, POULTRY

1. Genetics: Mr. G. L. Smith, Mr. Collins, Mr. Fairchild.
2. Nutrition: Mr. G. L. Smith, Mr. Ringrose, Mr. Holter, Mr. Repka.
3. Management: Mr. G. L. Smith, Mr. Skoglund, Mr. O'Connor.
4. Diseases: Mr. Allen, Mr. Corbett, Mr. Dunlop, Mr. Strout, Mr. S. C. Smith, Mr. Stackhouse, Mr. Wight.
5. Products: Mr. G. L. Smith.
6. Light Horsemanship: Mr. O'Connor, Ms. Briggs, Mr. Squires.
7. Physiology: Mr. Squires.

An opportunity is given for the student to select a special problem in any of the fields listed under the guidance of the instructor. Elective only after consultation with the instructor in charge. May be repeated. 2 credits.

Anthropology (85)

(See Sociology and Anthropology)

The Arts (59)

Chairman: Melvin J. Zabarsky

PROFESSORS: John W. Hatch, John Laurent, George R. Thomas, Melvin J. Zabarsky

ASSOCIATE PROFESSORS: Sigmund Abeles, Arthur Balderacchi, Richard D. Merritt, Winifred Clark Shaw, Daniel L. Valenzo

ADJUNCT ASSOCIATE PROFESSOR: Joyce Reopel (part-time)

ASSISTANT PROFESSORS: Bruno Civitico, Conley Harris, Brian T. Jefferson, Peter Moak, Ian Walker, Shirley Zavin

INSTRUCTORS: Morton C. Abromson, Maryse Searls

ADJUNCT INSTRUCTOR: Carolyn Abeles (part-time)

Courses in the Departments of The Arts are designed to support all degree programs: B.A., B.F.A., and B.S.

Three-Dimensional Courses

401. CERAMICS

A course designed to give a basic understanding of the ceramic media. Includes hand-forming and potter's-wheel techniques. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

413. JEWELRY AND METALSMITHING

Structural and decorative design and construction of jewelry, flatware, and hollow ware. Soldering, polishing, chasing, casting, raising, forging, fabrication, and enameling metal (sterling silver, copper, brass, pewter) are included. Elective by permission. 2 laboratories; 4 credits.

425. WOODWORKING

A basic woodworking course that integrates drawing, design, theory, and techniques with construction of projects of the student's own design. Open to Occupational Therapy students only. Elective by permission. 2 laboratories; 4 credits.

434. INTRODUCTION TO THREE-DIMENSIONAL DESIGN

An introductory course for all students planning to concentrate in 3-dimensional design, i.e., sculpture, ceramics, furniture design, and jewelry. Various materials will be explored to discover and develop an understanding of the oneness that occurs when form and material are properly integrated. Elective by permission. 1 4-hour laboratory; 4 credits.

501. CERAMICS

Use of the various production techniques as tools for perceptual development with the ceramic media. Technical development of clay bodies and glazes. Prerequisite: Arts 434. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

502. CERAMICS

Investigation of specialized areas of ceramics with a major emphasis on perceptual development. Includes various methods of firing and glaze treatment. Research project required. Prerequisite: Arts 434. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

513, 514. INTERMEDIATE JEWELRY AND METALSMITHING

Design and construction of jewelry and/or flatware and hollow ware as the student desires. Casting, stone setting, and production emphasized. Prerequisite: Arts 434 and elective by permission. Cost of materials for projects varies from \$10 to \$50. 2 laboratories; 4 credits.

519. INTERMEDIATE WEAVING

Exploring weaves and fibers. Drafting to fabric analysis. Four to twelve harness pattern workshop. Elective by permission. Prerequisite: Arts 434. Cost for project materials varies from \$20 to \$50. 1 laboratory; 4 credits.

525, 526. WOOD FURNITURE DESIGN

Exploration in the design and construction of major furniture forms. Development of a portfolio of completed work and investigations leading to a limited thesis. Prerequisite: Arts 434. Elective by permission. 2 laboratories; 4 credits.

567, 568. SCULPTURE

A studio course that investigates, through a variety of sculptural media, basic three-dimensional elements such as form, mass, texture, color, rhythm, positive-negative space, balance, variety, etc. Prerequisite: Arts 434. Elective by permission. 2 laboratories; 4 credits.

The Arts

601. CERAMICS

Intensified development and problem solving with the ceramic media. Individual problems assigned. Prerequisite: Arts 501 and 502. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

625. WOOD/ENVIRONMENTAL DESIGN

An advanced course in the design and construction of human surroundings. Portfolio and thesis required. Prerequisite: Arts 525-526. Elective by permission. 2 laboratories; 4 credits.

667. CASTING

A course designed for students whose major emphasis of study is in a three-dimensional discipline. The production of wax models, venting, investing, casting, chasing, and mounting of finished work will provide the student with an opportunity to carry on independent experimentation and study within the medium of cast bronze and aluminum sculpture. Prerequisite: Arts 567 or 525 or 501 or 502 or 568 or 513. Elective by permission. 2 laboratories; 4 credits.

668, 669. ADVANCED SCULPTURE

A course for advanced students in sculpture who have sufficient background to perform individual and independent research into technical and aesthetic solutions of contemporary problems. Individual criticism. Prerequisite: Arts 567, 568, and 667. Elective by permission. Laboratories arranged; 4 credits.

Two-Dimensional Courses

419. WEAVING

An introductory course in hand weaving using 2-12 harness looms and tapestry frame. Design and weaving of fabrics, table linens, rugs, and hangings. A 4-harness pattern workshop included. Elective by permission. 2 laboratories; 4 credits. Second semester this course is open to Occupational Therapy majors only for 2 credits. Cost of materials for projects varies from \$10 to \$50.

431. VISUAL STUDIES

A studio course exploring fundamental composition problems related to 2-dimensional art forms using black and white and color. Elective by permission. 2 laboratories; 4 credits.

432. DRAWING I

A studio drawing course that investigates, through a variety of drawing approaches, basic visual elements such as form, line, space, texture, composition, etc. Elective by permission. 2 laboratories; 4 credits.

433. COLOR

A basic studio course designed to heighten the student's visual perception of color by investigating its behavior and interaction in two-dimensional space. A variety of problems will deal with illusion, optical mixture, interpenetration, transparency, after image, color change, etc., and will be explored through the medium of collage. Elective by permission. 2 laboratories; 4 credits.

451. INTRODUCTION TO PHOTOGRAPHY

The basic theory and practice of photography, covering equipment and materials, camera operation, developing, and printing. Creative solutions are sought to problems designed to increase the student's perception. Elective by permission. 1 lecture; 1 laboratory; 4 credits.

455. DRAFTING AND ARCHITECTURAL DESIGN

Basic drafting procedures, including lettering. Study of architectural symbols and interpretation of architectural plans. Problems of architectural design with emphasis on space utilization and space planning. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

532. DRAWING II

An extensive course in drawing in studio and from nature; still life and figure drawing in pencil, pen and ink, chalk, and charcoal, etc. Objective drawing as a means of seeing and expressive use of the media will be stressed. Prerequisite: Arts 432 and elective by permission. 2 laboratories; 4 credits.

533. DRAWING III

A studio drawing course concentrating on the figure with assigned drawing projects. Prerequisite: Arts 532. Intermediate Drawing. Elective by permission. 2 laboratories; 4 credits.

534. DRAWING IV

An advanced drawing course that while based on weekly compositional assignments will concern itself primarily with the individual student. The course will lead toward conceptual exercises using mixed media. Prerequisite: Arts 533. Elective by permission. 2 laboratories; 4 credits.

536. INTRODUCTORY PRINTMAKING

A basic graphics course studying a range of media and executing prints using wood, metal, and plastic. Prerequisite: Arts 532 and elective by permission. 2 laboratories; 4 credits.

537. LITHOGRAPHY AND SERIGRAPHY

Expression and experimentation in two graphic techniques: Lithography in black and white and further exploration in color, and Serigraphy (Silk Screen) in black and white plus color; various film, stencil, glue and tusche resists. Elective by permission. (Offered alternate years.) 4 credits.

542. BEGINNING OIL PAINTING

An introductory studio course in oil painting. Use of the media, color, and composition are studied in still life, figure, landscape, and conceptual assignments. Normally this course follows and continues the experience of Arts 532. Elective by permission. 2 laboratories; 4 credits.

547, 548. INTERMEDIATE PAINTING

An intermediate level studio course designed to continue Arts 532, 542. A further exploration on the aspects of composition, color, and conceptualization as introduced in Beginning Oil Painting 542. Elective by permission. 2 laboratories; 4 credits.

544. WATER MEDIA

A studio course dealing with various water media, transparent and opaque, with emphasis on watercolor and inks. Tempera and polyvinal will also be introduced. Prerequisite: Arts 532 and elective by permission. 2 laboratories; 4 credits.

545. WATER MEDIA II

A continuation and development of the various water media experiences of Arts 544 with the introduction of Egg Tempera and mixed Media. Prerequisite: Arts 544. Elective by permission. 2 laboratories; 4 credits.

551. INTERMEDIATE PHOTOGRAPHY

Introduction to the basic theory and practice of color photography. Discussions and demonstrations of special camera and laboratory controls for creative photography. Projects may be executed in black and white or color. A portfolio of photographs and a term paper will be required at the end of the semester. Prerequisite: Arts 451 and elective by permission. 1 laboratory; 4 credits.

The Arts

636. INTAGLIO WORKSHOP

A graphic workshop concentrating on the techniques and problems of intaglio printmaking; drypoint, etching, aquatint, engraving, and collography, with emphasis on means toward the expression of individual imagery through these media. Prerequisite: Arts 536, Introductory Printmaking. Elective by permission. 2 laboratories; 4 credits.

643, 644. ADVANCED PAINTING

An advanced studio course in which the student is expected to work independently on assigned projects and with individual criticism. This course may be taken a second time with emphasis on the particular need of the individual. Prerequisite: Arts 542 and 547, 548. Elective by permission. Laboratories arranged; 4 credits.

651. ADVANCED PHOTOGRAPHY

A course for the serious student of photography. Application of new materials and controls to projects designed for the individual student. Color and/or black and white. Emphasis on the graphic expression of a personal point of view. A portfolio of photographs will be required at the end of the semester. Weekly seminars and group critiques. Elective by permission. Prerequisite: Arts 451, 551. 1 4-hour laboratory. It is recommended that students provide their own camera equipment. 4 credits.

796. PROBLEMS IN THE VISUAL ARTS

Advanced students may select a special problem in one of the visual arts; i.e., (1) Photography, (2) Sculpture, (3) Drawing, (4) Painting, (5) Graphics, (6) Water Media, (7) Drafting and Architectural Design, (8) Art Education, (9) Curatorial Assistant, (10) Art History, (11) Ceramics, (12) Jewelry and Metalsmithing, (13) Weaving, or (14) Wood Design, in which they have exhibited proficiency, to be developed by means of conferences and studio work. Prerequisite: permission of department chairman. Hours to be arranged. Credits to be arranged. This course may be repeated to a total of not more than 8 credits.

798. SEMINAR IN THE VISUAL ARTS

Seminar designed to provide a forum for synthesizing visual experiences. Students will explore intellectual assumptions underlying works of art. Readings, discussions, viewings, and written papers. Required of all students in the B.F.A. program. Other advanced students may elect with instructor's permission. 1 laboratory; 4 credits.

History of Art

475, 476. INTRODUCTION TO THE ARTS

A broad survey of the history of Western Art. Prehistoric through Gothic, first semester; Gothic through twentieth century, second semester. 4 credits.

577. NINETEENTH CENTURY PAINTING AND SCULPTURE

The history of European painting and sculpture from the French Revolution to the late nineteenth century. Prerequisite: Arts 476 or permission of instructor. 4 credits.

578. TWENTIETH CENTURY PAINTING AND SCULPTURE

The history of European painting and sculpture from the late 19th century to the present. Prerequisite: Arts 476 or permission of instructor. 4 credits.

582. CLASSICAL ART

A survey of the monuments in Greece and Rome covering the following periods: archaic, classical, and Hellenistic in Greece, and the area influenced by Greek culture; late Republican and Imperial Rome. Significant works from about the mid-eighteenth century B.C. to the second and third centuries. A.D. are analyzed chronologically. A comprehensive picture of the classical achievement, primarily in architecture and sculpture, and modern debts to the past. Prerequisite: Arts 475 or permission of instructor. 4 credits. (Alternate years.)

583. PRIMITIVE AND ORIENTAL ART

An inquiry into the origins of art in pre-history, an investigation of the art of selected primitive cultures, and a study of Oriental art concentrating on the pictorial development of China and Japan. This course is primarily concerned with the evolution of pictorial and sculptural images essentially foreign to the classic western tradition. 4 credits. (Alternate years.)

585. AMERICAN ARCHITECTURE

A chronological survey of architecture in the United States from earliest Colonial times to the present. Architectural field trips in New Hampshire, Massachusetts, and Maine. 4 credits (Alternate Years.)

586. AMERICAN ART

A chronological survey of painting and sculpture in the United States from the Colonial period to the present, with particular attention to works from collections in New Hampshire and Massachusetts. Prerequisite: Arts 476 or permission of instructor. 4 credits.

587. BAROQUE ART

A survey of the arts of the seventeenth century. The course will focus on painting, sculpture, and architecture in Italy and France; painting in Spain and Lowlands; and architecture in England. Prerequisite: Arts 476 or permission of instructor. 4 credits.

588. MODERN ARCHITECTURE

Study of the major trends in European and American Architecture and city planning since the mid-nineteenth century. Directions in contemporary architecture. Visits with architects to contemporary buildings in the area. 4 credits. (Alternate years.)

589. ITALIAN RENAISSANCE ART I

A survey of painting, sculpture and architecture of Trecento and Quattrocento. Emphasis on Giotto, Masaccio, Piero della Francesca, Alberti, Brunelleschi, Ghiberti, Donatello, Mantegna, and Bellini. Prerequisite: Arts 476 or permission of instructor. 4 credits.

590. ITALIAN RENAISSANCE ART II

A continuation of Arts 589. Emphasis on the major figures of the High Renaissance: Bramante, Leonardo, Raphael, Michelangelo, and Titian. Prerequisite: Arts 476 or permission of instructor. 4 credits.

684. MEDIEVAL ART

A survey of the vast material of the Middle Ages, from the first and second centuries A.D. to the fourteenth century, covering architecture, sculpture, mosaics, manuscripts, and the minor arts. The transitional character of this vast period will be stressed, as well as its dependence upon the antique past. Architecture and the more minor arts will be accented. Prerequisite: Arts 475 or permission of instructor. 4 credits. (Alternate years.)

686. NORTHERN PAINTING

The development of painting in France, Germany, and the Lowlands from the manuscript illuminators of the fourteenth century to Durer and Holbein in the sixteenth century. Prerequisite: Arts 476 or permission of instructor. 4 credits.

797. SEMINAR IN ART HISTORY

Selected topics in the History of Art which will vary. Open to advanced under-graduate students. Required of Arts Majors selecting Art History option. Topics will be announced prior to registration. Prerequisite: permission of instructor. May be taken more than once with permission of adviser. 4 credits.

Biochemistry

Art Education

491. CONTEMPORARY MEDIA

The uses of contemporary media such as film, slides, tapes, light shows, and television in the classroom will be discussed. Students will explore the possibilities for creative expression using these media. The course will consist of field trips, lectures, and studio experiences. Prerequisite: permission of instructor. 4 credits.

493. INTRODUCTION TO ART EDUCATION

A course designed to acquaint students with the philosophies, methodologies, and practices of art education in public schools. The course will consist of in-school experiences, lectures, seminars, and studio practices. Special emphasis is placed on developing techniques for fostering creative art experiences in the schools. Elective by permission. 4 credits.

791. PROBLEMS OF TEACHING ART IN SECONDARY SCHOOLS

The purpose and objectives of teaching art in the secondary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the secondary-school art program. Prerequisite: Art-Education 792 with a grade of C or better. Elective by permission. 2 lectures; 1 laboratory; 4 credits.

792. PROBLEMS OF TEACHING ART IN ELEMENTARY SCHOOLS

The purposes and objectives of teaching art in elementary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the elementary schools. Elective by permission. 1 lecture; 1 recitation; 2 laboratories; 4 credits.

Biochemistry (18)

Chairman: Edward J. Herbst

PROFESSORS: Thomas G. Phillips, *emeritus*; Stanley R. Shimer, *emeritus*; Donald M. Green, Edward J. Herbst, Miyoshi Ikawa, Douglas G. Routley, Samuel C. Smith, Arthur E. Teeri

ASSOCIATE PROFESSORS: Gerald L. Klippenstein, James A. Stewart

402. BIOCHEMISTRY AND MAN

This course, designed to be of interest to all students, will examine the biochemical principles man uses to modify his existence. The biochemical basis of disease treatment and prevention, nutrition, industrial processing, food manufacture, and the role played by biochemical reactions in pollution and its control are among the topics covered. Prerequisite: secondary school level general chemistry. Mr. Green. 3 lectures; 4 credits.

501. BIOLOGICAL CHEMISTRY

An introduction to organic and biological chemistry. Mr. Teeri. Prerequisite: one semester of chemistry or equivalent. 3 lectures; 1 laboratory; 4 credits.

601. GENERAL BIOCHEMISTRY

An introduction to the general principles of biochemistry. Mr. Ikawa. Prerequisite: elementary organic chemistry. 3 lectures; 1 laboratory; 4 credits.

656. PHYSIOLOGICAL CHEMISTRY AND NUTRITION

An introductory biochemistry course with emphasis on human physiological chemistry and nutrition. The laboratory includes a study of procedures basic to chemical methods used in medical diagnostic work. Mr. Teeri. Prerequisite: satisfactory preparation in organic chemistry. 3 lectures; 1 laboratory; 4 credits.

699 (699). SENIOR THESIS

Participation in research in biochemistry. For seniors majoring in biochemistry who have completed Biochemistry 751. Staff. 2 credits.

702. COMPARATIVE MARINE BIOCHEMISTRY

The nutrition, metabolism, and composition of marine organisms. Special aspects, such as pigments, toxins, hormones, and luminescence, will also be considered. Mr. Ikawa. Prerequisite: Biochemistry 601 or equivalent. 2 lectures; 2 credits.

722. NEUROCHEMISTRY

A study of those aspects of biochemistry unique to the nervous system. Among the topics to be considered are: metabolism; alterations in normal brain chemistry produced by chemicals, drugs, nutrition, memory and learning, and pathological changes. Prerequisite: a course in organic chemistry. A course in biochemistry will be helpful but is not a prerequisite. Mr. Stewart. 4 credits. (Alternate years; offered in 1975-76.)

751. PRINCIPLES OF BIOCHEMISTRY

The fundamental principles of biochemistry with emphasis on the chemistry, metabolism, and biological function of nucleic acids, proteins, carbohydrates, and lipids. Mr. Klippenstein and Mr. Stewart. Prerequisite: one year of organic chemistry or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

752. TOPICS IN BIOCHEMISTRY

A detailed consideration of metabolism and of current developments in biochemistry. Staff and guest lecturers. Prerequisite: Biochemistry 751. 2 lectures; 2 credits.

760. ENZYME CHEMISTRY

The structure, properties, and function of enzymes; the kinetics and mechanisms of enzyme-catalyzed reactions; and the methods used in purification, characterization, and assay of enzymes. Mr. Klippenstein. Prerequisite: a course in general biochemistry. 3 lectures; 1 laboratory; 4 credits. (Not offered in 1974-75.)

762. PLANT METABOLISM

The function, occurrence, synthesis, and degradation of plant constituents. Emphasis is placed on respiration and photosynthesis and the metabolism of nitrogenous and aromatic compounds. Biochemical mechanisms such as those involved in seed dormancy, fruit ripening, and disease resistance are discussed in relation to their roles in plant survival. Mr. Routley. Prerequisite: Biochemistry 751 or equivalent. 2 or 4 credits.

770. BIOCHEMICAL GENETICS

The biochemical mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Mr. Green. Prerequisite: Biochemistry 751 or permission of instructor. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered in 1975-76.)

781. THE NUCLEIC ACIDS

The chemistry and metabolism of the nucleic acids: molecular structures, purification and separation procedures, synthesis and biosynthesis, and the biological functions of the nucleic acids. Mr. Herbst. Prerequisite: organic chemistry and biochemistry. 3 lectures; 3 credits.

795, 796. INVESTIGATIONS IN BIOCHEMISTRY

Staff. Prerequisite: permission of instructor. Subject matter and hours to be arranged. 2 credits.

Biology

Biology (60)

Courses coordinated by the Chairman of the Biological Sciences Division,
College of Liberal Arts

The following courses (excepting Biology 541, 543, and 791) are intended primarily for the non-major and to satisfy the distribution requirement for science.

401. HUMAN BIOLOGY

An elementary consideration of the structure, function, and development of the systems of the human body. 4 credits. *No credit toward a major or minor.* Students who have received credit for Zoology 507-508 cannot receive credit for Biology 401.

(402) 402. MAN AND HIS ENVIRONMENT

Elementary considerations of biological principles from selected areas in population and ecosystem ecology, exploring their impact on the living and non-living worlds; man's modification of his environment and its consequences. 4 credits. *No credit toward a major or a minor.* Students who have received credit for Biology 541 or 641 cannot receive credit for Biology 402.

(403). THE LIVING WORLD

A basic course in general biology: survey of plant and animal kingdoms and elementary principles of heredity, evolution, and ecology. 4 credits. *No credit toward a major or minor.*

404. HEREDITY AND MAN

The genetic basis for variation, with emphasis given to human inheritance. Topics include normal and abnormal chromosome complements, the mutable gene and its relation to expression, including genetic diseases, and the genetic material in evolution. 4 credits. *No credit toward a major or minor.* Students who have received credit for Zoology 604 cannot receive credit for Biology 404.

(407). CONCEPTS IN CELL BIOLOGY

An experimental and historical approach to selected topics in cell biology. Emphasis will be placed on those cell structures which play an important role in the development of the adult organism from the egg. Within this context, the philosophy and practical limitations of research in biology will be considered. 4 credits. *No credit toward a major or minor.*

409 (409). HUMAN REPRODUCTIVE BIOLOGY

Consideration of all aspects of human sexuality from anatomical, physiological, and a variety of other viewpoints. Emphasis on those aspects of greatest concern to college-age students. 4 credits. *No credit toward a major or minor.*

420. MAN, NATURE, AND DISEASE

An introduction to the ecology of human disease with emphasis on the role of disease in history as well as the biological, social, and economic problems involved in eradication and control. Particular attention will be paid to diseases that still account for serious sickness and mortality in overpopulated, underdeveloped countries. 4 credits.

541 (541). GENERAL ECOLOGY

Interrelationships between organisms and their physical environment, population growth, structure, and species interactions; introduction to the ecosystem; energetics, succession and structure, with examples drawn from marine, freshwater, and terrestrial habitats. Prerequisites: introductory chemistry, Botany 411, Zoology 412, or equivalent. 4 credits.

Botany and Plant Pathology

543 (543). FIELD ECOLOGY

Consideration of ecological principles through exercises in selected natural habitats and in the laboratory. The ability to analyze, quantify, and synthesize ecological information will be stressed. Prerequisites: Math 427 or statistics or equivalent, present or prior enrollment in Biology 541, and permission of instructor. 1 laboratory; 2 credits.

791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL BIOLOGY

Objectives and methods of teaching. The selection and organization of materials, preparation of visual aids, setting up of aquaria and other projects. The use of the field trip as a tool in teaching high school biology. Prerequisite: two years of biological science and permission of instructor. 4 credits.

Botany and Plant Pathology (19)

Acting Chairman: Robert O. Blanchard

PROFESSORS: Stuart Dunn, *emeritus*; Charlotte G. Nast, *emerita*; Albion Hodgdon, Avery Rich, Richard Schreiber

ADJUNCT PROFESSOR: Alex L. Shigo

ASSOCIATE PROFESSOR: Arthur C. Mathieson

ASSISTANT PROFESSORS: Marion E. Mills, *emerita*; Alan L. Baker, May Biggs-Haugstad, Robert Blanchard, A. Linn Bogle, Russell Kinerson, William MacHardy

ADJUNCT ASSISTANT PROFESSOR: Terry Tattar

411 (411). GENERAL BOTANY

An introduction to plant science. The evolution of structure and function in the plant kingdom. Mr. Schreiber, Ms. Biggs-Haugstad. 3 lectures; 1 laboratory; 4 credits.

503. THE PLANT WORLD

Presenting a survey of the plant kingdom from an evolutionary point of view, beginning at the level of single-celled plants and tracing the development of structure and function of plant organs in, and inter-relationships of, the major groups of plants. Mr. Bogle. Prerequisite: Botany 411 (or equivalent with permission of instructor). 2 lectures; 2 laboratories; 4 credits.

525. INTRODUCTION TO MARINE BOTANY

The life history, classification, and ecology of marine macroscopic and microscopic plants, including phytoplankton, sea weed, and salt-marsh plants. The course is divided into three equal portions; microscopic marine plants, macroscopic marine plants, and the interactions between man and marine plant communities. Several optional Saturday morning field trips will be offered. Prerequisite: either Botany 411, a semester of Biology, or permission of instructor. Staff. 3 lectures; 1 laboratory; 4 credits.

566. SYSTEMATIC BOTANY

The scientific basis of plant taxonomy and the identification and classification of our native trees, shrubs, and wild flowers. Mr. Hodgdon. Prerequisite: one semester of biological science. 2 lectures; 2 laboratories; 4 credits.

606. PLANT PHYSIOLOGY

An introduction to the function of higher plants with an emphasis on water relations, metabolism, growth, and development. Ms. Biggs-Haugstad and Mr. Pollard. Prerequisite: Botany 411, 503, or Plant Science 421 and one year of chemistry or permission of the instructor. 3 lectures; 1 laboratory; 4 credits.

Botany and Plant Pathology

717. GENERAL LIMNOLOGY

An introduction to the special relationships of freshwater organisms to the chemical, physical, and biological aspects of their aquatic environment. Emphasis on factors regulating the distribution of organisms and primary and secondary productivity of lakes. Mr. Baker and Mr. Haney. Prerequisites: Biology 541 or equivalent. 3 lectures; individual project; 4 credits.

719. FIELD LIMNOLOGY

Principles of freshwater ecology are examined through laboratories and exercises dealing with a variety of freshwater habitats. Stress is placed on the methods used to study freshwater lakes and interpretation of data. Includes a seminar series and occasional Saturday field trips. Mr. Baker and Mr. Haney. Prerequisites: prior or simultaneous enrollment in Botany 717 and permission of instructor. 2 laboratories; 1 seminar; occasional Saturday field trips; 3 credits.

721. FRESHWATER PHYCOLOGY

Identification, classification, ecology, and life histories of the major groups of freshwater algae. Periodic field trips will be scheduled throughout the semester. Mr. Baker. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits.

722. MARINE PHYCOLOGY

Identification, classification, ecology, and life histories of the major groups of marine algae. Particular emphasis will be placed upon the benthonic, marine algae of New England. Laboratories will include field trips during the latter portion of the course. Mr. Mathieson. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits. (Alternate years; not offered in 1974-75.)

723. MARINE ALGAL ECOLOGY

The distribution, abundance, and growth of marine plants in relation to their environment (chemical, physical, and biological). The students will be expected to attend regular, planned field trips and to conduct an independent research project. Mr. Mathieson. Prerequisite: Botany 722, Zoology 715, or permission of instructor. 2 lectures; 1 laboratory; field trips; 4 credits. (Alternate years; offered in 1974-75.)

724. FRESHWATER ALGAL ECOLOGY

Fresh-water algal habitats, the principles prerequisite to understanding man's impact on algal communities of lakes and streams. Winter and spring field problems will be carried out. Mr. Baker. Prerequisite: Botany 721 or permission of instructor. 2 lectures; 2 laboratories; 4 credits.

727. INTRODUCTION TO MARINE PHYTOPLANKTON

A study of the taxonomy and life histories of marine phytoplankton from fresh and preserved marine plankton collections. Cultural techniques and current methods for assessing standing crop and productivity will be studied. Staff. 2 lectures; 2 laboratories; 4 credits.

728. MARINE PHYTOPLANKTON ECOLOGY

Study of spatial and temporal distribution of phytoplankton populations in oceans and estuaries with emphasis on interactions with the physical, chemical, and biological aspects of their environment. Laboratories will cover methods of collecting and evaluating phytoplankton populations. Staff. 2 lectures; 2 laboratories; 4 credits.

732. CELL BIOLOGY

The structure, physiological behavior, and development of cells. The cellular basis of heredity. Mr. Schreiber. Prerequisite: one year each of the biological sciences and of chemistry. 3 lectures; 1 seminar; 4 credits.

735. CELL PHYSIOLOGY (PLANT)

The functions of living cells with emphasis on algal cells. Ms. Biggs-Haugstad. Prerequisite: one year of general chemistry and one year of biological sciences; or permission of instructor. 2 lectures; 2 laboratories; 4 credits.

741. ECOSYSTEM ANALYSIS

Description of ecosystems with respect to: community components, ecosystem development, and biogeochemical cycles. Methods of analysis and interpretation of field data. Mr. Kinerson. Prerequisite: Biology 541 or permission of instructor. 1 lecture; 1 laboratory; 1 colloquium; 4 credits.

742. PHYSIOLOGICAL ECOLOGY

The physiological basis of plant-environment interactions will be considered for cellular, whole plant, and population processes. Biometeorology, physiological adaptation and variation, evolution of ecotypes, growth and reproductive phenomena, and mathematical simulation of plant processes will be included. Mr. Kinerson. Prerequisite: Botany 606 or permission of instructor. 1 lecture; 1 laboratory; 1 colloquium; 4 credits.

747. AQUATIC HIGHER PLANTS

A survey of flowering plants, fern relatives, and Bryophytes found in and about bodies of water in northeastern United States. Extensive field work, preparation techniques, representative collections, herbarium work, lectures, and discussions. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture; 1 colloquium; 1 half-day laboratory; 4 credits. (Offered in 1974-75.)

751. PLANT PATHOLOGY

The nature of disease in plants; the symptomatology, etiology, and classification of plant diseases. Mr. Rich. Prerequisite: Botany 411 or 503 or equivalent. 2 lectures; 2 laboratories; 4 credits.

752. MYCOLOGY

Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Living specimens from all groups will be examined. Techniques in preparing pure cultures will be stressed. Mr. Blanchard. Prerequisite: Botany 411 or Botany 503, or equivalent. 2 lectures; 2 laboratories; 4 credits. (Alternate years; not offered in 1974-75.)

753. FOREST PATHOLOGY

Forest and shade tree diseases: principles, etiology, epidemiology, and control. Mr. Blanchard. Prerequisite: Botany 411 or Botany 503, or equivalent. 2 lectures; 2 laboratories; 4 credits.

(754). PRINCIPLES OF PLANT DISEASE CONTROL

Exclusion, eradication, protection, immunization, and the specific practical methods used to control plant diseases. Mr. MacHardy. Prerequisite: Botany 751 or 753. 2 lectures; 2 laboratories; 4 credits. (Alternate years; not offered in 1974-75.)

758. PLANT ANATOMY

The anatomy of vascular plants with special emphasis upon tissue development and structure. Mr. Bogle. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits. (Alternate years; offered in 1974-75.)

762. MORPHOLOGY OF THE VASCULAR PLANTS

The life histories and evolution of the extinct and living vascular plants, including comparisons of general structure and sexual organs. Mr. Bogle. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits. (Alternate years; not offered in 1974-75.)

Chemical Engineering

764. MICROTECHNIQUE

A methods course in embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Mr. Bogle. Prerequisite: permission of instructor. 2 lectures; 4 hours of laboratory; 4 credits. (Alternate years; offered in 1974-75.)

767. ADVANCED SYSTEMATIC BOTANY

The principles and rules of plant classification and nomenclature, study of plant families, field and herbarium work. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture; 1 colloquium; 1 laboratory (full afternoon); 4 credits. (Alternate years; not offered in 1974-75.)

795-796. INVESTIGATIONS IN: 1) SYSTEMATIC BOTANY, 2) PLANT PHYSIOLOGY, 3) PLANT PATHOLOGY, 4) PLANT ANATOMY, 5) PLANT ECOLOGY, 6) MYCOLOGY, 7) CELL BIOLOGY, 8) PHYCOLOGY, 9) BOTANICAL TEACHING, 10) MORPHOLOGY, 11) CELL PHYSIOLOGY, 12) SCIENTIFIC WRITING

Individual projects under faculty guidance. Elective only by permission of the appropriate instructor. Hours to be arranged. 2 or 4 credits.

799. BOTANY SEMINAR

Presentation and discussion of oral reports on research with practice in use of visual aids. Participation by all resident departmental majors. Botany Club in charge. 1 hourly session per week; 0 credit.

Chemical Engineering (46)

Chairman: Stephen S. T. Fan

PROFESSORS: Irvin Lavine, *emeritus*; Oswald T. Zimmerman, *emeritus*

VISITING PROFESSOR: Yin-Chao Yen

ASSOCIATE PROFESSOR: Stephen S. T. Fan

ASSISTANT PROFESSORS: Steven M. Slater, Robert S. Torrest, Gail D. Ulrich

INSTRUCTOR: Stephen D. Foss

410. SURVEY OF CURRENT ENERGY AND POLLUTION ISSUES

A comprehensive presentation of the energy supply situation in this country and in the world. Survey and discussion of reserves of conventional fuel sources, e.g. coal, oil, natural gas. Consideration of alternative sources, e.g. nuclear and solar. Forecasts of energy needs and strategies to meet these needs. A comprehensive survey of major forms of environmental pollution with emphasis on air and water pollution. Examination of sources of pollution, their economic and environmental impacts and methods for their control. Discussion of regulatory standards for air and water quality. Prerequisite: good background in high school chemistry. 3 lectures; 1 recitation; 4 credits.

501. INTRODUCTION TO CHEMICAL ENGINEERING I

An overview of the profession; the presentation and interpretation of engineering data; introduction to systems of units; dimensional analysis and heat and material balance; computer programming. 2 credits.

502. INTRODUCTION TO CHEMICAL ENGINEERING II

A study of chemical equilibrium and heats of reaction needed to describe systems undergoing chemical change; an intensive treatment of heat and material balances on complex systems. 4 credits.

- 601. FLUID MECHANICS AND UNIT OPERATIONS**
Development of the continuity, momentum, and energy equations; laminar and turbulent flow in pipes and boundary layers; rheology. Applications to unit operations including flow in porous media, filtration, and fluidization. 3 lectures; 1 laboratory; 4 credits.
- 602. HEAT TRANSFER AND UNIT OPERATIONS**
Thermal properties of materials, steady-state and transient conduction and convection; applications to heat exchangers and process equipment. 3 lectures; 1 laboratory; 4 credits.
- 603. APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS**
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations. Series solutions, Bessel functions, Laplace transforms. Matrix algebra. Interpretation and solution of partial differential equations. 3 lectures; 1 laboratory; 4 credits.
- 604. CHEMICAL ENGINEERING THERMODYNAMICS**
The thermal properties of matter; the first law; the second law; useful thermodynamic functions; behavior of ideal and real gases and liquids; volumetric and phase behavior; cycles; steady-flow processes; compression of gases; refrigeration and liquefaction of gases. 3 lectures; 1 recitation; 4 credits.
- 605. MASS TRANSFER AND STAGewise OPERATIONS**
Diffusion in gases, liquids, and solids; mass transfer phenomena including stagewise operation; design and analysis of process equipment. 3 lectures; 1 laboratory; 4 credits.
- 606. CHEMICAL ENGINEERING KINETICS**
Study of chemical kinetics and the use of laboratory data to design commercial reactors. Analysis of continuous, batch, plug-flow, and well-stirred reactors for homogeneous and catalytic multiphase reactions. 3 lectures; 1 laboratory; 4 credits.
- 607. PHYSICAL METALLURGY**
An introductory study of the nature of metals, emphasizing the quantum mechanical description of the solid state and including atomic structure, bonding, historical development of metal theories, elementary zone or band theory, and X-ray diffraction. The microscopic metal system, thermodynamics of metallurgical processes, defects and dislocations, phase relations of pure metals and alloys, microstructure, and physical and thermal treatment of metals. Study of some non-metals. 3 lectures; 1 laboratory; 4 credits.
- 608. CHEMICAL ENGINEERING DESIGN**
The principles of cost engineering, including estimation of plant investment, working capital, operating costs, labor requirements, payout time and profitability, value of money, capitalized costs, simple and compound interest, depreciation, taxes and insurance, overhead, financing of chemical enterprises, design of equipment and plants for minimum cost, plant location, transportation, sales cost, equipment cost, and cost indexes. Each class selects one or more problems involving the complete design of a chemical plant. For each problem, the most desirable process must be determined; the site selected; the equipment and plant designed; calculations made for all costs, profitability, and payout time; and a complete report prepared, including the drawings of equipment and plant layout. 1 lecture; 3 laboratories; 4 credits.
- 609. FUNDAMENTALS OF AIR POLLUTION AND ITS CONTROL**
The nature of air pollution sources, pollutant transfer, and effects. Discussion of regulatory, administrative, legal, and social aspects of air pollution, as well as engineering aspects of control. 4 credits.

Chemical Engineering

695. CHEMICAL ENGINEERING PROJECT

Each student selects a research problem which he carries out independently under faculty supervision. Intensive study in both the library and the laboratory and a satisfactory report upon completion of the work are required. 2-4 credits.

696. INDEPENDENT STUDY

Individual study projects in various areas of chemical engineering as determined to be of particular interest and value to the student. Permission of the student's adviser and department chairman are required. Permission will be granted only to those students who have proved their ability by superior scholastic achievement. 1-4 credits.

701. HIGH POLYMERS

Principles and practice of high polymer manufacture, including industrial polymerization methods and equipment design. Laboratory work includes typical polymerization reactions and the physical and chemical testing of various types of plastics and synthetic fibers. 3 lectures; 1 laboratory; 4 credits.

712. INTRODUCTION TO NUCLEAR ENGINEERING

The scientific and engineering development of nuclear reactors, including basic binding-energy physics, nuclear stability, radioactivity, the elements of nuclear reactor theory, and the engineering problems of heat transfer, fluid flow, materials selection, and shielding. 4 credits.

713. NUCLEAR CHEMICAL TECHNOLOGY

The design, construction, and operation of nuclear process equipment, including reactors and associated chemical processing facilities, and isotope separation plants. The technology of applied radiation chemistry. 3 credits.

750. INTRODUCTION TO PROCESS SIMULATION AND OPTIMIZATION

Analysis and numerical simulation of controlled chemical systems. Laplace transforms. Transient responses. Methods for solution of nonlinear equations. Simultaneous ordinary differential equations; Runge-Kutta, Crank-Nicholson methods. Steady state optimization: linear programming, classical search techniques. Unsteady state optimization: Pontryagin's maximum principle. 3 lectures; 1 recitation; 4 credits.

752. PROCESS DYNAMICS

A basic treatment of process dynamics, including a study of first- and second-order linear processes and their response to step and sinusoidal driving functions. Graphical analysis of the entire control system is included with special emphasis on the optimum design of a stable system. 4 credits.

762. INTRODUCTION TO OPTIMIZATION

Simulation and analysis of chemical systems. Numerical methods of solution. Nonlinear equations. Simultaneous ordinary differential equations: Runge-Kutta, Crank-Nicholson methods. Steady state optimization: linear programming, classical search techniques. Unsteady state optimization: Pontryagin's maximum principle. 4 credits.

772. PHYSICOCHEMICAL PROCESSES FOR WATER AND AIR QUALITY CONTROL

The origins and characterization of pollutants. Basic processes in water and air pollution control including filtration, sedimentation, coagulation and flocculation, adsorption and absorption. Elements of process fundamentals including applied fluid mechanics, mass transfer, and kinetics will be presented. Other topics will be thermal pollution, chemical treatment, oil spills on water, and aeration. 3 lectures; 1 laboratory; 4 credits.

Chemistry (47)Chairman: Alexander R. Amell

PROFESSORS: Harold A. Iddles, *emeritus*; Alexander R. Amell, Kenneth K. Andersen, Albert F. Daggett, Clarence L. Grant, Helmut M. Haendler, Paul R. Jones, Robert E. Lyle, James D. Morrison, Frank L. Pilar, Albert K. Sawyer

ASSOCIATE PROFESSORS: David W. Ellis, Colin D. Hubbard, Gloria G. Lyle, Charles W. Owens, J. John Uebel, James H. Weber, Charles M. Wheeler

ASSISTANT PROFESSOR: N. Dennis Chasteen

***401-402. GENERAL CHEMISTRY**

Elementary chemistry including laboratory work. The emphasis is on a largely nonmathematical, broad view of chemistry including topics of general interest appropriate for students who intend to take no additional chemistry course. Included are students whose major department requires this course, and those interested in satisfying a science requirement. Cannot be used as a prerequisite for other chemistry courses without permission of the chemistry department. 3 lectures; 1 laboratory; 4 credits.

***403-404. GENERAL CHEMISTRY**

The fundamental laws and conceptions of chemistry, including a study of the non-metals and metals and their compounds. The theoretical principles are illustrated by lecture demonstrations and the applications of chemistry in the professions are explained. For students who plan to take further courses in the Department of Chemistry. 3 lectures; 1 laboratory; 4 credits.

***405. INTRODUCTORY CHEMISTRY**

Discussion of the basic principles of chemistry, including atomic structure, bonding, equilibria, and thermodynamics, as the first course for chemistry majors. Presupposes secondary-school chemistry. Cannot be taken for credit if credit received for Chem. 403-404. 3 lectures; 1 laboratory; 4 credits.

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. This course introduces the principles and techniques of chemical analysis and is normally followed by a more advanced course in instrumental methods of chemical analysis. (Students must register for Chemistry 407 concurrently.) Prerequisite: Chemistry 404 or 405. 3 lectures; 3 credits.

407. QUANTITATIVE ANALYSIS LABORATORY

This course includes experimental work to familiarize the student with the techniques of weighing and titration, with more important techniques of gravimetric and volumetric analysis, and with certain instrumental methods of analysis. Treatment of data, error analysis, and calculations of results are emphasized. (Must be taken concurrently with Chemistry 406.) 1 laboratory; 2 credits.

409-410. BACKGROUND OF CHEMICAL IDEAS

The development of present-day chemical theories in their historical and philosophical context, and their relationships to other fields of human thought. The emphasis is on class discussion and concentrated study of topics of interest to the individual student. Cannot be used as prerequisite for other Chemistry courses. 3 lectures; 4 credits.

*Students may receive credit for only one course from 401, 403, 405 and 409, and for only one course from 402, 404, and 410.

Chemistry

517. QUANTITATIVE ANALYSIS

This course is designed to meet the needs of students planning to enter professional fields such as medicine, dentistry, plant and animal science, nursing, oceanography, and interdisciplinary areas concerned with environmental problems; all of these fields rely heavily on a sound knowledge of the principles and techniques of analytical chemistry. Gravimetric, volumetric, and instrumental methods are considered. Prerequisite: Chemistry 404 or 405. (Students must take Chemistry 518 concurrently.) 3 lectures; 3 credits.

518. QUANTITATIVE ANALYSIS LABORATORY

Experimental work with the techniques of weighing and titration, with illustrative gravimetric and volumetric determination, and with selected instrumental methods such as pH and potentiometry, spectrophotometry, atomic absorption, and gas chromatography. (Students must register for Chemistry 517 concurrently.) 1 laboratory; 2 credits.

545. ORGANIC CHEMISTRY

An introductory but comprehensive study of the chemistry of carbon compounds with emphasis on the particular phases of the subject needed by students preparing to be technicians, nurses, majors in biological sciences, and others, where a brief course is desired. Prerequisite: Chemistry 404 or 405. Elective for medical technology, nursing, and majors in botany. (Chemistry 546 must be taken concurrently.) 3 lectures; 3 credits. Students receiving credit for Chemistry 545 may not receive credit for Chemistry 547-548 or for Chemistry 651-652.

546. ORGANIC CHEMISTRY LABORATORY

(Must be taken concurrently with Chemistry 545.) 1 laboratory; 2 credits.

547-548. ORGANIC CHEMISTRY

The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. The use of group reactions for the identification of organic substances in a systematic scheme of qualitative organic analysis. Oriented towards the physical sciences. Intended primarily for chemistry and engineering majors. Prerequisite: Chemistry 404 or 405 or permission of instructor. (Chemistry 549-550 must be taken concurrently.) 3 lectures; 3 credits. Students receiving credit for Chemistry 547-548 may not receive credit for either Chemistry 545 or Chemistry 651-652.

549-550. ORGANIC CHEMISTRY LABORATORY

(Must be taken concurrently with Chemistry 547-548.) 1 laboratory; 2 credits.

651-652. ORGANIC CHEMISTRY

The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. Oriented toward biological and health sciences. Intended primarily for pre-healing-arts students. Prerequisite: Chemistry 404 or 405 or permission of instructor. Chemistry 653-654 must be taken concurrently. 3 lectures; 3 credits. Students receiving credit for Chemistry 651-652 may not receive credit for either Chemistry 545 or Chemistry 547-548.

653-654. ORGANIC CHEMISTRY LABORATORY

Laboratory exercises to accompany Chemistry 651-652. Students must take Chemistry 651-652 concurrently. 1 laboratory; 2 credits.

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES

Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radiochemical operations. Prerequisite: general inorganic chemistry and general physics. 3 lectures; 1 laboratory; 4 credits.

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. Prerequisite: Mathematics 428 and physics. Undergraduates must register for Chemistry 685-686 concurrently. 3 lectures; 3 credits.

685-686. PHYSICAL CHEMISTRY LABORATORY

Experimental work illustrating the principles of chemistry. Emphasis is upon the measurement of thermodynamic properties, chemical kinetics, and methods of determining the structure of matter. Prerequisite: Mathematics 428 and physics. Chemistry 683-684 must be taken concurrently. 1 laboratory; 2 credits.

696. INDEPENDENT STUDY

With the consent of the adviser and the departmental chairman, an exceptional student may enroll in a course of independent study. This may consist of individual reading, writing, or laboratory work, which will be carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry, with approval of the adviser and department chairman. Credits to be arranged.

697. CHEMICAL LITERATURE

The use of the chemistry library as a research tool. Prerequisite: Chemistry 548 or 652. 1 credit.

698. SEMINAR

Student reports on topics of interest. Prerequisite: Chemistry 548 or 652 and 684. 1 credit.

699. THESIS

The related background and experimental observation of the year's investigation in some selected subject is required. Members of the staff. For seniors in chemistry who have completed Chemistry 548, 762, 684, and having a grade point average of 2.5, or permission of adviser and department chairman. 5 laboratories; 4 credits. Credit/Fail.

708. RESEARCH TECHNIQUES

Lectures and laboratory to show experimental methods and interpretation of results. Topics include gas liquid chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, and X-ray. Staff. 1-3 credits.

755. ADVANCED ORGANIC CHEMISTRY

An advanced survey of methods of synthesis and determination of structure, including stereochemistry, of complex organic compounds. Structural emphasis being placed on the solution of assigned problems. The laboratory will be devoted to the synthesis and structural determination of complex organic compounds, techniques for the separation and determination of purity of unknown compounds, and the identification of these unknowns by spectroscopy and chemical means. Prerequisite Chemistry 547 or 651 or equivalent. (Students must register for Chemistry 756 concurrently.) 3 credits.

756. ADVANCED ORGANIC CHEMISTRY LABORATORY

Laboratory exercises to accompany Chemistry 755. (Must be taken concurrently with Chemistry 755.) 1 laboratory; 2 credits.

762. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

A treatment of the theory, instrumentation, and application of methods such as atomic absorption, conductimetry, coulometry, emission spectrography, gas chromatography, polarography, potentiometry, and spectrophotometry to chemical analysis. Prerequisite: Chemistry 406; Chemistry 684 as a prerequisite or concurrently or permission of instructor. (Students must register for Chemistry 763 concurrently.) 3 lectures; 3 credits.

Civil Engineering

763. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS LABORATORY

Instrumental design and operation, experimental parameters, error analysis, and the applications of the methods covered in Chemistry 762. (Must be taken concurrently with Chemistry 762.) 1 laboratory; 2 credits.

774. INORGANIC CHEMISTRY

The basic theoretical concepts of modern inorganic chemistry at a moderate level, and their applications to inorganic reactions and compounds. Prerequisite: Chemistry 683; Chemistry 684 pre- or corequisite; or permission of instructor. Undergraduates must take Chemistry 775 concurrently. 3 credits.

775. INORGANIC CHEMISTRY LABORATORY

Synthesis and characterization of inorganic compounds with an emphasis on techniques not taught in other laboratory courses. (Undergraduates must take Chemistry 774 concurrently.) 1 laboratory; 2 credits.

776. PHYSICAL CHEMISTRY III

Introduction to quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prerequisite: Chemistry 683. 4 credits.

Civil Engineering (48)

Chairman: Robert P. Vreeland

PROFESSORS: Russell R. Skelton, *emeritus*; Victor D. Azzi, Charles O. Dawson, J. Harold Zoller

ASSOCIATE PROFESSORS: Louis H. Klotz, Harold E. Langley, Jr., John P. Nielsen, Robert P. Vreeland, Tung-Ming Wang

ASSISTANT PROFESSOR: Paul L. Bishop

ADJUNCT ASSOCIATE PROFESSOR: Gerald H. Batchelder

400. CIVIL ENGINEERING LECTURES

An introduction to the profession of civil engineering; 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 Civil Engineering freshmen; open to others by permission of instructor. 1 lecture; 0 credit. NLG.

404. ENGINEERING COMPUTER APPLICATIONS

Application of computer programming to the solution of basic engineering problems, using FORTRAN IV, WATFORR, and WATFIV. An introduction to the use of Problem-Oriented-Languages such as COGO. Prerequisite: Mathematics 403 or equivalent. Two lectures; one recitation; 2 credits.

501. SURVEYING

A course for non-civil engineering students in the theory and use of tape, level, transit, and aerial photographs in making plane and topographic surveys. Use of surveys as a basis for deeds, maps, construction, design, environmental studies, and reports involving the use of land or other natural resources. No prerequisite. 2 lectures; 2 laboratories; 4 credits.

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 application to state plane coordinate systems. Prerequisite: Civil Engineering 404, Mathematics 427-428. 3 lectures; 2 laboratories; 4 credits.

508. ENGINEERING GRAPHICS

Concepts and practice in orthographic projection and fundamentals of descriptive geometry. 2 laboratories; 2 credits.

523-524. MECHANICS I AND II

The static and dynamic behavior of rigid and deformable bodies. Equilibrium, compatibility, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods; stress and deformation in materials and simple structural elements. Review of particle dynamics; kinematics and kinetics of rigid bodies in two and three dimensions. Prerequisite: Mathematics 427, Physics 407. 4 credits.

611. ENVIRONMENTAL PLANNING CONCEPTS

Course designed for students not in civil engineering. A nontechnical view of pressing urban and regional environmental problems, with an emphasis upon the common characteristics and interrelationships of these problems. Using a systems approach, the course focuses upon water quality and pollution, air pollution, thermal pollution, and transportation. Particular emphasis is upon new developments and approaches to these problems which will not be covered in engineering or mathematical detail. No prerequisites. Not open to civil engineering majors. 4 credits.

621. TRANSPORTATION PLANNING AND DESIGN

Determination of public needs for transportation. Planning of transportation systems, and the comparison and evaluation of alternative system modifications. Analysis of non-user impacts of transportation facilities. Geometric design and traffic capacity of highways. Prerequisite: civil engineering major or approval of instructor. 3 lectures; 1 laboratory; 4 credits.

622. ENGINEERING MATERIALS

The structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. An introduction to the micro-structure and properties of common metals, plastics, and ceramics. Prerequisite: junior standing. 3 lectures; 1 laboratory; 4 credits.

642. FLUID MECHANICS

Properties of fluids, fluid statics, flow of incompressible and compressible ideal fluids, flow of real fluids, measurement of fluid properties, and the characteristics of flow through various measuring devices. 3 lectures; 1 laboratory; 4 credits.

643. SANITARY ENGINEERING I

The sources, quantity, quality, and sanitary aspects of public water supplies, and distribution systems; and the theory and problem of sewerage. Prerequisite: Civil Engineering 642, Chemistry 403 or 405. 3 lectures; 1 laboratory; 4 credits.

665. SOIL MECHANICS

Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the principles underlying the behavior of soils subjected to various loading conditions. Prerequisite: Civil Engineering 622, 642. 3 lectures; 1 laboratory; 4 credits.

681. STRUCTURAL ANALYSIS

The analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. Prerequisite: Civil Engineering 523-524. 3 lectures; 1 design period; 4 credits.

Civil Engineering

682. STRUCTURAL DESIGN CONCEPTS

The basic elements of structural synthesis and design including modeling concepts for analysis-design cycles by manual and computer approaches, development of design criteria, and general structural system behavior. Prerequisite: Civil Engineering 681. 3 lectures; 1 design period; 4 credits.

685. INDETERMINATE STRUCTURES

The analysis of indeterminate structures, including non-prismatic members subject to static and moving loads. Solutions by classical, numerical, and computer applied methods. Prerequisite: Civil Engineering 681. 3 lectures; 1 design period; 4 credits.

695. CIVIL ENGINEERING PROJECTS

A course designed to encourage independent research, under faculty guidance, of a subject of particular interest to an individual or a small group. Prerequisite: approval of faculty member involved. 2-4 credits.

701. ADVANCED SURVEYING

Principles of instrumental and analytical photogrammetry. Theory of conformal mapping and its application to the state plane coordinate systems. Geodetic surveying. Error theory and its application to the planning and adjustment of surveys. Application of electronic computers to surveying calculations. Prerequisite: Civil Engineering 505. 3 lectures; 1 laboratory; 4 credits.

711. COMMUNITY PLANNING

An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable community planning programs—including purpose and scope; preliminary survey; elements of land planning; the master plan; transportation and circulation systems; street patterns and traffic; motor vehicle parking; airport sites; public building sites; parks and recreational facilities; zoning; control of land subdivision; neighborhood and shopping centers; housing, legal, financial, environmental and economic problems; and redevelopment of blighted areas. Prerequisite: permission of instructor. 4 lectures; 4 credits.

714. CONTRACTS, SPECIFICATIONS, AND PROFESSIONAL RELATIONS

The essential elements and legal requirements of engineering contracts; the purposes and content of specifications; professional conduct, relations, registration, and ethics. Construction planning and management; cost analysis based on quantity surveys and unit-cost methods. Prerequisite: permission of instructor. 4 lectures; 4 credits.

721. PAVEMENT DESIGN

Design of flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prerequisite: Civil Engineering 620 and 665. 3 lectures; 1 laboratory; 4 credits.

731. NETWORK PLANNING AND SCHEDULING

The application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. 1 lecture; 1 laboratory; 2 credits.

732. SYSTEMS ANALYSIS

An analysis of engineering projects encompassing social and economic criteria as well as engineering feasibility studies. 2 lectures; 2 credits.

744. SANITARY ENGINEERING II

The essential elements of water supply and wastewater disposal unit operation the processes. Prerequisite: Civil Engineering 643. 3 lectures; 1 laboratory; 4 credits.

745. HYDROLOGY AND HYDRAULICS

The occurrence and physical effects of water on the earth, including meteorology, ground-water runoff and stream-flow routing, open-channel flow, reservoirs, control works, hydroelectric power, irrigation, drainage, and multipurpose projects. Prerequisite: Civil Engineering 642. 4 lectures; 4 credits.

746. WASTEWATER TREATMENT PLANT DESIGN

A study of the fundamental factors affecting choice of treatment units. Design of the components of a wastewater treatment plant and the preparation of a plan for a particular city that comprises a suitable combination of the units previously designed. Prerequisite: Civil Engineering 744. 3 lectures; 1 design period; 4 credits.

747. WATER TREATMENT PLANT DESIGN

Concepts, principles, and theory of water treatment plant design using a water source for a particular city and developing a treatment system for that community. Prerequisite: Civil Engineering 744. 3 lectures; 1 design period; 4 credits.

748. SOLID WASTE DISPOSAL

Study of basic concepts and theory of solid waste collection and disposal systems. Design methods involved in disposal system. Prerequisite: Civil Engineering 643. 3 lectures; 1 design period; 4 credits.

751. TRANSPORTATION PLANNING

The techniques used to predict the demand for transportation services. The transportation planning process including trip generation, distribution, mode choice, network assignment, and system evaluation. The use of computer models to study transportation facilities in New England. Prerequisite: Civil Engineering 621 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

752. TRAFFIC ENGINEERING

The concepts and techniques used in designing for and controlling traffic flow. Among the topics covered are: traffic control, capacity and volume calculations, parking, highway safety, geometric design, and traffic flow models. The course focuses upon the design aspects and operational characteristics of traffic facilities. Prerequisites: Civil Engineering 621. 4 lectures; 4 credits.

753. URBAN AND REGIONAL SYSTEMS ANALYSIS METHODS

The mathematical techniques necessary in the analysis of urban and regional systems. Matrix operations, regression analysis, linear programming, network analysis, factor analysis, and stochastic systems. Emphasis on computer applications to regional systems in New England. Prerequisite: Mathematics 427 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

754. ANALYSIS OF URBAN AND REGIONAL SYSTEMS

The application of analytical techniques to regional systems in New England. Individual or group projects concerned with such systems as migration, transportation, health care, education, recreation, and sanitation. Prerequisite: Civil Engineering 753 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

763. ADVANCED SOIL MECHANICS I

The physical and mechanical properties of soil in relation to engineering structures. The theory of consolidation, shearing resistance, bearing capacity, settlement, slope stability, earth pressure, and seepage studies. Prerequisite: permission of instructor. 4 lectures; 4 credits.

765. FOUNDATION ENGINEERING

Application of the principles of soil mechanics to selection of the type of substructure; determination of allowable soil-bearing capacities based on rupture and

Communication Disorders

settlement theories; determination of active and passive earth pressures; and foundation construction methods. Computations by classical, numerical, and computer applied methods. Prerequisite: Civil Engineering 665, 682, and senior standing. 3 lectures; 1 design period; 4 credits.

768. SEEPAGE THROUGH EARTH STRUCTURES

Fundamentals of groundwater flow, Darcy's Law, flow nets, Dupuit's theory and application, conformal mapping techniques, confined flow, flow through earth and rock structures, seepage towards wells. Prerequisite: Civil Engineering 665 and Civil Engineering 642. 2 lectures; 2 credits.

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. Prerequisite: Civil Engineering 682 and permission of instructor. 1 lecture; 1 design period; 2 credits.

784. STRUCTURAL ANALYSIS BY MATRIX AND NUMERICAL METHODS

Presentation of a unifying concept of basic structural analysis theories, introduction to matrix and numerical methods of analysis, and their application by linear graph concepts using computers. Prerequisite: Civil Engineering 685. 3 lectures; 1 design period; 4 credits.

790. INELASTIC STRUCTURAL DESIGN

A continuation of modern design theory, ultimate design of reinforced concrete, and plastic analysis of steel structures. 4 lectures; 4 credits.

793, 794. ADVANCED STRUCTURAL DESIGN I AND II

The design in steel by elastic and plastic theories and in reinforced concrete by the working stress and ultimate strength methods for structural elements and connections using the appropriate controlling specifications. Prerequisite: Civil Engineering 682 or permission of instructor. 3 lectures; 1 design period; 4 credits.

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. 2-4 credits.

Classics

(See Spanish and Classics)

Communication Disorders (42)

Chairman: F. Harry Tokay

ASSOCIATE PROFESSORS: Frederick P. Murray, F. Harry Tokay

ASSISTANT PROFESSOR: Anthony S. Giles

LECTURER: Elena F. Stuart

520 (520). SURVEY OF COMMUNICATION DISORDERS

A survey of speech, language, and hearing disorders. Includes a brief introduction to etiology, diagnosis, and treatment of the major disorders of communication. 3 lectures; 1 laboratory; 4 credits.

Communication Disorders

- 521. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISM**
An indepth study of the anatomy, physiology, and neurology of the mechanisms important for the production of speech. The function of each mechanism will be investigated. 3 lectures; 4 credits.
- 524. APPLIED PHONETICS OF AMERICAN ENGLISH**
An introduction to phonetics through use of the international phonetic alphabet primarily in the analysis of the sounds of American English. Study and transcription of American and foreign dialects in conjunction with the professional interest of the student. 4 credits.
- 631. SPEECH PATHOLOGY I**
An examination of the etiology and treatment of the more common speech disorders. Emphasis is given to speech development, articulation problems, and stuttering. 4 credits.
- 632. SPEECH PATHOLOGY II**
The nature of speech disorders of psychological and physical origin. Identification, case-study method, observations, referral procedures, and rationales for therapy are discussed. Pertinent research is reviewed regarding aphasia, cerebral palsy, mental retardation, and emotional disturbance. Speech/voice/language therapy is considered in an interdisciplinary context. Prerequisite: Communication Disorders 631 or permission of instructor. 4 credits.
- 634 (634). CLINICAL PRACTICE IN SPEECH PATHOLOGY**
Supervised experience in diagnosis and therapy with speech-handicapped children and adults. Discussion and demonstrations of therapeutic procedures and practices. Initial experiences are provided with school-age children with articulation disorders in individual and group therapy. Prerequisites: Communication Disorders 524 and 632. 4 credits.
- 638. THE ACQUISITION OF LANGUAGE**
An examination of some of the research in the fields of speech pathology, linguistics, and learning theory as it relates to the development of language in the normal child. 4 credits.
- 650. PRINCIPLES AND PRACTICE OF PUBLIC SCHOOL SPEECH THERAPY**
An examination of the principles, goals, and philosophy of public school speech, language, and hearing therapy. Includes supervised practicum. Prerequisites: Communication Disorders 524 and 632. 3 lectures; 1 laboratory; 4 credits.
- 660 (660). SPECIAL PROBLEMS IN COMMUNICATION DISORDERS**
Individual or group projects to enrich or expand theoretical knowledge and to afford an opportunity of applied experience. By permission and arrangement with faculty. Variable credits of 2, 4, 6, or 8. May be repeated to a maximum of 8 credits.
- 704. BASIC AUDIOLOGY**
Introduction to clinical audiology stressing pure-tone and speech audiometry, the normal hearing process, and pathologies of hearing. Prerequisite: Communication Disorders 521 or permission of instructor. 4 credits.
- 705. INTRODUCTION TO AUDITORY PERCEPTION AND AURAL REHABILITATION**
Exploration of the research and testing procedures dealing with the phenomenon of auditory perception. Application of this knowledge to the communicatively impaired. Prerequisite: Communication Disorders 704 and permission of instructor. 4 credits.

Continuing Education

780. SEMINAR IN DIAGNOSIS OF SPEECH AND LANGUAGE DISORDERS

An examination of the philosophy and goals of diagnosis of speech and language disorders, with emphasis on development and prediction of therapeutic programs. Examination of related tests and measurement tools, including standardization methods and applicability to a clinical population of persons with speech and language disorders. Prerequisites: Communication Disorders 521, 631, 632. 4 credits.

(782). SEMINAR IN BEHAVIOR MODIFICATION OF SPEECH AND LANGUAGE DISORDERS

An examination of the application of operant conditioning and desensitization procedures to disorders of communication in therapy settings. Emphasis on interaction patterns involved in therapy utilizing a behavioral approach. Prerequisite: permission of instructor. 4 credits.

795 (795). INDEPENDENT STUDY

Application of the theory of specific communication-disorder areas for individual or group projects. May be repeated and taken for variable credits of 2, 4, 6, or 8. Prerequisite: permission of instructor.

Community Development

(See Institute of Natural and Environmental Resources)

Computer Science

(See Interdisciplinary Programs and Options and Math Program Description, Pages 128 and 95.)

Continuing Education Career Option Courses (90)

Director of Division of Continuing Education: Edward J. Durnall

Additional career option courses appear under Administration (30), Secretarial Studies (33), Recreation and Parks (41), and Merrimack Valley Branch (91) library science. Consult the Associate in Arts Degree chapter, Degree Options section, for specific course numbers.

Accounting

460. PRINCIPLES OF ACCOUNTING

An introduction to accounting theory and practice, using as models the sole proprietorship, partnership, and the corporation. The accounting process for recording, summarizing, and reporting financial data by periodic statements is analyzed. Systems to account for and control purchases, sales, cash, receivables, and inventory are presented, along with problems in valuation of assets and measurements of income. (Not open to students who have had Administration 502 or to Administration or Hotel Administration majors.) 4 credits.

Banking

440. MONEY AND BANKING

A study of the American financial system, with special emphasis on money and banks. Analysis of how money is created and theories of how money affects the economy. Examination of the goals, tools, and effectiveness of monetary policy. Prerequisite: Continuing Education 530 or Economics 401 or 402. (Not open to students who have had Economics 635.) 4 credits.

441. BANK OPERATIONS

Course develops a comprehensive knowledge of bank organization and of the processes by which the banking system carries on the millions of banking transactions that take place every day. Operating systems examined include cash management and control, bank clearing and collections operations, loan and deposit administration, internal audit and control systems, and ancillary services. Prerequisite: Continuing Education 460 or Administration 502. 4 credits.

540. BANK INVESTMENTS

General principles of investment analysis and portfolio analysis in relation to bank operations. Constraints affecting the tradeoff between liquidity, safety, and profitability. Types of securities suitable for banking investments. Optional timing of investment transactions. 4 credits.

541. BANK CREDIT MANAGEMENT

Course develops a comprehensive knowledge of the bank credit function, its effect on the money supply, its role in serving commercial and consumer borrowers, and its function as an earning asset of the bank. Topics covered include bank credit policy, credit analysis, credit regulations, unsecured and secured commercial and consumer credit transactions, and collection practices. 4 credits.

Criminal Justice

550. CRIMINAL JUSTICE ADMINISTRATION AND ORGANIZATION

To provide criminal justice administrators with an understanding of contemporary administrative methods for the most efficient utilization of available personnel, facilities, and equipment in meeting the goals of their mission. Includes principles of organization, planning and research, budgeting and control, decision making, personnel management, management by objectives, effective communications, and administrative practices in the various criminal justice agencies. 4 credits.

551. CRIME PREVENTION AND CONTROL

To provide criminal justice practitioners and students with a basic understanding of the way a total community and criminal justice sub-divisions can and must mobilize resources together to prevent and control crime. Problem-solving as an operational approach will be the core concept. Specific crimes will be examined in depth in relation to increasing risk, target hardening, reducing desire, and community factors. This analysis will focus both on the event and the offender set against the background of the community in which the offense occurs. 4 credits.

552. CORRECTIONS TREATMENT AND CUSTODY

The development of a frame of reference for a scientific approach to offenders through description and examination of clinical tools for diagnosis and treatment. Analysis of methods employed by correctional institutions combined with an analysis of essentials in institutional climate, personnel, structure, and procedure. Examination of factors involved in correctional decision-making and innovative management techniques. 4 credits.

Health Care Administration

500. INTRODUCTION TO HEALTH CARE SYSTEMS

The introductory course is designed to give the student a perspective for implementing his role as a health professional. Course content includes the historical and current health care systems; the significance of current health legislation; private, voluntary, and governmental health organizations; professional health associations; standard setting, accreditation, certification, and licensure agencies. 4 credits.

Insurance

501. THE HEALTH CARE SYSTEM IN THE COMMUNITY

Acquaints administrators of health care facilities, including hospitals and nursing homes, with the principles of medical care, personal and social care, the psychology of patient care, interdisciplinary interaction, therapeutic and supportive care. It will include seminars on community health care interrelationships, long-term care, and hospital-based care. 4 credits.

502. MANAGEMENT OF HEALTH CARE FACILITIES

A course for administrators in health care facilities including nursing homes and hospitals. Topics of the course include review of: applicable standards of environmental health, safety, and sanitation; local health and safety regulations; administration of health care facilities; medical staff relationships; departmental organization and management. 4 credits.

503. LEGAL AND FISCAL RESPONSIBILITIES FOR HEALTH CARE FACILITIES ADMINISTRATORS

Provides nursing-home and health-care-facilities administrators with information concerning their legal and fiscal responsibilities. New Hampshire rules, regulations, and standards will be emphasized. 4 credits.

Insurance

420. PRINCIPLES OF INSURANCE

Fundamental principles of insurance, including history, ethics, and the theory of risk; types of insurance carriers; basic features of life, fire, health, casualty, surety, automobile, property, and marine insurance; vocational opportunities. 4 credits.

421. LIFE, ACCIDENT, AND HEALTH INSURANCE

Investment aspects of life insurance and modern approaches to personal and business uses. Types of contracts are analyzed both from the buyer's and company's points of view. Legal concepts, the beneficiary clause, riders, protective clauses, and settlement options, including analysis of the life, accident, and health insurance contract, are discussed and supplemented by recent court cases. Prerequisite: Insurance 420. 4 credits.

422. PROPERTY, LIABILITY, AND MARINE INSURANCE

An analysis of fire insurance; casualty insurance; fidelity and surety bonds; transportation, marine, and aircraft insurance; and workmen's compensation. Underwriting practices, loss adjustment, and loss prevention are discussed. Government regulation, rate making, and reinsurance are also covered. Prerequisite: Insurance 420. 4 credits.

Management

430. MANAGEMENT PRINCIPLES AND ORGANIZATION

Fundamental concepts of management and organization. Seminar and case study methods are used in the discussion of management philosophy and objectives. Organization structure, communication, planning and controlling, and the decision-making processes. (Not open to Administration and Hotel Administration majors.) 4 credits.

431. HUMAN BEHAVIOR AND SUPERVISION

Principles of the behavioral sciences as they relate to business and industry. Seminar and case-study methods are used. Topics include the nature of people at work, leadership, using the informal organization, employee training and development, counseling and the problem worker, motivation, resistance to change, and morale appraisal and improvements. (Not open to Administration and Hotel Administration majors.) 4 credits.

530. ECONOMICS

A survey of economic theory from macro-economic and micro-economic perspectives. Economic problems and the role of government are dealt with at both levels. (Not open to students who have had Economics 401 or 402, or Resource Economics 401, 402.) 4 credits.

531. SALESMANSHIP

Selling principles, fundamentals, and techniques. Customer needs and courses of satisfaction will be investigated. Sales promotion, premiums, advertising, and other aids will be discussed. Emphasis will be on personal selling with student demonstrations and case studies being utilized. This course will be useful to salesmen, potential salesmen, and business managers in any field. 4 credits.

532. BUSINESS LAW

A thorough presentation of legal principles with practical applications to every-day business situations. Legal theory will be combined with considerations of how the law operates as a matter of practice. Case study methods will be used. (Not open to students who have had Administration 647.) 4 credits.

Merchandising

410. FUNDAMENTALS OF MERCHANDISING

Introduction to merchandising with particular emphasis on broad policies and principles which govern specific decisions. (Not open to Administration or Hotel Administration majors.) 4 credits.

411. PROMOTION AND ADVERTISING

The theory and practice of communicating reasons for buying to prospective customers. (Not open to Administration or Hotel Administration majors.) 4 credits.

510. RETAILING

The practical application of tested methods to the typical retail establishment. 4 credits.

511. MERCHANDISE CREDIT MANAGEMENT

The theory and practical application of theory to problems involving the use of credit encountered by the typical wholesaler or retailer. 4 credits.

Real Estate

425. FUNDAMENTALS OF REAL ESTATE

An examination of title and the 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 credits.

426. REAL ESTATE APPRAISAL

An intensive study of the principles of residential and commercial appraising. Topics included are: influences affecting value, the three approaches to value, principles of land and building analysis, building cost estimation, depreciation—its cause and effect. Prerequisite: Real Estate 425. 4 credits.

427. REAL ESTATE LAW AND FINANCE

The course is divided into two major sections: real estate law and real estate finance. Topics included in real estate law: nature and classes of property, methods of ownership, purchase and sales, liens, encumbrances, mortgages, deeds of trust, foreclosures, restrictions, and the rights, duties, and responsibilities of real estate brokers. Topics included in real estate finance: mortgage lending, loan application procedure, property appraisal for loans, construction, residential financing, income-property financing. Prerequisite: Real Estate 425. 4 credits.

MVB Library Science

Cooperative Work Experience

506. FIELD EXPERIENCE

Field experience with an agency, organization, or institution to provide a practical learning experience in a specialized area. Students will be supervised by the career option coordinator and the professional supervisor on site. Students must be matriculated in an option before enrolling in the field experience for that option, one or more semesters. Prerequisite: permission of the Division director. 2 or 4 credits. May be repeated to a maximum of 8 credits.

Merrimack Valley Branch Library Science Courses (91)

Library Science Courses

The following Merrimack Valley Branch courses are offered on the Durham campus of the University of New Hampshire as core courses in the Library Science career option in the Associate in Arts degree program.

Library Science

401. INTRODUCTION TO LIBRARIES

A general introduction to the history of libraries, various types of libraries, the library's role as a social institution; the philosophy of library service, and the tools, techniques, and routines of library work. Includes field trips to various types of libraries and guest lecturers. 4 credits.

402. LIBRARY TECHNICAL SERVICES I

Prepares the student to support the professional librarian in the following areas of technical services: preparing materials using the Dewey Decimal Classification and the Library of Congress Classification, typing and filing cards, introduction to subject-heading theory and use, and maintenance of shelf list and other files. 4 credits.

403. SUPPORT FOR PUBLIC SERVICES

Prepares the student to support the professional librarian in reference work, teaches the use of basic reference and bibliographic tools, philosophy of reference services; special emphasis is placed on reference work in all types of school libraries. 4 credits.

501. NON-BOOK MATERIALS AND SERVICES

Technical organization and operation of audio-visual materials, services, and equipment. 4 credits.

502. LIBRARY TECHNICAL SERVICES II

Acquisition and processing of materials; technical aspects of circulation system. 4 credits.

503. CHILDREN'S LIBRARY SERVICE

Book and non-book materials for children; procedures and techniques for working with children; implementation of special programs in schools and public libraries; selection of materials and some reference methods. 4 credits.

Earth Sciences (49)

Chairman: Herbert Tischler

PROFESSORS: Donald H. Chapman, *emeritus*; T. Ralph Meyers, *emeritus*; Cecil J. Schneer, Herbert Tischler

ASSOCIATE PROFESSORS: Franz E. Anderson, Wallace A. Bothner, Henri E. Gaudette, Glenn W. Stewart

ASSISTANT PROFESSORS: Francis S. Birch, Theodore C. Loder

401. PRINCIPLES OF GEOLOGY I

The earth and its history. A consideration of land forms and a discussion of the materials and structures of the earth's crust. Staff. 3 lectures; 1 laboratory; 4 credits. Offered both semesters.

402. PRINCIPLES OF GEOLOGY II

The earth and its history continued. The interpretation of past geologic events and their effect on the development of life forms. Prerequisite: Earth Sciences 401. Staff. 3 lectures; 1 laboratory; 4 credits.

409. ENVIRONMENTAL GEOLOGY

An understanding of geological processes allows man to use the products and forces of nature to exploit and manage his environment and to anticipate some of the unforeseen problems that may arise. Topics to be discussed will include: water resources; geologic hazards, such as landslides, earthquakes, stream erosion, and sedimentation; and land use, site investigations, and the exploitation of natural resources. Prerequisite: Earth Sciences 401 or permission of instructor. 4 credits.

501. INTRODUCTION TO OCEANOGRAPHY

Descriptive and regional oceanography covering the physical, chemical, biological, and geological aspects of the sea. Mr. Anderson, Mr. Birch, and Mr. Loder. 3 lectures; 4 credits.

503. INTRODUCTION TO MARINE SCIENCE

The course is team taught under the auspices of the New Hampshire College and University Council (NHCUC). Topics include: physical, geological and chemical oceanography; biological oceanography including marine plankton, algae, and invertebrates; field trips and cruises. Prerequisites: approval of campus representative of the Marine Sciences Committee of the NHCUC, Dr. Theodore C. Loder. Offered fall and spring semesters on Saturday only. (Not available for credit after completing Earth Science 501.) 4 credits.

512. DESCRIPTIVE AND DETERMINATIVE MINERALOGY

The physical and chemical properties of minerals, their associations, modes of occurrence and uses, with training in their identification. Mr. Bothner. Prerequisites: Earth Science 401 and Chemistry 401 or 403 passed or taken concurrently. 2 lectures; 2 laboratories; 4 credits.

531. STRUCTURAL GEOLOGY

The structural units of the earth's crust and the mechanics of their formation. Mr. Stewart. 3 lectures; 1 laboratory or field work; 4 credits.

561. GEOMORPHOLOGY

The factors producing the present aspect of the land surface, particularly that of New England. Special emphasis on the work of running water, glaciers, and marine agents. Field trips during the fall season. 3 lectures; 1 laboratory; 4 credits.

603. MARINE SCIENCE SUMMER INSTITUTE

This six-week institute consists of three course offerings in specific marine-oriented disciplines and involves lectures, labs, field trips, plus two weeks of intensive field work at the Cobscook Bay Marine Science Station. Student takes two out of the three courses. Prerequisites: approval of campus representative of the Marine Sciences Committee of the New Hampshire College and University Council, Dr. Theodore C. Loder. Not for major credit in Earth Science. 8 credits. May be repeated.

Earth Sciences

613. PRINCIPLES OF MINERALOGY

Introduction to crystallography; principles of the physics and chemistry of natural solids; the atomic structures of minerals and their investigation by x-ray diffraction. Prerequisite: one year of college chemistry or permission of instructor. Mr. Schneer. 3 lectures; 1 laboratory-recitation; 4 credits.

614. PETROGRAPHY

Description and classification of igneous, sedimentary, and metamorphic rocks in hand specimen and thin section; introduction to optical mineralogy. Prerequisite: Earth Sciences 512. Mr. Bothner. 2 lectures; 2 laboratories; 4 credits.

632. MAPPING TECHNIQUES AND FIELD GEOLOGY

Training in basic techniques of geologic mapping. Mr. Stewart. Prerequisite: Earth Science 531. 1 lecture; 2 laboratories; 4 credits.

652. INVERTEBRATE PALEONTOLOGY

The classification, evolution, and stratigraphic occurrence of invertebrate animals as recorded by fossils. Field trips will be made to collect specimens and to study environments of living and fossil material. Mr. Tischler. 3 lectures; 1 laboratory; 4 credits.

662. GLACIAL GEOLOGY

The characteristics of existing glaciers and an interpretation of Pleistocene glacial features. The abundant and varied evidence of glaciation in northeastern North America and Baltic Europe will be emphasized, and New Hampshire examples of both alpine and continental glaciation will be studied in the field. 3 lectures; 1 laboratory; 4 credits.

725. IGNEOUS AND METAMORPHIC PETROLOGY

The study of igneous and metamorphic rock series; the application of textural, mineralogical, and chemical analysis, and phase rule and phase diagram interpretation to petrogenesis. Prerequisite: Earth Sciences 613, 614, or permission of instructor. Labs consist of field study and petrographic analysis. Mr. Bothner. 3 lectures; 1 laboratory; 4 credits.

734. APPLIED GEOPHYSICS

Theory and application of gravity, magnetic, seismic, electrical, and thermal methods of investigating subsurface geology. Practical fieldwork and use of computers in data analysis. Mr. Birch. Prerequisites: Mathematics 428 passed or taken concurrently, Earth Science 401, one year of college physics, or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

741. GEOCHEMISTRY

Applications of thermodynamics to geological processes; geochemical differentiation of the earth; the principles and processes which control the distribution and migration of elements in geological environments. Mr. Gaudette. 3 lectures; 1 laboratory; 4 credits.

752. CHEMICAL OCEANOGRAPHY

An introduction to the chemistry of the oceans, with emphasis on water structure, chemical composition and equilibrium models, gas exchange, biological effects on chemistry, trace metals, and analytical methods. Laboratory includes short cruise aboard *R/V Jere A. Chase*. Mr. Loder. Prerequisite: permission of instructor. 3 lectures; 1 laboratory (optional); 3 or 4 credits.

754. SEDIMENTATION-STRATIGRAPHY

The properties of sediments and sedimentary rocks, with emphasis on lithofacies, biofacies, principles of stratigraphic correlation and sedimentary tectonics. Mr. Anderson and Mr. Tischler. 2 lectures; 1 laboratory; 4 credits.

759. GEOLOGICAL OCEANOGRAPHY

Geologic properties of the earth that are unique to the continental shelves and ocean basins. Special emphasis will be placed on submarine geomorphology, eustatic sea-level changes, crustal and subcrustal oceanic structure, and the evolution of the ocean basins. Prerequisite: Earth Science 501 and 754. Mr. Anderson and Mr. Birch. 2 lectures; 1 discussion group; 1 special project; 4 credits.

781. PHYSICAL GEOLOGY

The materials and structures of the earth and the erosive agents that modify them are described in the lectures and are examined and studied in the laboratory and on field trips. This course is for certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Earth Science 401 or equivalent.) 4 credits.

782. HISTORICAL GEOLOGY

The history and development of the physical features of the earth and the development of life on the earth. Fossil organisms will be briefly surveyed in the laboratory and the methods of historical geology will be illustrated in the laboratory and on field trips. Prerequisite: Earth Science 781 or equivalent. This course is for certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Earth Science 402 or equivalent.) 4 credits.

795. GEOLOGICAL PROBLEMS

1. Areal Geology; 2. Geochemistry; 3. Geomorphology, Advanced; 4. Geophysics; 5. Glacial Geology, Advanced; 6. Groundwater Geology; 7. Historical Geology, Advanced; 8. Industrial Minerals; 9. Micropaleontology; 10. Mineral Fuels; 11. Mineralogy, Advanced; 12. Optical Crystallography; 13. Ore Deposits; 14. Paleontology, Advanced; 15. Petrology, Advanced; 16. Regional Geology; 17. Sedimentation; 18. Stratigraphy; 19. Structural Geology, Advanced; 20. Marine Geology; 21. Physical Oceanography; 22. History of Geology; 23. Earth Science Teaching Methods; 24. Senior Synthesis; 25. Chemical Oceanography.

Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. Staff, 2 or 4 credits.

796. HONORS PROJECT

Independent research projects similar to Earth Science 795 for students with 3.0 or better, average in Earth Science. Staff. 2 or 4 credits.

797. GEOLOGY COLLOQUIUM

Study of selected topics in both classical and modern geological thought. Designed for majors. 0 credit. NLG.

Economics (31)

Program Director: Robert C. Puth

PROFESSORS: Carroll M. Degler, *emeritus*; Arthur W. Johnson, *emeritus*; Ruth J. Woodruff, *emerita*; Robert F. Barlow, John A. Hogan, Manley R. Irwin, John J. Korbel, Samuel R. Reid, Sam Rosen, Kenneth J. Rothwell, Dwayne Wrightsman

ASSOCIATE PROFESSORS: George W. Betz, Allan J. Braff, William R. Hosek, Richard L. Mills, Lawrence Nordell, *visiting*

ASSISTANT PROFESSORS: Lawrence P. Cole, Phillipe DeVille, John R. Haskell, Richard Hurd, Robert C. Puth, Heidimarie Sherman

Economics

(400) 400. ECONOMIC ISSUES

Application of economic analysis to wide range of current economic issues. Depending on the instructor and the interests of students, such issues as environmental pollution, federal deficit spending, monopoly and waste, poverty and proposals for its alleviation, price and wage controls, the urban crisis, war and the economy, etc., will be discussed in a nontechnical, conceptual framework. Classes organized around student reports on, and discussion of, outside readings. No prerequisites. No credit towards a major or minor in economics. 4 credits.

401 (401). PRINCIPLES OF ECONOMICS (MACRO)

An introduction to the basic functions of the United States economy viewed as a whole, together with policies designed to affect its performance. The problem of economic scarcity, and introduction to 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 issues concerning economic growth. No prerequisites. Not open to students who have had Resource Economics 401. 4 credits.

(402) 402. PRINCIPLES OF ECONOMICS (MICRO)

An introduction to the functions of the component units of the economy and their interrelations. The units of analysis are the individual consumer, the firm, and the industry. The theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, the demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. No prerequisites. 4 credits.

403, 404. HONORS ECONOMICS (MACRO, MICRO)

Special seminars in the principles of economics for classes of up to 20 students who are capable of, and interested in, rapidly acquiring sufficient competence in the use of the tools of economic analysis so that pressing contemporary economic problems and issues may be examined in depth and alternative policies considered. Conduct of the course emphasizes student participation and interchange with other students and the instructor. Readings will be selected from popular and technical literature. No formal prerequisites, but permission of the instructor is required. 4 credits.

415. ECONOMIC HISTORY OF THE UNITED STATES

The development of the United States economy from Colonial times to the present. Models of economic development and their applicability to the United States at various times. The role of social, political, and cultural factors in shaping the economy. Development and influence of economic institutions. No prerequisite. 4 credits.

525. INTRODUCTION TO ECONOMIC STATISTICS

Classical statistical techniques useful in economic science. Includes methods of collection, analysis and presentation of statistical data, introduction to probability theory, statistical inference, regression and correlation analysis, index numbers, and time series analysis. Prerequisite: Mathematics 415 or equivalent. 4 credits.

601. INCOME DISTRIBUTION: WEALTH AND POVERTY

A multidisciplinary approach to conflicting economic systems and ideologies; income distribution, wealth, and poverty; public policy. Several countries of the world will be considered. Not for major credit. 4 credits.

605 (605). INTERMEDIATE ECONOMIC ANALYSIS

Analysis of supply and demand. The determination of prices, production, and the distribution of income in non-competitive situations as well as in the purely competitive model. General equilibrium. Prerequisite: Economics 402. 4 credits.

- 611 (611). NATIONAL INCOME ANALYSIS**
Macro-economic measurement, theory, and public-policy determination. Prerequisite: Economics 401, 402. 4 credits.
- 615. HISTORY OF ECONOMIC THOUGHT**
The evolution of economic thought, including the work of contemporary economists. Examination and critical appraisal of the work of major economists and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prerequisite: Economics 401, 402. 4 credits.
- 621. ECONOMIC DEVELOPMENT**
An analysis of the problems and available solutions confronting the underdeveloped areas of the world. Prerequisite: Economics 401, 402. 4 credits.
- 626. INTRODUCTION TO QUANTITATIVE ECONOMICS**
Development of the concept of a simple testable economic model of either the explanatory or forecasting type. Alignment of the model with reality by means of computer-performed statistical estimation. Discussion of types of error encountered, consequences of such errors, and possible methods of dealing with errors of various kinds. Prerequisite: Economics 525. 4 credits.
- 630. COMPARATIVE STUDY OF ECONOMIC SYSTEMS**
An examination of socialism, communism, capitalism, and modifications of these economic systems, particularly as exemplified by the Soviet Union, China, Yugoslavia, France, the United Kingdom, and the United States. Prerequisite: Economics 401, 402. 4 credits.
- 635. MONEY AND BANKING**
An analysis of money, its supply, demand, impact on the economy, and control by the central bank. Prerequisite: Economics 401, 402. 4 credits.
- 641. PUBLIC FINANCE**
Problems and policies of expenditure, revenue, and debt of the public sector. Economic analysis and evaluation of tax systems and governmental fiscal programs. Prerequisite: Economics 401, 402. 4 credits.
- 645. INTERNATIONAL TRADE**
Theory of international trade, foreign exchange, balance of payments, tariffs, and protection. The economic aspects of international relations, with particular reference to recent policies. Prerequisite: Economics 401, 402. 4 credits.
- 651. GOVERNMENT REGULATION OF BUSINESS**
The role of government in economic affairs, with emphasis on mergers, competition, monopoly, and the regulated industries. No prerequisites. 4 credits.
- 655. TRADE UNIONS AND INDUSTRIAL MANAGEMENT**
Trade-union history, philosophy, and policies. Historical development of management attitudes and the attitudes of law and legislation toward unions. Collective bargaining: its nature, purpose, and public policy considerations. Prerequisite: Economics 401, 402. 4 credits.
- 656. LABOR ECONOMICS**
Application of the tools of economic analysis to the market for labor. Wage determination and wage policy under union and non-union conditions. The determination of factor shares of the national income with particular emphasis on labor's share. Prerequisite: Economics 402. 4 credits.

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695-696. INDEPENDENT STUDY

Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from Undergraduate Counselor and proposed project instructor. Permission will be granted only to students who have demonstrated unusual individual initiative. 2-8 credits per semester.

711. ECONOMIC FLUCTUATIONS

The study of recurrent movements of prosperity and depression with emphasis upon causes and public-policy implications. Prerequisite: Economics 611; or permission of instructor. 4 credits.

720. U. S. ECONOMIC HISTORY

The development of the United States economy from Colonial times to the present. Presentation and application of economic models and interpretation of data are stressed. The influence of capital accumulation, industrialization, foreign trade, monetary factors, and government are considered, with peripheral attention to non-economic factors. Primarily a course in applied economic theory. Prerequisites: Economics 605, 611, or consent of instructor. 4 credits.

721. EUROPEAN ECONOMIC HISTORY

The development of Western European and Mediterranean economics from medieval times to the Common Market. Presentation and application of economic models and interpretation of data are stressed. Attention is centered on capital accumulation, technology, trade, industrialization, monetary factors, and the role of government, but the influence of non-economic factors is discussed where relevant. Prerequisite: Economics 605, 611, or consent of instructor. 4 credits.

722. CASE STUDIES IN ECONOMIC DEVELOPMENT

An analysis and evaluation of economic development problems and policies in selected countries. Non-economic factors, important as initial conditions and conditioning influences for the process of economic development, are emphasized. Major development-policy areas are studied, and an appraisal of national-planning experience and the prospects for regional cooperation is made. Prerequisites: Economics 401, 402 or consent of instructor. 4 credits.

725. STATISTICAL THEORY

The theoretical basis of statistical methods: probability distributions, statistical inference, and decisions. Prerequisite: permission of instructor. 4 credits.

726. MATHEMATICAL ECONOMICS

An introduction to the principal mathematical techniques and their application in economics. Prerequisite: permission of instructor. 4 credits.

727. INTRODUCTION TO ECONOMETRICS

The application of statistics and mathematics to economics. The formulation of economic models, their measurement, and verification. Prerequisite: permission of instructor. 4 credits.

728. STATISTICAL DECISION-MAKING

The application of probability and statistics to decision problems. The major emphasis is on the Bayesian approach to decisions under uncertainty, which explicitly injects prior judgements of decision-makers and the consequences of alternative actions into the decision-making process. Prerequisite: permission of the instructor. 4 credits.

735. ADVANCED MONEY AND BANKING

Emphasis on central banking, monetary policy, and monetary theory. Study of current problems and developments in banking. 4 credits.

746. INTERNATIONAL FINANCE

The international monetary mechanism. Analysis of private and official international capital flows. Instruments and institutions. The multi-national corporation. Exchange rates, adjustment systems, international liquidity, foreign aid. Prerequisite: Economics 401, 402. 4 credits.

750. IMPERFECT COMPETITION

Extensive survey of firm behavior in imperfectly competitive market forms, such as monopoly and oligopoly. The implications for price and research performance under such market forms are examined and the relevance of the theoretical arguments are assessed by recourse to appropriate empirical studies. Prerequisite: Economics 605 or permission of instructor. 4 credits.

758. MANPOWER AND EDUCATION PLANNING

The flows of human beings within and between the educational and manpower sectors of the economy will be investigated. Such flows will also be related to the flows of goods and services in the industrial sector. Study of the interrelationships of these flows will be directed toward the construction of a computer simulation-model for use in tracing the impact throughout the economy of manpower and educational-planning decisions. Prerequisite: Economics 401, 402 or consent of instructor. 4 credits.

768. SURVEY OF URBAN ECONOMICS

Introduction to the theoretical and empirical bases for investigating urban economy; a discussion of policy alternatives for the problems of poverty, housing, urban renewal, transportation, local fiscal affairs, and pollution. Prerequisite: Economics 605 or permission of instructor. 4 credits.

798. SEMINAR IN ECONOMIC PROBLEMS

Special topics in Economics. This course may be repeated. Prerequisite: consent of adviser and instructor. 2 or 4 credits.

Education (61)

Chairman: Gerald J. Pine

PROFESSORS: Everett B. Sackett, *dean emeritus*; Thomas O. Marshall, *emeritus*; Angelo V. Boy, Roland B. Kimball, Carleton P. Menge, Gerald J. Pine

ADJUNCT PROFESSORS: Donald D. Durrell, Frederick M. Jervis

ASSOCIATE PROFESSORS: Michael D. Andrew, Charles H. Ashley, Jason E. Boynton, John G. Chaltas, David D. Draves, Edward D. Durnall, David J. Hebert, Bud B. Khleif, Joseph J. Petroski, M. Daniel Smith, Deborah E. Stone, Dwight Webb

ASSISTANT PROFESSORS: Margaret D. Ackerman, Virginia F. Bereit, John J. Carney, Ellen Corcoran, Ronald P. Curcio, Ann L. Diller, Sidney Eder, Fred J. Krieg, Edward J. Lawton, Judith A. Meagher

ADJUNCT ASSISTANT PROFESSORS: John R. Cavanaugh, Peter Cimbolio

INSTRUCTOR: Michael C. Diamonti

LECTURERS: John D. Bardwell, Jean E. Sweeney

PROFESSORS: William H. Annis, (Occupational Education); Richard H. Balomenos, (Mathematics-Education); Herbert Tischler, (Earth Science-Education)

ASSOCIATE PROFESSORS: Lewis C. Goffe, (English-Education); Elizabeth A. Snell, (Home Economics-Education); John B. Whitlock, (Music-Education)

Education

ASSISTANT PROFESSORS: Thomas R. Barstow and Nancy C. Rupp, (Physical Education); Brian T. Jefferson, (Art Education)

LECTURER: Barbara H. Wing, (Foreign Language-Education)

RESIDENT SUPERVISORS: Richard Aieta, Eleanor Caron, William Childs, Tom Conway, Robert Cook, Robert Dodge, William Elwell, Richard Floyd, Michael Garrett, Thomas Gore, George Griewank, Maryellen Ham, Paul Hitchings, Ronald Jeffords, Janice Kenney, Alide Lavallo, Jacquelyn McCusker, Walter Morgan, Al Pellerin, Marjorie Perkins, Priscilla Royal, Ruth Seidel, Anne Smith, Charles Vaughn

(500). EXPLORING TEACHING

A course 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 advisement related to teaching as a career provided. Prerequisite for further work toward teacher certification. (Does not fulfill social science requirement.) 4 credits. NLG, Credit/Fail.

(575). PHILOSOPHY OF EDUCATION

An introductory philosophical study of the nature, significance, and place of education within the human condition. The fundamental purpose of this course is to help each student begin to work out and articulate his or her own attitude toward the basic issues which lie at the heart of education at all levels. Although this course is open to any undergraduate without prerequisite, it is especially aimed at those students who want to explore or intend to enter the field of education and who seek to broaden their understanding of the purpose and significance of education. 4 credits.

(611). TEACHING ELEMENTARY SCHOOL SOCIAL STUDIES

The objectives, content, methods, and materials for instructing elementary school children in the social studies. (Offered in Division of Continuing Education only.) 4 credits.

(612). TEACHING ELEMENTARY SCHOOL MATHEMATICS

The objectives, content, methods, and materials for instructing elementary school children in mathematics. (Offered in Division of Continuing Education only.) 4 credits.

(613). TEACHING ELEMENTARY SCHOOL SCIENCE

Involvement strategies for elementary science instruction. Inquiry and discovery approaches will be compared with more conventional methods. Selection and justification of goals for science instruction will also be treated. A brief survey of resources available for science teachers, including analysis of current curriculum projects. (Offered in Division of Continuing Education only.) 4 credits.

(691). SCIENCE CURRICULUM AND INSTRUCTION

A course to introduce inservice and preservice secondary teachers of physics, chemistry, earth science, or general science to modern curricula and methods in the sciences. A survey of some of the contemporary programs of national interest in secondary school science. A variety of goals and methods for teaching science. 4 credits.

(694). COURSES IN SUPERVISED TEACHING

Supervised Teaching of Physical Education. 6 credits. NLG.

Supervised Teaching of Occupational Education. 6 credits. NLG.

*Supervised Teaching of Art. 6 credits. NLG.

*Supervised Teaching of English. 6 credits. NLG.

*Supervised Teaching of Social Studies. 6 credits. NLG.

Supervised Teaching of Home Economics. 6 credits. NLG.

*Supervised Teaching of Foreign Language. 6 credits. NLG.

*Supervised Teaching of Mathematics. 6 credits. NLG.

*Supervised Teaching of Music. 6 credits. NLG.

*Supervised Teaching of Sciences. 6 credits. NLG.

(700). EDUCATIONAL STRUCTURE AND CHANGE

Organization, structure, and function of American schools; the processes of change in education. Emphasis will be on how successful innovation can be accomplished in classrooms and schools. Included will be options involving field experiences. A number of variable-credit modules will be offered within this area of study. A list of sections to be offered will be available in the Department of Education prior to preregistration. Prerequisite: Education 500 or permission of instructor. Minimum of 4 credits required for teacher certification. Variable credit, 1-4 credits.

(701). HUMAN LEARNING AND DEVELOPMENT

Development of the individual and analysis of the learning process. A number of variable-credit modules centering on the theories, research, and implications for education of a specific topic will be offered each semester and in the summer program. A list of sections to be offered will be available in the Department of Education prior to preregistration. Prerequisite: Education 500 or permission of instructor. Minimum of 4 credits required for teacher certification. Variable credit, 1-4 credits.

(703). ALTERNATIVE TEACHING MODELS

Basic teaching models and techniques (from very teacher-directed to very student-centered) will be studied along with systems with which to analyze applications of the models and techniques. Models will be studied through observation of master classroom teachers, observation of exemplary video-tapes, service as aides to master classroom teachers, and seminars. Techniques and analysis systems will be studied through observation of video-tapes, micro-teaching, completion of appropriate self-instruction units, and seminars. A list of sections to be offered will be available in the Department of Education prior to preregistration. Prerequisite: Education 500 or permission of instructor. Minimum of four credits required for teacher certification. Variable credit, 1-4 credits.

(705). ALTERNATIVE PERSPECTIVES ON THE NATURE OF EDUCATION

A course designed to help students formulate, develop, and evaluate their own educational principles, standards, and priorities. The course will include an exploration of alternative philosophies of education and an examination of some contemporary educational issues. Prerequisite: Education 500 or permission of instructor. 4 credits.

(706). INTRODUCTION TO READING INSTRUCTION IN THE ELEMENTARY SCHOOLS

Investigation of the reading process. Analysis of current procedures and materials for teaching reading. Diagnostic techniques will be explored. Clinical experience is included. This course fulfills the reading requirement for prospective elementary teachers enrolled in the five-year teacher-education program and may be included in the 12 required graduate credits in Education at the graduate level. Course may also be taken for undergraduate credit prior to entrance into fifth year; in this case the course fulfills the reading requirement but is not applicable toward the 12 required graduate credits. 4 credits.

(707). APPROACHES TO TEACHING READING AT THE SECONDARY LEVEL

The Reading Curriculum in the Secondary School: Analysis of the structural components (developmental, corrective, remedial); materials and methods of instruction

*These courses will be available to all classes up to and including the graduating class of 1977.

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and appraisal; and instruments of measurement and evaluation in the comprehensive secondary reading program. 2 credits.

Teaching Reading through the Content Areas: Alternative and Application. Introduces students to new approaches, concepts, and methodologies designed to develop ability to teach reading within the framework of the content-area classroom. Includes workshop format for development and production of instructional strategies and materials designed to make operational a reading-content integrated program at the secondary level. 2 credits.

(734). CHILDREN'S LITERATURE

A consideration of children's books and methods of using them, with emphasis given to intermediate grades. Practical demonstrations of how to correlate children's books with various special projects. 4 credits.

742. SUPERVISED TEACHING IN THE ELEMENTARY SCHOOL

Full semester of supervised student teaching for majors in elementary education. 16 credits.

(763). INTRODUCTION TO EDUCATIONAL MEDIA

The role of educational media in the learning process with emphasis on the curricular integration of the materials and equipment commonly available in the school library media center. The design and implementation of learning systems will provide a framework for the development of individual skills. 4 credits.

(785). EDUCATIONAL TESTS AND MEASUREMENTS

An introduction to the theory and practice of educational evaluation. Emphasis given to uses of test results in classroom teaching and student counseling. Introductory statistical techniques. 4 credits.

(795, 796). INDEPENDENT STUDY

Open to juniors and seniors only. Must be approved by appropriate faculty member. 2 or 4 credits.

(797). SEMINAR IN CONTEMPORARY EDUCATIONAL PROBLEMS

A seminar offered by one or more members of the staff dealing with issues or problems of special contemporary significance. Normally the seminar will focus on a problem which has been the subject of recent special study by the staff member(s). Prerequisite: permission of instructor(s). Variable credit, 1-4. May be repeated for different topics.

Electrical Engineering (50)

Chairman: Joseph B. Murdoch

PROFESSORS: Leon W. Hitchcock, *emeritus*; Fletcher A. Blanchard, Robert N. Faiman, Albert D. Frost, John B. Hraba, Joseph B. Murdoch, Alden L. Winn

ADJUNCT PROFESSOR: Sidney W. Darlington

ASSOCIATE PROFESSORS: Ronald R. Clark, Glen C. Gerhard, Filson H. Glanz, Donald W. Melvin, John L. Pokoski, Kerwin C. Stotz

ASSISTANT PROFESSOR: Kondagunta Sivaprasad

INSTRUCTORS: Ernest E. Nichols, Antal A. Sarkady, Charles F. Walker

401. INTRODUCTION TO ELECTRICAL ENGINEERING I

An overview of the electrical engineering profession; lectures by faculty and guests as well as field trips. The role of the electrical engineer as a professional person and the

ethics of the engineering profession are explored. Required of electrical engineering freshmen. 1 lecture; 1 credit. Credit/Fail.

402. INTRODUCTION TO ELECTRICAL ENGINEERING II

This course is designed to increase the student's understanding of the practice of electrical engineering and to indicate how the curriculum meets his needs. Elements of electrical science, computer programming, and computer logic are provided to enable the student to appreciate some of the areas of technology in which electrical engineering professionals are employed. Exploration of the ways in which technology can contribute to a better society. Prerequisites: Math 427 and Physics 407. Required of electrical engineering freshmen. 3 lectures; 1 laboratory; 4 credits.

503. ELECTRICAL CIRCUIT THEORY

Generalized network analysis, coupled circuits, one- and two-port networks, elementary synthesis, filter properties, analysis of interconnected passive networks, steady-state and transient analysis of distributed parameter networks. Prerequisite: Electrical Engineering 502. 4 credits.

509. ELECTROMAGNETIC FIELDS

Static and dynamic electric, magnetic, and electromagnetic fields. Maxwell's equations, wave equations, plane waves. Prerequisites: Mathematics 527, Mathematics 528, Physics 408. 4 recitations; 4 credits.

510. LINEAR ELECTRONIC CIRCUITS

Theory of operation, analysis, and design of active circuits containing electronic devices. Prerequisite: Electrical Engineering 511. Electrical Engineering majors must take Electrical Engineering 518 concurrently. 4 credits.

511. NONLINEAR ELECTRONIC CIRCUITS

Active electronic non-linear circuits in the switching mode. Treats analysis and design of both discrete component and integrated circuits. Prerequisite: Electrical Engineering 502. 3 lectures; 1 laboratory; 4 credits.

517. ELECTRICAL LABORATORY I

Operation and application of instruments used in electrical engineering. Prerequisite: Electrical Engineering 503 taken concurrently and Electrical Engineering 516. 1 laboratory; 1 credit.

518. ELECTRICAL LABORATORY II

Experimental investigations in the principles of electrical engineering as applied to electrical devices and systems. Prerequisite: Electrical Engineering 510, 520 taken concurrently, and Electrical Engineering 517. 2 lectures; 2 laboratories; 4 credits.

520. ELECTROMECHANICAL ENERGY CONVERSION

Theory and analysis of transformers and electromechanical energy converters. Prerequisite: Electrical Engineering 502 and 509, or 502 and 535. Electrical Engineering majors must take Electrical Engineering 518 concurrently. 4 credits.

531. ELEMENTS OF DIGITAL SYSTEMS

Fundamental principles involved in the design and analysis of digital systems. Topics include number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. In the laboratory, the students will build systems using modern integrated circuit technology and will have "hands on" experience with a minicomputer. For non-Electrical Engineering majors. 3 recitations; 1 laboratory; 4 credits.

533. ELECTRONICS AND INSTRUMENTATION FOR ENGINEERS

This course is designed for civil and chemical engineering students. Topics covered include DC and AC circuits, electronic devices, power supplies, amplifiers, digital

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circuits, transducers, and recording systems. Prerequisite: Physics 408, Math 527. 3 lectures; 1 laboratory; 4 credits.

539-540. ELECTRICAL ENGINEERING FUNDAMENTALS I AND II

Fundamental DC and steady state AC circuits; external characteristics of electronic devices in the linear, non-linear, and switching modes; introduction to Boolean algebra; digital devices; analysis and synthesis of logic circuits; basic transistor amplifiers; amplifiers as feedback systems; analog computers; instrumentation systems; magnetic fields; DC and AC machine characteristics; transient behavior of machines; introduction to automatic control systems. This course is designed for non-Electrical Engineering majors. Prerequisite: Math 527; 3 recitations; 1 laboratory; 4 credits.

541-542. ELECTRICAL CIRCUITS I AND II

Analysis of electrical circuits including DC, AC, and transient circuits. Included are topics from linear circuit theory, power considerations, resonance conditions, Fourier series, Laplace transforms, and complex frequency analysis. Prerequisites: Math 428, Electrical Engineering 402 or equivalent experience. 3 recitations; 3 credits.

543. INTRODUCTION TO DIGITAL SYSTEMS

Fundamental principles involved in the design and analysis of digital systems. Topics include number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. In the laboratory, the students will build systems using modern integrated circuit-technology and will have "hands on" experience with a mini-computer. For Electrical Engineering majors. 2 recitations; 1 laboratory; 3 credits.

544. SIGNAL PROCESSING FUNDAMENTALS

Methods of analysis for distributed systems, signal processing applications of Laplace and Fourier transforms, introductory probability theory. Prerequisite: Math 527. 3 recitations; 3 credits.

548. ELECTRONICS I

Semiconductor and vacuum device characteristics; mathematical and equivalent circuit models. Amplifier performance specifications; circuit analysis and design techniques for linear small-signal and power amplifiers at audio, radio, and video frequencies. Three lecture-recitation hours per week or two lecture hours and one 2½ hour laboratory session per week. Prerequisites: Math 527, Electrical Engineering 541, and Electrical Engineering 542 (may be taken concurrently). 3 credits.

551. ELECTRONICS II

Feedback theory, analysis and design with operational amplifiers, sinusoidal oscillators, modulators, detectors, and analog circuits. Three lecture hours per week or two lecture hours and one 2½ hour laboratory session per week. Prerequisites: Electrical Engineering 548 and 607 (may be taken concurrently). 3 credits.

552. ELECTRONICS III

Analysis and design of digital and switching circuits using both discrete and integrated components. Three lecture hours per week or two lecture hours and one 2½ hour laboratory session per week. Prerequisites: Electrical Engineering 551 and 543. 3 credits.

603. ELECTROMAGNETIC FIELDS AND WAVES I

Electrostatic field in free space, conductors, and dielectrics; capacitors; Laplace and Poisson's equations; magnetostatic fields in free space and ferromagnetic materials; magnetic circuits; inductors; Faraday's law. Prerequisites: Math 527, Electrical Engineering 544 or equivalent. 3 credits.

- 604. ELECTROMAGNETIC FIELDS AND WAVES II**
Maxwell's equations for time varying fields; relation between field and circuit theory; plane waves in dielectric and conducting media; reflection and refraction of waves in isotropic media; transmission lines, wave guides, and resonators; antennas and radiation. Prerequisites: Electrical Engineering 603. 3 credits.
- 605. ELECTRONIC PROPERTIES OF MATERIALS AND DEVICES**
The nature of the electron, energy levels, energy bands, and semiconductor materials. Electronic transport properties of conductors and semiconductors, PN junction theory, physics of bipolar and field effect transistors, transistor characteristics and circuit models, thermionic emission and the vacuum tube. Prerequisite: Physics 408, Chemistry 405, Electrical Engineering 510, and Mathematics 527. 4 credits.
- 607. ELECTRICAL CIRCUITS III**
Analysis and synthesis of electrical circuits. State equations. Passive, active, and digital filters. Prerequisite: Electrical Engineering 542. 3 recitations; 3 credits.
- 608. INTRODUCTION TO COMMUNICATION AND CONTROL**
Modeling and simulation of physical systems. Examples of open and closed loop control systems. Signal representation, modulation, and detection methods in communication systems. Multiplexing and coding. Prerequisite: Electrical Engineering 602 and 606 (may be taken concurrently). 3 recitations, or two recitations and one laboratory; 3 credits.
- 609. ELECTRONIC MATERIALS AND DEVICES**
The structure of materials, nature of the electron, energy levels, energy bands, semiconductor statistics. Electronic transport phenomena, pn junction theory, physics of bipolar transistors, JFET's, MOSFET's, and other active devices. Thermionic emission, photo-conductivity, and the nature of dielectric and magnetic properties of solids. Prerequisites: Electrical Engineering 552 and 604, Physics 408, and completion of the chemistry requirement. 3 recitations; 1 laboratory; 3 credits.
- 620. ELECTRONICS AND INSTRUMENTATION**
A service course for those students not in engineering or physics. No attempt is made to cover the topics in mathematical or engineering detail. Emphasis is placed on making the student aware of problems which he is likely to encounter when using electronic equipment. Proper technique for using electronic instruments is pointed out in classroom demonstrations and laboratory experiments. Topics covered include D.C. and A.C. circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. No prerequisites except junior standing. 3 recitations; 1 laboratory; 4 credits.
- 654. ELECTROMECHANICAL ENERGY CONVERSION**
Theory and analysis of transformers and electromechanical energy converters. Prerequisite: Electrical Engineering 603 and 542; 3 recitations; 3 credits.
- 695 (695). ELECTRICAL ENGINEERING PROJECTS**
A laboratory or advanced study course. Each student will either join one of the department research projects or engage in a project which is in one of the areas of current staff interest. Admission to the course will be limited to those accepted by a staff member. 1-4 conferences or 1-2 laboratories; variable credit.
- (701). APPLIED ELECTROMAGNETIC FIELDS**
Introduction to Maxwell's equations; boundary-value problems in electrostatics and magnetostatics; plane wave propagation; reflection and refraction in isotropic media; guided wave propagation; rectangular and cylindrical wave guides; simple resonators; elements of micro-wave circuits, linear antennas; aperture antennas, arrays of dipoles; receiving antennas and reciprocity. Prerequisite: Electrical Engineering 509 or equivalent. 3 recitations; 1 laboratory; 4 credits.

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706. ADVANCED NETWORK THEORY

Matrices, linear graph theory, and the topological analysis of active and passive networks; concepts of natural frequencies and state; formulation and solution of state equations; application of linear graph and state techniques to real-world system problems. Prerequisite: Electrical Engineering 503. 4 credits.

711. DIGITAL SYSTEMS

An extension of Electrical Engineering 543 to more advanced switching theory techniques (i.e., design of unclocked sequential circuits, minimization of multiple output circuits, etc.) and digital design tools (i.e., L.S.L., multiplexing, etc.). A variety of applications will be studied. Prerequisite: Electrical Engineering 543 or permission of instructor. 3 recitations; 1 laboratory; 4 credits.

712. LOGICAL DESIGN OF DIGITAL COMPUTERS

Computer architectures including arithmetic, memory, control, and input-output units are studied with emphasis on the trade-offs between hardware, software, and cost. In the laboratory, students will be provided "hands on" experience with machine language programming, interfacing of peripherals, etc., on several mini-computers and microcomputers. Prerequisite: Electrical Engineering 543 or permission of instructor. 3 recitations; 1 laboratory; 4 credits.

714. MINICOMPUTER APPLICATIONS ENGINEERING

Principles of organization and operation of minicomputer-based systems. Topics include interfacing of special purpose peripherals, data structures, control structures, program and data organization, microprogramming, and real-time monitor systems. Applications include communication, automated measurement, and process control systems. Prerequisites: Electrical Engineering 543 and programming experience, or permission of instructor. 3 recitations; 1 laboratory; 4 credits.

727. POWER SYSTEMS

An introduction to the modeling and planning of electric power transmission systems. Prerequisite: Electrical Engineering 503. 4 credits.

741. FUNDAMENTALS OF ACOUSTICS

The development of the acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics of acoustical sources; measurement of acoustic sources; microphones; measurement of sound level; properties of acoustical materials; ultra-sonics; architectural acoustics. Prerequisites: Physics 408, Mathematics 527. 3 recitations; 1 laboratory; 4 credits.

757. FUNDAMENTALS OF COMMUNICATIONS

Introduction to communications systems, Fourier analysis of signals, amplitude and frequency modulation, detection, digital and sampled-data signals, noise in electrical circuits. Prerequisite: permission of instructor. 3 recitations; 1 laboratory; 4 credits.

758. COMMUNICATION SYSTEMS

Fundamentals of the design of high frequency communication systems. RF amplification, modulators for amplitude and frequency modulation systems, receiving techniques, antennas, free space propagation, propagation characteristics of the ionosphere. Prerequisite: Electrical Engineering 509, 757 or equivalent. 3 recitations; 1 laboratory; 4 credits.

762. ILLUMINATION

Radiation; color and spectra; physics of light production; sources of ultra-violet, visible, and infrared energy; lamp circuitry; control of light; illumination design. The course will be conducted on a seminar basis with each student researching and discussing the above topics and doing a project in the application of visible or near-visible energy in business and industry, education, the ocean, agriculture, medicine, or other areas. 2 or 4 credits.

770. INTEGRATED CIRCUIT DESIGN AND TECHNOLOGY

An introduction to the principles of operation, design, processing, and technology of linear and nonlinear integrated circuits. Bipolar and unipolar structures, including surface-controlled devices, will be considered. Related topics will include thin-film hybrid circuit techniques, vacuum technology, opto-electronic devices, and microwave active circuits. Prerequisites: Electrical Engineering 505 and 510. 2 recitations; 2 laboratories; 4 credits.

775. APPLICATIONS OF INTEGRATED CIRCUITS

The design and construction of linear and nonlinear electronic circuits using existing integrated circuits with an extreme emphasis on the use of operational amplifiers. This course is primarily a laboratory course for those who are interested in the practical applications of nondigital integrated circuit devices. 4 credits.

781. OCEAN INSTRUMENTATION PROJECT

An interdisciplinary effort to define and solve a real-world problem, involving measurements of physical, chemical, or biological parameters in an ocean or fresh-water environment. Students will operate as a team to formulate system specifications, assemble components, and design a test procedure for demonstrating the feasibility of the prototype system. The project will culminate in the preparation of a written final report and oral demonstration before a panel of invited experts in the field. Prerequisite: senior standing in Engineering. Biweekly conferences and individually scheduled laboratory sessions. 4 credits.

782. CONTROL SYSTEMS

Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Prerequisite: permission of instructor. 3 recitations; 1 laboratory; 4 credits.

784. BIOELECTRONICS

A study of topics in bioelectronics including biotelemetry, physiological transducers, and modeling. Animal systems such as the nervous system, circulatory system, the ear, and the eye will be studied from an engineering point of view. Prerequisite: Electrical Engineering 510 or equivalent. 4 credits.

(785). UNDERWATER ACOUSTICS

An introduction to the field of underwater acoustics including vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small and large signal considerations. Prerequisite: senior or graduate status with permission of instructor. 4 credits.

786. INTRODUCTION TO RADIO ASTRONOMY

Characteristics of 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, galactic background, line emissions (Hydrogen, Hydroxyl), quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prerequisite: senior or graduate status within College of Technology. 4 credits.

796 (796). SPECIAL TOPICS IN ELECTRICAL ENGINEERING

New or specialized courses are presented under this listing, on sufficient demand. Independent study can be given under this course title. Prerequisite: permission of instructor. 2 or 4 credits.

English

English (62)

Chairman: Robert Hapgood

PROFESSORS: William G. Hennessy, *emeritus*; Sylvester H. Bingham, *emeritus*; Robert C. Webster, *emeritus*; Max S. Maynard, *emeritus*; Robert Hapgood, William B. Hunter, Edmund G. Miller, Donald M. Murray, Philip L. Nicoloff, John C. Richardson, Thomas A. Williams

ASSOCIATE PROFESSORS: Thomas A. Carnicelli, Carl Dawson, Michael DePorte, Karl Diller, Lewis C. Goffe, Terence P. Logan, Mark R. Smith, Theodore Weesner, John A. Yount

ASSISTANT PROFESSORS: Earl E. Briden, S. Anthony Caldwell, Elizabeth H. Hageman, Hugh M. Potter, Robert M. Rehder, Alan H. Rose, Susan Schibanoff, David V. Siddall, Charles D. Simic

INSTRUCTORS: Lester A. Fisher, Andrew H. Merton

LECTURER: Nancy H. Deane

301. IMPROVEMENT IN WRITING*

Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 3 recitations; 0 credit. NLG.

302. IMPROVEMENT IN READING*

Intensive drill in reading skills for six weeks. 3 recitations; 0 credit. NLG.

303. ENGLISH AS A SECOND LANGUAGE

For students to whom English is a foreign language, a course of instruction in speaking, reading, and writing. 0 credit. NLG.

401 (401). FRESHMAN ENGLISH

Training to write more correctly and with more force and to read with more appreciation and discernment. The staff of the department, under the direction of Mr. Carnicelli. 4 credits.

402 (402). FRESHMAN SEMINARS—APPROACHES TO LITERATURE

Intensive study of a specific literary topic, a theme, a genre, a major figure, or a specific period of English or American literature. 4 credits.

501 (501). EXPOSITORY WRITING

The discipline of non-fiction writing. Weekly papers and frequent conferences required. Prerequisite: English 401 or exemption from it. 4 credits.

512. INTRODUCTION TO AMERICAN LITERATURE

A survey of American literature from the beginning to the present. Some attention will be paid to methods of presenting this literature to high school students. Open only to English Teaching majors. 4 credits.

513, 514. A SURVEY OF ENGLISH LITERATURE

513: From the Old English period to 1800. 514: From 1800 to the present. Prerequisite: English 401 or exemption from it. 4 credits.

515, 516. A SURVEY OF AMERICAN LITERATURE

515: From the beginning of American literature through Whitman. 516: From the Civil War to the present. Prerequisite: English 401 or exemption from it. 4 credits.

*Any student may be recalled and reassigned to an instruction group at any time in his four years of college upon report of any member of the faculty that his work in composition or in reading is deficient.

- 517. AN INTRODUCTION TO LITERARY GENRES**
An introduction to literary forms, either traditional (such as lyric, epic, comedy, and tragedy) or modern (such as the novel and short story). The genres studied and their number vary from year to year. Prerequisite: English 401 or exemption from it. 4 credits.
- 518. THE BIBLE AS LITERATURE**
The various literary types found in the Bible and a survey of the influence of the Bible on English literature. Prerequisite: English 401 or exemption from it. 4 credits.
- 519. INTRODUCTION TO CRITICAL ANALYSIS**
An introduction to the basic skills of critical reading and writing. Students will be expected to participate in class discussions and to write frequent short analytical papers. Readings will be in the three major genres—fiction, poetry, and drama. This course is required of all English majors, and should be taken early in their programs. Prerequisite: English 401 or exemption from it. 4 credits.
- 520. LITERATURE AND THE HISTORY OF IDEAS**
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Prerequisite: English 401 or exemption from it. 4 credits.
- 621, 622. NEWSWRITING**
Workshop courses for the student wishing to develop the reporting and writing skills of a professional newsman. Prerequisite: English 501 or its equivalent. May be repeated for credit with the approval of the department chairman. Written permission of the instructor required for registration. 4 credits.
- 625-626. WRITING FICTION**
A workshop in the fundamental techniques of fiction. Individual conferences. Prerequisite: English 501 or the equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairman. 4 credits.
- 627-628. WRITING POETRY**
A workshop in the fundamental techniques of poetry. Individual conferences. Prerequisite: English 501 or its equivalent. Written permission of instructor required for registration. May be repeated for credit with approval of the department chairman. 4 credits.
- 651, 652. COMPARATIVE WORLD LITERATURE**
A comparison of two or more national literatures through movements, genres, motifs, and dominant philosophic and artistic ideas. 4 credits.
- 695, 696. SENIOR HONORS**
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English. In the first semester the student will examine a series of special literary problems and write a number of short papers. In the second semester, he will investigate independently one or two larger topics and write one or two long papers. *Open to seniors by departmental invitation only.* May be counted as two courses toward the eight which constitute a major in English. 4 credits.
- 697, 698. SENIOR SEMINARS**
Intensive study of specialized topics which vary from year to year. Enrollment in each seminar limited to 15 students. *Exceptional juniors may be admitted with permission of instructor and department chairman.* 4 credits.

English

701-702. **ADVANCED WRITING OF FICTION**

Workshop discussions of advanced writing problems and readings of students' fiction. Individual conferences. Prerequisite: English 625-626 or its equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairman. 4 credits.

703-704. **ADVANCED NON-FICTION WRITING**

A workshop course for advanced students of writing. The course provides a second year of training for those interested in journalism, but it also provides an opportunity for students to practice other forms of non-fiction writing. Individual conferences. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairman. 4 credits.

705, 706. **ADVANCED WRITING OF POETRY**

Workshop discussions of advanced writing problems and readings of students' own poetry. Individual conferences. Prerequisite: English 627-628 or its equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairman. 4 credits.

707. **FORM AND THEORY OF FICTION**

An introduction to the form and theory of fiction from the writer's point of view. 4 credits.

708. **FORM AND THEORY OF NON-FICTION**

An introduction to the form and theory of non-fiction from the writer's point of view. 4 credits.

709. **THE FORM AND THEORY OF POETRY**

An introduction to the form and theory of poetry from the writer's point of view. 4 credits.

710. **CRITICAL ANALYSIS OF FICTION**

A course designed to acquaint the student with a variety of modern approaches to the criticism of fiction, with special emphasis upon developing skills in close analysis of individual works. 4 credits.

711. **CRITICAL ANALYSIS OF POETRY AND DRAMA**

A non-historical, non-genre approach to individual poems and plays with emphasis on the works themselves. 4 credits.

712. **CRITICAL ANALYSIS OF EXPOSITION**

A course designed especially for the English Teaching major in which students analyze essays and write non-fiction prose. The course will stress a variety of critical approaches and introduce several methods of teaching composition. 4 credits.

713, 714. **LITERARY CRITICISM**

Major critics from Plato to the present and the chief critical approaches to literature. 4 credits.

715. **APPLIED LINGUISTICS**

Methods of teaching and learning foreign languages, with background work on theories of language acquisition. The emphasis is on the methodology of teaching English as a second language, but students interested in teaching other languages may do their projects on those languages. 4 credits.

716. **PROBLEMS IN APPLIED LINGUISTICS**

A consideration of such problems as language acquisition in children and adults, bilingualism, and linguistic field methods. 4 credits.

718. **ENGLISH LINGUISTICS**
A descriptive approach to modern English grammar, emphasizing the insights provided by linguistic analysis. 4 credits.
719. **ENGLISH GRAMMAR**
A review of English grammar including both traditional and contemporary approaches. 4 credits.
742. **PURITANISM AND THE ENLIGHTENMENT IN AMERICA**
American literature and thought from the Colonial beginnings through the early republic. 4 credits.
743. **AMERICAN TRANSCENDENTALISTS**
Emerson, Thoreau, and other transcendentalists. 4 credits.
744. **AMERICAN FICTION TO THE CIVIL WAR**
Cooper, Poe, Hawthorne, Melville, and others. 4 credits.
745. **AMERICAN POETRY OF THE NINETEENTH CENTURY**
Bryant, Poe, Emerson, Whitman, Dickinson, and others. 4 credits.
746. **AMERICAN REALISM AND NATURALISM**
Twain, Henry James, Adams, Stephen Crane, Dreiser, and others. 4 credits.
- 747, 748. **AMERICAN FICTION AND DRAMA OF THE TWENTIETH CENTURY**
Fitzgerald, Hemingway, O'Neill, Faulkner, and others. 4 credits.
749. **AMERICAN POETRY OF THE TWENTIETH CENTURY**
Robinson, Frost, Stevens, Pound, Eliot, Jeffers, Hart Crane, Robert Lowell, and others. 4 credits.
752. **HISTORY OF THE ENGLISH LANGUAGE**
A study of the evolution of the English language, with special emphasis upon the relation between linguistic change and literary style. 4 credits.
753. **OLD ENGLISH**
An introduction to Old English language and literature through readings of selected poetry and prose. 4 credits.
754. **BEOWULF**
A reading of the poem and an introduction to the scholarship. Prerequisite: English 753. 4 credits.
- 755, 756. **CHAUCER**
755: Chaucer's allegorical poems and *Troilus and Criseyde*. 756: *The Canterbury Tales*. 4 credits.
- 757-758. **SHAKESPEARE**
757: surveys a number of representative plays. 758: studies a few plays more intensively. 4 credits.
759. **MILTON**
Milton's life and times, all his poetry, and a selection of his prose. 4 credits.
- 763, 764. **ENGLISH LITERATURE IN THE SIXTEENTH CENTURY**
763: Major literary figures of the continental Renaissance (in translation), including Petrarch, Machiavelli, Ariosto, Rabelais, Montaigne, Cervantes, and Erasmus; major English writers of the period, including More, Skelton, Wyatt, and Surrey. 764: A study of Sidney, Spenser, and other non-dramatic poets and prose writers of the Elizabethan period. 4 credits.

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765, 766. ENGLISH LITERATURE IN THE SEVENTEENTH CENTURY

765: Major writers of prose and poetry in the first half of the century; special emphasis upon the relationships between the "metaphysical" and the "classical" modes of poetry. 766: Restoration comedy of manners, heroic drama, verses, satire; Dryden, Milton, and Bunyan. 4 credits.

767, 768. ENGLISH LITERATURE IN THE EIGHTEENTH CENTURY

767: Swift, Pope, Addison, Gay, Defoe. 768: Fielding, Gray, Johnson, Boswell, Gibbon, Goldsmith, Sterne, Blake. 4 credits.

769, 770. THE ENGLISH ROMANTIC PERIOD

769: Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey. 770: Byron, Shelley, Keats. 4 credits.

771, 772. VICTORIAN PROSE AND POETRY

771: Carlyle, Mill, Ruskin, Newman, Tennyson, and Browning. 772: Arnold, Clough, the pre-Raphaelites, Swinburne, Hopkins, Hardy, Housman, and others. 4 credits.

773, 774. BRITISH LITERATURE OF THE TWENTIETH CENTURY

773: Survey of the novels of the period. 774: Survey of the poetry of the period. 4 credits.

781, 782. INTRODUCTION TO ENGLISH DRAMA

The development of English drama, exclusive of Shakespeare, from the Middle Ages to the present. 781: From the Middle Ages to the closing of the theatres in 1642. 782: From the Restoration to the present. 4 credits.

783. THE ENGLISH NOVEL OF THE EIGHTEENTH CENTURY

The rise and development of the novel through study of selected major works by Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. 4 credits.

784. THE ENGLISH NOVEL OF THE NINETEENTH CENTURY

Representative novels from among the following authors: Austen, Scott, Dickens, Thackeray, Emily Bronte, Charlotte Bronte, Trollope, George Eliot, Hardy, and Conrad. 4 credits.

791-792. ENGLISH EDUCATION—PROBLEMS IN THE TEACHING OF HIGH SCHOOL ENGLISH

Principles and methods of teaching literature, composition, and language in secondary schools. Required of all students in the English-teaching major. Open to English majors with permission of instructor. 2 credits. *No credit toward the English major.*

795, 796. INDEPENDENT STUDY

Individual guided study in special topics. Open to highly qualified juniors and seniors both semesters but for a *maximum of 4 credits*. To be elected only with permission of the department chairman and of the supervising faculty member or members.

797, 798. SPECIAL STUDIES IN LITERATURE

1. Old English Literature, 2. Medieval Literature, 3. The Renaissance, 4. The Seventeenth Century, 5. The Eighteenth Century, 6. The English Romantic Period, 7. The Victorian Period, 8. The Twentieth Century, 9. The Drama, 10. The Novel, 11. Poetry, 12. Non-Fiction, 13. American Literature, 14. A Literary Problem. The precise topics and methods of each section will vary. 4 credits.

Entomology (20)

Chairman: G. Thomas Fisher

PROFESSORS: James G. Conklin, *emeritus*; Robert L. Blickle

ASSOCIATE PROFESSORS: G. Thomas Fisher, J. M. Macklin, R. Marcel Reeves

ASSISTANT PROFESSOR: James S. Bowman

400. INSECTS: THEIR ROLE AS MAN'S GREATEST COMPETITOR

What are insects? Their role in the environment as it relates to man and his sphere of activities. Open to any student. Not to be used for major credit. Mr. Fisher. 2 lectures; 4 credits.

(402). INTRODUCTORY ENTOMOLOGY

An introduction to entomology in its broad aspects. The structure, biology, and classification of insects. This course is adapted to students contemplating a major in entomology, in wildlife management, or in the fields of biology or biology-education. Each student is required to make an insect collection. Open to any student. Staff. 3 lectures; 1 laboratory; 4 credits.

503. PRINCIPLES OF ECONOMIC ENTOMOLOGY

The nature of insect damage. The methods of insect control. Quarantine and regulatory measures. Natural control. Applied control measures. Open to any student. Mr. Bowman. 3 lectures; 4 credits.

507. FOREST ENTOMOLOGY

Structure and development of insects. Orders and families of insects of importance to foresters. Principles of insect control. Biology and control of representative forest insects. Each student is required to make an insect collection. Adapted especially for forestry majors. Open to any student. Mr. Reeves. 3 lectures; 1 laboratory; 4 credits.

704. MEDICAL ENTOMOLOGY

Insects and arachnids in relation to public health. The more important disease carriers, their biologies, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lectures; 1 laboratory; 4 credits.

707, 708. ADVANCED ENTOMOLOGY

Insect anatomy, insect ecology, and systematic entomology. Required of entomology majors. Open to others by permission of instructor. R 1. Taxonomy; R 2. Morphology; R 3. Aquatic Insects; R 4. Insect Physiology. Mr. Blickle and Staff. 2 lectures; 1 4-hour laboratory; 4 credits.

709, 710. ADVANCED ECONOMIC ENTOMOLOGY

Studies in the specialized phases of entomology. This course is structured to meet the objectives of the individual student. R 1. Agricultural Entomology; R 2. Biological Control of Insects; R 3. Chemical Control of Insects; R 4 Regulatory Entomology; R 5. Structural Pest Control. Mr. Fisher and Staff. Required of entomology majors. Open to others by permission of instructor. Hours to be arranged. 2 or 4 credits.

Environmental Conservation

(See Institute of Natural and Environmental Resources)

French and Italian

Forest Resources (21)

(See Institute of Natural and Environmental Resources)

French and Italian

Chairman: Grover E. Marshall

PROFESSOR: Louis J. Hudon

ASSOCIATE PROFESSORS: Edna S. Hudon (part-time), Jack R. Vrooman

ASSISTANT PROFESSORS: Rose T. Antosiewicz, Lydia L. Crowson, Robert M. Davis,
Grover E. Marshall

French (63)

New students will be assigned to proper courses on the basis of their scores on the College Board Achievement test and on departmental placement tests given at the first meeting of each course. All courses in the department are conducted in French unless otherwise noted. Junior and senior non-majors may write papers and examinations in English in courses numbered 600 and above. French 605-606 is the first course counting toward a major. Students educated in French-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary level college courses in foreign languages if the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY FRENCH

For students without a previous knowledge of French. Development of basic skills in aural comprehension, speaking, writing, reading, 5 recitations. Students will not be permitted to retain credit for French 401 without passing French 402. Laboratory attendance as required. 4 credits. (May not be taken for credit by students who had two or more years of French in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.)

501. INTERMEDIATE FRENCH

Similar to French 503, below, but for students whose preparation does not qualify them for French 503. This course prepares students for French 504. Completion of this course satisfies the Bachelor of Arts foreign language requirement. 5 recitations; laboratory attendance as required; 4 credits.

503-504. INTERMEDIATE FRENCH

Intensive reading of complete texts, formal review of grammar, training in oral and written expression of ideas. 3 recitations; laboratory attendance as required; 4 credits.

505-506. INTRODUCTION TO FRENCH LITERATURE AND THOUGHT

Reading, discussion, and written analysis of major works in French literature. (Not open to students who have had French 503-504.) 3 recitations; 4 credits.

(514), 514. FRENCH GRAMMAR AND SPEECH

Thorough review of grammar and practice in oral and written expression. Prerequisites: French 504 or 506. (May be taken concurrently with 506.) 3 recitations; 4 credits.

605-606. READINGS IN FRENCH LITERATURE

Intensive readings in French literature from the Middle Ages to the present day. Outside readings on the historical and cultural background of the works read. Open to students who have received a grade of C or better in French 504 or 506. 3 recitations; 4 credits.

621. FRENCH PROSE IN TRANSLATION

A study of works which have determined the course of French thought from the Renaissance to the modern period. Readings, discussions, papers in English. Does not count towards the French major. 4 credits.

622. FRENCH DRAMA IN TRANSLATION

Major works of comedy, tragedy, and drama. Examples range from the classic theatre of Moliere and Racine to the present day. Readings, discussions, papers in English. Does not count towards the French major. 4 credits.

685-686. JUNIOR YEAR AT DIJON UNIVERSITY

A program of studies at the University of Dijon (France) for juniors who have completed their sophomore year at the University of New Hampshire and have passed with a grade of B or better French 605-606 and French 514. Students interested in the program are expected to take courses in French in both their freshman and sophomore years. The students chosen for the program will be required to attend orientation sessions during the second semester of their sophomore year. Interested students should consult with the director of the program, Professor Lydia Crowson. Not offered for graduate credit. Students not majoring in French must obtain the permission of their major department. 32 credits.

(741). FRENCH LITERATURE OF THE MIDDLE AGES

Readings in the epic, lyric poetry, and the romance. Prerequisite: French 606. 4 credits. (Offered upon sufficient demand.)

(742). FRENCH LITERATURE OF THE RENAISSANCE

Readings in the literature of the sixteenth century. Prerequisite: French 606. 4 credits. (Offered upon sufficient demand.)

759-760. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY

Readings in the literature of the seventeenth century. Prerequisite: French 606. 4 credits. (Alternate years; not offered 1974-75.)

761-762. EIGHTEENTH CENTURY FRENCH LITERATURE AND THOUGHT

Readings in the Age of Enlightenment. Prerequisite: French 606. 4 credits. (Alternate years; offered 1974-75.)

767-768. NINETEENTH CENTURY FRENCH LITERATURE

Readings in Romantic, Parnassian, and Realistic literature of the century. Prerequisite: French 606. 4 credits. (Alternate years; not offered 1974-75.)

(770). INTRODUCTION TO MODERN FRENCH POETRY

Studies in French poetry from Baudelaire to the present. Prerequisite: French 606. 4 credits. (Alternate years; not offered 1974-75.)

781-782. CONTEMPORARY FRENCH NOVEL AND THEATER

Readings in the French novel and theater of the twentieth century. Prerequisite: French 606. 4 credits. (Alternate years; offered 1974-75.)

790. ADVANCED LANGUAGE AND STYLE

Translation of literary texts, intensive study of the principal techniques of style, *explication de textes*. Open to qualified students who have had a minimum of two courses in French numbered 741 and above. 4 credits.

791. METHODS OF FOREIGN LANGUAGE TEACHING

An interdepartmental course. A critical study of the objectives, methods, and techniques used in teaching Spanish, French, German, and Latin at all levels from elementary through college. Discussion, demonstration, preparation of instructional

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materials, microteaching of the language skills. Prerequisite: permission of the instructor. No credit toward a French major. (Same as German 791, Latin 791, and Spanish 791.) 4 credits.

795-796. SPECIAL STUDIES IN FRENCH LANGUAGE AND LITERATURE

Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics which may be selected are: the work of a major French author, specific topics in any area of French literature. Prerequisite: permission of the department chairman. Variable credit.

798. SEMINAR IN FRENCH LITERATURE

A study of French authors chosen by the instructor. Prerequisite: French 606. 4 credits.

Italian (64)

New students will be assigned to the proper course upon consultation with the department. Students educated in Italian-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary level college courses in foreign languages if the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY ITALIAN

For students without a previous training in Italian. Development of basic skills in aural comprehension, speaking, writing, reading. 5 recitations; laboratory attendance as required. 4 credits. (No credit for Italian 401 without Italian 402.) (May not be taken for credit by students who had two or more years of Italian in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.)

503-504. INTERMEDIATE ITALIAN

A complete review of the fundamentals of grammar and syntax. Selected readings intended as a general introduction to Italian civilization and culture. 3 recitations; laboratory attendance as required; 4 credits.

795, 796. INDEPENDENT STUDY IN ITALIAN LANGUAGE AND LITERATURE

Individual guided study in special topics in any area of Italian literature. Prerequisite: permission of the department chairman. Variable credit.

Geography (65)

Chairman: William H. Wallace

PROFESSOR: William H. Wallace

ASSOCIATE PROFESSOR: Robert G. LeBlanc

ASSISTANT PROFESSOR: Robert L. A. Adams

LECTURER: James W. Cerny

401, 402. REGIONAL GEOGRAPHY OF THE WORLD

A survey of the geography of the world, organized in terms of the major culture areas of the earth. Geography 401 considers the areas of Western culture—Europe and the New World countries of the Americas and Australia and New Zealand. Geography 402 is concerned with the study of Non-Western culture areas—Black Africa, The Dry World, Oriental Asia, and the Pacific. In each area the unique integration of human

and physical phenomena that produces the distinctive character of the region is studied. 4 credits.

473 (473). THE WEATHER

Interpretation of atmospheric phenomena; heating and circulation of the atmosphere; nature and movement of air masses influencing the weather of North America, especially New England. Explanation of day-to-day weather changes as they occur by graphic analysis, including practical or applied meteorology. 2 lectures; 1 laboratory; 4 credits. (Does not satisfy the Social Science requirement.)

511. GEOGRAPHY OF ANGLO-AMERICA

A regional and topical analysis of the United States and Canada. Physical features and human phenomena are studied in the context of their contributions to the character of the area. 4 credits. (Alternate years; offered fall 1974.)

531. GEOGRAPHY OF WESTERN EUROPE AND THE MEDITERRANEAN

A regional and topical analysis of the geography of Western Europe and the Mediterranean region. Major topics studied include the patterns of natural phenomena, cultural features, and economic systems. 4 credits. (Alternate years; not offered in 1974-75.)

532. GEOGRAPHY OF THE USSR AND EASTERN EUROPE

A systematic analysis of the Soviet Union and the Communist Bloc countries of Eastern Europe with an emphasis on the former. Topics include natural regions, population, ethnography, agriculture, manufacturing, transportation, and trade. The contemporary pattern of population and the location of economic activity are viewed from the perspectives of historical process, the physical resource base, and the economic ideology of Communism. 4 credits (Alternate years; not offered in 1974-75.)

(571) 572. PHYSICAL GEOGRAPHY

A systematic study of the geography of the earth in terms of climates, landforms, vegetation, and soils. Geography 571 is concerned with the study of weather and climate. Landforms, vegetation, and soils, and the integration of physical features in selected areas are studied in Geography 572. 2 lectures; 1 laboratory; 4 credits. (Alternate years; 571 not offered in 1974-75; 572 offered spring 1975.) (Does not satisfy the Social Science requirement.)

581. CULTURAL GEOGRAPHY

An analysis of the geographic pattern of mankind. The differentiation of the world in terms of population, race, language, religion, and economy. Emphasis is placed on the historical origin and the diffusion of these phenomena as well as their significance in understanding the contemporary culture map of the world. 4 credits. (Alternate years; not offered in 1974-75.)

582. ECONOMIC GEOGRAPHY

An analysis of the areal variation of the earth in terms of man's production, exchange, and consumption of economic goods. Agriculture, extractive industries, manufacturing, trade, transportation, and various tertiary activities are studied in terms of their location, their development, and their interaction with related phenomena. Attention will be given to the development and application of various theories of location. 4 credits. (Alternate years; not offered in 1974-75.)

590. INTRODUCTORY CARTOGRAPHY

An introduction to cartography. This course, through lectures and laboratory projects, is designed to develop an awareness of map usage, to develop an appreciation and understanding of the principles of map design, and to acquaint the student with some of the problems of map execution. Emphasis is placed upon

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special purpose thematic maps of the type commonly used in scholarly papers, theses, journals and books. The course is project-oriented. Two lecture-laboratory sessions. 4 credits.

610. THE GEOGRAPHY OF NEW ENGLAND

An intensive study of the geography of the New England region. Major themes are 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 field excursions will be held on weekends near the end of the term. Prerequisite: permission of instructor. 4 credits. (Alternate years; offered spring 1975.)

612. GEOGRAPHY OF FRENCH CANADA

An examination of the French culture region of eastern Canada. Focus of the course is upon the distinctiveness of French-Canadian culture, the reasons for its persistence and the probability of its continued viability. The following topics are covered: natural environment, exploration and settlement, economic change, population change, migration of French Canadians, development of a bicultural society, and the social, economic, and political aspects of the Quiet Revolution. 4 credits. (Alternate years; not offered in 1974-75.)

670. CLIMATOLOGY

The study of the climates of the world. A knowledge of the basic meteorological processes is assumed. Major topics studied include: the atmospheric circulation and its effect upon climates, climatic change, and the problems of climatic description and classification. Most of the course is devoted to the analysis of the climatic characteristics of the major regions of the world. Prerequisite: Geography 473 or Geography 571 or permission of instructor. 4 credits. (Alternate years; offered spring 1975.) (Does not satisfy the Social Science requirement.)

690. ADVANCED CARTOGRAPHY

In-depth examination of selected topics. An opportunity to pursue individual interests while sharing in the work of the instructor and other students. Topics include: map symbolization, map perception, computer mapping, map projection, surface analysis, etc. Prerequisite: Geography 590 or permission of the instructor. One two-and-one-half-hour session. 4 credits.

783. HISTORICAL GEOGRAPHY OF THE UNITED STATES

The spatial analysis of Indian economic life in 1492 and of European exploration, colonization, population change, economy, urbanization, and ethnicity to 1900. Occasional focus on the development of geographic illusions and their significance. 4 credits. (Alternate years; offered fall 1974.)

795 (795). SPECIAL PROJECT IN GEOGRAPHY

The study of special problems in geography by means of readings, library, archival, and field work. This course is intended primarily for seniors majoring in geography. Prerequisite: permission of instructor. 2 or 4 credits.

797. SEMINAR IN GEOGRAPHY

The methodology and philosophy of geography. The course deals with the history of geographic thought, the organizing concepts of the discipline, and the approaches to geographic analysis. The definition and investigation of research problems from the geographic perspective. Primarily for seniors majoring in geography. 4 credits. NLG. Credit/Fail.

Geology

See Earth Sciences.

German and Russian

Chairman: Michael J. Rosenbush

ASSOCIATE PROFESSORS: Marron C. Fort, Helmut F. Pfanner

ASSISTANT PROFESSORS: Alexander P. Danoff, *emeritus*; Guenter Herr, Michael J. Rosenbush, James L. Sherman

German (66)

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 the student has had two or more years of the foreign language in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.

401-402. CONVERSATIONAL GERMAN

Instruction through active use of the German language by means of aural and audio-visual methods. Previous knowledge of German is not required. 5 hours; required laboratory; 4 credits.

403-404. SCIENTIFIC GERMAN

A study and analysis of the German language through reading of selected texts in the natural and physical sciences. Emphasis on translation. Previous knowledge of German is not required. 5 hours; 4 credits.

405-406. GERMAN FOR READING KNOWLEDGE

A study and analysis of the German language through reading of selected texts in literature, the humanities, and the social sciences. Previous knowledge of German is not required. 5 hours; required laboratory; 4 credits.

407. ACCELERATED GERMAN

German 401-402 in one semester. Active use of the German language employing audio-visual techniques. Previous knowledge of German is not required. 10 hours; required laboratory; 8 credits.

501. INTERMEDIATE GERMAN

Continuation and review of grammar, reading comprehension, and oral-aural practice. This course is designed for those students with high school German who wish to fulfill the Liberal Arts foreign language requirement and for those students with a reading knowledge background who need a transition to the oral-track method employed in German 504. German and English are the languages of instruction. 4 hours; required laboratory; 4 credits.

503-504. INTERMEDIATE GERMAN

A continuation of German 401-402 or 407. German is the language of instruction. 4 hours; required laboratory; 4 credits.

507-508. INTENSIVE INTERMEDIATE GERMAN

This course is designed for students who have demonstrated superior ability in Elementary German. Prerequisite: a grade of A in German 402, 404, 406, 407, or their high school/college equivalents, or permission of the instructor. Intensive practice in written and oral expression. The language of instruction is German. 4 hours; required laboratory; 4 credits.

525. INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION

A study of the homogeneous and the heterogeneous aspects in the political, social, and cultural life of East Germany, West Germany, Austria, and Switzerland.

German and Russian

Conducted in English. (This course or its equivalent is required of all German majors and strongly recommended for those taking part in the Salzburg Program.) 4 credits.

526. INTRODUCTION TO GERMAN LITERATURE

Reading and analysis of poems, dramas, and short prose works selected from the works of Goethe, Heine, Hesse, Mann, Rilke, Kafka, Brecht, Frisch, Dürrenmatt, and others, with an introduction to the theory of literary forms. Conducted in German. (This course or its equivalent is required of all German majors going on the Salzburg Program and as a prerequisite to upper-level literature courses.) 4 credits.

601-602. ADVANCED LANGUAGE AND STYLE

This course, which is essential for all students intending to engage in study or research in a German-speaking country, is designed to further develop active facility in the use of spoken and written German. Treatment of a wide range of topics in essays and oral reports. (Required of all German majors; not open to students who will have taken the equivalent courses in Salzburg.) 3 hours; required laboratory; 4 credits.

621-622. GERMAN LITERATURE IN TRANSLATION

Readings of major works in German literature of the last 200 years as represented by Grass, Böll, Brecht, Hesse, Mann, Kafka, Büchner, Heine, Hoffmann, Goethe. Readings, discussion, papers in English. Does not count toward a German major. 4 credits.

623. SURVEY OF PRECLASSICAL GERMAN LITERATURE

The development of German literature from its beginnings till the latter part of the eighteenth century with reading and analysis of one courtly epic (in modern translation) and selected works by Walther von der Vogelweide, Hans Sachs, Luther, Opitz, Gryphius, Grimmelshausen, Gottsched, Wieland, and Lessing. Prerequisite: German 526. 4 credits.

624. THE AGE OF GOETHE

Major literary movements between 1770 and 1832 with reading and analysis of selected works by Herder, Goethe (including *Faust*), Schiller, Hölderlin, Kleist, Tieck, Novalis, Friedrich Schlegel, and Eichendorff. Prerequisite: German 526. 4 credits.

625. GERMAN LITERATURE OF THE NINETEENTH CENTURY

Major literary movements from Goethe's death (1832) until the unification of Germany by Bismarck (1872) with reading and analysis of selected works by Mörike, Grillparzer, Heine, Stifter, Keller, Meyer, Storm, and Fontane. Prerequisite: German 526. 4 credits.

626. MODERN GERMAN LITERATURE

Major literary movements from 1872 until the present with reading and analysis of selected works by Hauptman, Hesse, Mann, Hofmannsthal, Rilke, Kafka, Benn, Brecht, Zuckmayer, Böll, Frisch, Dürrenmatt, and Grass. Prerequisite: German 526. 4 credits.

685-686. JUNIOR YEAR IN SALZBURG

A program of studies at the University of Salzburg (Austria) for students of colleges and universities in New England who have completed their sophomore year and have passed a minimum of four full courses in German with an average grade of B (3.0) or better and have an over-all grade average of C+ (2.5). German majors at UNH are required to take German 526 before going to Salzburg. Students participating are expected to attend a four-week non-credit orientation seminar in Salzburg prior to the beginning of the fall semester. This program is open to all students regardless of major. Interested students should consult the director, Studies Abroad Program. Variable to 32 credits.

726. GERMAN CULTURE AND CIVILIZATION

A survey of the historical, social, artistic, and folkloristic developments in German-speaking countries from the beginnings to the present. 4 credits.

781. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE

The changes in sounds, structure, and vocabulary of the German language from the earliest record to the present. Required for German majors. 4 credits.

791. METHODS OF FOREIGN LANGUAGE TEACHING

Interdepartmental course. A critical study of the objectives, methods, and techniques used in teaching Spanish, French, and German at all levels from elementary through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of the instructor. (Same course as French 791, Latin 791, and Spanish 791.) 4 credits.

795, 796. SPECIAL STUDIES IN GERMAN CULTURE AND CIVILIZATION

Independent and in-depth investigation of a vast range of subjects; barring duplication of material, may be repeated for credit; presumes a sound background in Germanic studies. 1-4 credits.

Russian (67)

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 the student has had two or more years of the foreign language in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.

401-402. ELEMENTARY RUSSIAN

Instruction through active use of the Russian language. Oral-aural practice and written drills designed to achieve a mastery of basic grammatical patterns. Previous knowledge of Russian is not required. 5 hours; required laboratory; 4 credits.

501-502. INTERMEDIATE RUSSIAN

Continuation of Russian 401-402. Review of Russian grammar, reading of prose, and practice in oral and written expression. Prerequisite: Russian 402 or equivalent high school/college course with a grade of C or better. 4 hours; required laboratory; 4 credits.

503-504. RUSSIAN CONVERSATION AND PHONETICS

Designed to increase fluency in Russian conversation and improve phonetic articulation. The content reflects contemporary Soviet speech and expressions. Prerequisite: Russian 401-402 or permission of instructor. 2 hours; 2 credits.

595. RUSSIAN CULTURE AND CIVILIZATION

Introduction to the peculiarities of the Russian culture in relation to the general European setting. Students may pursue a future interest in Russian language, literature, arts, politics, and history. 4 credits.

605-606. INTRODUCTION TO RUSSIAN LITERATURE

Readings of selections from Russian literature. Discussion and composition based on the texts read. Prerequisite: Russian 502 with a grade of B or better or permission of instructor. 4 credits.

621. RUSSIAN LITERATURE IN TRANSLATION

Readings of major works of Russian literature of the last 150 years as represented by Pushkin, Gogol, Tolstoy, Dostoevsky, Solzhenitsyn. Readings, discussions, papers in English. 4 credits.

History

622. DOSTOEVSKY AND SOLZHENITSYN

Critical study of the major novels with particular attention to the theme of social alienation. Conducted in English: readings, discussion, term papers in English. 4 credits.

631-632. ADVANCED RUSSIAN CONVERSATION AND COMPOSITION

For students who wish to perfect their command of spoken and written Russian, maintain aural-oral fluency in Russian through intensive work in and out of the classroom; individual conferences and laboratory session. Prerequisite: Russian 501-502 or equivalent. 3 hours; required laboratory; 4 credits.

795, 796. SPECIAL STUDIES IN RUSSIAN LANGUAGE AND LITERATURE

Courses of study in selected topics in Russian language, culture, and literature. 4 credits.

Japanese

415-416. 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. 5 recitations; laboratory; 4 credits.

515-516. INTERMEDIATE JAPANESE

Review of Japanese grammar. Reading of prose and practice in oral and written expression. Emphasis upon Japanese in daily use in contemporary Japan. Prerequisite: permission of instructor and Japanese 416 with a grade of C or better. 4 recitations; laboratory; 4 credits.

Greek

(See Spanish and Classics)

Health Studies (43)

Dean: Basil J. F. Mott

400. HEALTH—HUMAN VALUES

An introduction to health including the examination of physiological, emotional, social, and environmental factors which affect health. The course is a source of basic health information and develops a broad understanding of current health-related issues. Students explore their own pattern of decision-making regarding issues which directly affect their own lives. 4 credits.

History (68)

Chairman: Douglas L. Wheeler

PROFESSORS: William Yale, *emeritus*; Thomas N. Bonner, William Greenleaf, Hans Heilbronner, Charles A. Jellison, William R. Jones, David F. Long, Darrett B. Rutman

ASSOCIATE PROFESSORS: Gibson R. Johnson, *emeritus*; Allan B. Partridge, *emeritus*; Charles E. Clark, Robert C. Gilmore, Marion E. James, Allen B. Linden, Frank D. McCann, Robert M. Mennel, Marc L. Schwarz, John O. Voll, Douglas L. Wheeler, Donald J. Wilcox

ASSISTANT PROFESSORS: Thomas M. Kemnitz, Judith Silver

Lower-division (500-level) courses are primarily designed for freshman and sophomore students; upper-division (600-700-level) courses are primarily for junior and senior students.

Students are not permitted to enroll concurrently in survey courses and advanced courses of the same area. Nor are they eligible to enroll in elementary courses after having completed advanced courses in the same area. Exemptions from this rule are possible only through petition.

Basic Course

The following course is recommended for students who desire a general introduction to the study of history.

401 (401). PRESENT IN PERSPECTIVE

This course will examine selected issues in contemporary life. Modern religious, cultural, and political topics will be discussed from the viewpoint of the historian in an effort to see the present in a broader perspective. Both Western and non-Western experiences will provide the basis for analysis. 4 credits.

Group 1. American History

503, 504. HISTORY OF THE UNITED STATES

American history from settlement to the present. Political, social, economic, and diplomatic aspects. 4 credits.

505, 506. AFRO-AMERICAN HISTORY

A survey of experiences, aspirations, and contributions of black Americans from their ethnic origins in Africa to the present American crisis in race relations. The historical method and constructive criticism will be applied in this course in order to arrive at knowledge about America's black people. Extensive reading of available sources will be encouraged. 4 credits.

510. U. S. HISTORY: INTRODUCTION

A topical survey, within broad chronological divisions, of the development of American civilization since 1600. *Not open* to students who elect History 503 or 504. 4 credits.

703. THE COLONIAL PERIOD OF AMERICAN HISTORY

Anglo-America from the late sixteenth century to the mid-eighteenth century, encompassing a general and interpretative view of the development of an Anglo-American culture along the eastern seaboard of North America. 4 credits.

704. THE SOURCES AND METHODS OF COLONIAL AMERICAN HISTORY

An introduction to the materials and methodology of the historian of Anglo-America, structured around a series of problems underlying the interpretations considered in History 703, specific approaches to these materials, and what historians have done with the materials. Prerequisite: History 703 and (for graduate students) permission of instructor. 4 credits.

705 706. AMERICA IN THE EIGHTEENTH CENTURY AND THE REVOLUTION

American colonial and revolutionary history during the period from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. 4 credits.

History

711, 712. NINETEENTH-CENTURY AMERICA

The historical factors, both domestic and international involved 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 credits.

715, 716. TWENTIETH-CENTURY AMERICA

United States history since 1896, from the triumph of industrialism on the national scene to the emergence of America as a world power in the nuclear age. Political, economic, and diplomatic developments. 4 credits.

719, 720. THE FOREIGN RELATIONS OF THE UNITED STATES

Primarily the history of American diplomacy, with attention given to the non-diplomatic aspects of foreign relations. 4 credits.

721, 722. HISTORY OF AMERICAN THOUGHT

An examination of the ideas, considered in their social context, of significant American thinkers. First semester, 1600 to 1860. Second semester, 1860 to the present. 4 credits.

723. AMERICAN HISTORIOGRAPHY

An examination of the principal writings of American historians from the Colonial period to the present time. Emphasis will be given to those works that pertain mainly to the American people and their immediate neighbors. Prerequisite: permission of instructor. 4 credits.

724. AMERICAN URBAN HISTORY

The development of urban society in America from Colonial times to the present. Lectures will also explore the comparative histories of European and American cities. 4 credits.

725, 726. AFRO-AMERICAN HISTORY

Basic historical problems, with reference to the economic, political, and social conditions of black Americans, from the early slave-trade period to recent radical confrontations and the Black Power movement. 4 credits.

Group II. European History

521. HISTORY OF SCIENCE (TO THE RENAISSANCE)

Prehistoric techniques, Pythagoreanism and Greek rationalism, the concept of the universe, neo-Platonism and the Newtonian synthesis, history of atomism. 4 credits.

522. HISTORY OF SCIENCE (POST RENAISSANCE)

The idea of the past, evolution; matter, energy, light; the rise and decline of classical physical science; history of relativity and the quantum theory. Prerequisite: History 521 or permission of instructor. 4 credits.

535 (535). MODERN EUROPEAN HISTORY

Primarily a topical survey of the major elements in the rise of Europe to global supremacy from the fourteenth to the nineteenth century, and its transformation in the twentieth. 4 credits.

559, 560. HISTORY OF ENGLAND

The history of the British Isles from earliest times to the present, and a consideration of the British Empire and Commonwealth of Nations. A parallel to English literature, a background to American political history, and a study of English culture and institutions in the democratic and social integration of the world. 4 credits.

739, 740. THREE MEDIEVAL CIVILIZATIONS

A study of the demise of classical antiquity in the lands bordering the Mediterranean and the genesis and fruition of three new cultural traditions: the Latin Christian, the Islamic, and the Byzantine. Stress will be put on religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. 4 credits.

741. THE AGE OF THE RENAISSANCE

The Renaissance from 1300 to 1600. The course will stress intellectual and cultural history and will concentrate on events in Italy, though aspects of the Renaissance in northern Europe will also be covered. 4 credits.

742. THE AGE OF REFORMATION

The course will cover the period from 1300 to 1600 in northern Europe, stressing the intellectual and cultural aspects of the European Reformation. While the course will concentrate on the events of the sixteenth century, important trends in the fourteenth and fifteenth centuries will be given considerable attention. 4 credits.

747. 17TH AND 18TH CENTURY FRANCE: THE OLD REGIME

How France changed from a corporate society where most bonds were local to one in which noble and peasant alike identified with the State. 4 credits.

748. 19TH CENTURY EUROPE: SOCIAL UPEHAVAL AND POLITICAL CHANGE

The tensions between social classes and institutions—the army, the church, the bureaucracy, and education—to see how they affected political development. The main emphasis will be on France. 4 credits.

749. THE AGE OF REVOLUTION

Revolution as a socio-political phenomenon in its historical setting. Comparative approach to Puritan, American, and French revolutions with reference to contemporary movements. 4 credits.

751, 752. EUROPEAN INTELLECTUAL HISTORY

The development of the European intellectual tradition from the Greek philosophers to the end of World War II. Emphasis is on the way in which basic ideas have developed out of previous modes of thought in response to new challenges. 4 credits. (Offered in alternate years.)

756. TWENTIETH CENTURY EUROPE

The background of World War I, the interwar period, the rise of European totalitarianisms, World War II, and the attempts to solve the conflicts of modern society in the post World War II period. 4 credits.

(759). HISTORY OF MODERN SPAIN AND PORTUGAL

The Iberian states and their peoples from the coming of liberalism to the present. Why Iberian liberalism and liberal government failed to triumph will be a featured theme. Political and social change will be emphasized as well as imperial and intellectual movements. In the study of two modernizing countries with persistent traditions, influences of Western European thought and activity will be included. (Seminar format.) 4 credits.

761, 762. ENGLAND IN THE TUDOR AND STUART PERIODS

An examination of the 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 credits.

History

763, 764. HISTORY OF RUSSIA

The development of the Russian state from its foundation to its present status as a world power. The course is designed to increase the understanding of the present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. 4 credits.

767, 768. HISTORY OF GERMANY

Germany and the various German states from the Reformation to the Third Reich and the presently divided Germany. The course will emphasize the relationship and importance of Germany to the rest of Europe. 4 credits.

771, 772. MODERN ENGLAND

The history of England from 1760 to the present. Emphasis is placed on the social, intellectual, economic, and political transformation of the country as it developed into a major industrial nation. 4 credits.

774. EUROPEAN HISTORIOGRAPHY

The development of historical writing from the Greeks to the twentieth century. The course will stress means of evaluating various types of historical writing, the intellectual context of the historians considered, and the effect of this on their work. Readings will be from selected historians. The course is neither a methodology course nor one in the philosophy of history and these problems will not be directly treated. 4 credits.

Group III. Non-Western History

501 (501). WORLD HISTORY

Historical analysis of the experience of the major world civilizations. History from a world perspective, noting interrelationships in time and space among the different human societies. Social, cultural, and political factors of the human experience are examined. 4 credits.

531, 532. LATIN-AMERICAN HISTORY

First semester deals with Amerindian America and the European conquest and domination down to the last half of the eighteenth century. Second semester examines 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 credits.

575. THE ANCIENT NEAR EAST

A history of the Near East from the neolithic revolutions to the time of Alexander the Great. Special attention will be given to the rise of civilization, the nature of man's artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt, and Judaism in its historical setting. 4 credits.

576. THE AEGEAN WORLD

A history of the Aegean area from Crete to the death of Alexander the Great in 323 B.C. 4 credits.

579, 580. THE HISTORY OF CHINA AND JAPAN

A two semester survey of the civilizations of China and Japan from their origins to the present. The goal of the first semester is to study aspects of the traditional civilizations of China and Japan. Students will consider such topics as the evolution of the Chinese imperial system and the development of feudalism in Japan, the dominant religions of China and Japan, and the literature and arts of the two civilizations. In the second semester the modernization of China and Japan from around 1800 to the present is the principal theme. The growth of nationalism in China and Japan, the rise of communism in China, and the development of Japan as a modern industrial state are among the topics of concern. 4 credits.

585, 586. THE HISTORY OF THE MIDDLE EAST

The history of the Middle East from the time of Muhammad to the present. The first semester covers the origins and expansion of Islam and the nature of medieval Islamic civilization. The second semester covers Ottoman history, relations with European powers, and the emergence of modern nations in the Middle East. 4 credits.

587, 588. HISTORY OF AFRICA SOUTH OF THE SAHARA

Africa from ancient times to the present. First semester: from prehistoric times to 1860. Second semester: from 1860 to the present. Topics analyzed will include African migrations, kingdoms and societies, African responses to the slave trade, Islam, European imperialism and colonialism, and industrialization. African nationalism, independence, and post-independence problems will be studied. 4 credits.

731. LATIN AMERICAN HISTORY: REGIONAL OR COUNTRY STUDIES

The history of a specified region or country; directed research papers will be required. History 531-532 is recommended but not required. See the department listing for the semester topic. 4 credits.

732. LATIN AMERICAN HISTORY: TOPICAL STUDIES

A thematic course in which directed research papers will be required. History 531-532 is recommended but not required. See the department listing for the semester topic. 4 credits.

777, 778. THE HELLENISTIC-ROMAN WORLD

The history of the Mediterranean and the Near East from the death of Alexander the Great to the collapse of the Roman and Persian Empires (fifth to seventh centuries A.D.) The course will cover the main political and social developments of the area, but will give most consideration to artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general religious climate that prepared the way for Islam. 4 credits.

(781). HISTORY OF MODERN CHINA, 1839-PRESENT

The modernization of China. The political, social, and cultural changes which have occurred in China from its early contacts with the West to the present. 4 credits.

784. HISTORY OF SOUTHERN AFRICA SINCE 1820

The struggle for political and economic control in the only region of Africa where European groups remain in power. With special attention to the development of European hegemony, the course will trace the impact of European imperialism, European settler nationalism, racial conflict, economic competition and industrialization, Apartheid, and Assimilation. Included will be a discussion of official American policy in this region. 4 credits.

785. THE MODERN MIDDLE EAST

A history of the Middle East from the eighteenth century to the present time, with special attention given to the problems created by modernization and reform of the traditional society, the conservative reaction to reform, the impact of nationalism, and the appearance of new ideologies. 4 credits.

(787). BLACK CONSCIOUSNESS AND PROTEST

A survey of the origins and cause of the rising consciousness and consequent activism of the peoples of Negro descent in the New World and in Africa from the early nineteenth century to the present. Will include lectures, discussions, and panels on protest literature, black nationalism, Pan-Negroism, Pan-Africanism, *negritude*, the Nation of Islam, and separatist religious sects in the Americas and Africa. The framework of the course will be cross-cultural and multi-disciplinary. 4 credits.

History

793. ADVANCED WORLD HISTORY

History from the perspective of the experience of the whole human community. The histories of separate areas will be examined in terms of their relationship to the general historical experience of man. Problems of interpretation, interrelationships, similarities, and differences in the development of the major traditions of civilization. Students will present oral and written reports as a basis for discussions. Prerequisite: permission of instructor. 4 credits.

Group IV. Special Courses

595, 596. EXPLORATIONS IN HISTORY

A special course exploring a variety of topics. See department listings for subject to be offered each semester. 4 credits.

697 (697). COLLOQUIA FOR SENIOR HISTORY MAJORS

Intensive study of selected historical subjects in seminar or colloquium. Topics and instructor to be announced each year. Open only to history majors. This course is required of all history majors and it is expected that they will take this course during their senior year. Juniors may be admitted with the permission of the instructor. May not be repeated for credit except with the permission of the department. Offered both semesters annually. Depending on the particular subject, may be used to satisfy major requirements in American, European, or non-Western history. 4 credits.

(789). SEMINAR IN THE HISTORY OF SCIENCE

Selected topics, conducted through special lectures, individual study, oral and written reports. The subject will vary from year to year. Cannot be used for credit in history without permission of the history department. Prerequisite: permission of adviser and instructor. 4 credits.

790. QUANTIFICATION AND COMPUTERS FOR THE HISTORIAN

An introduction to the historian's use of computers and statistics stressing the practical applications of both interactive terminal operations and batch processing. Students will be exposed to data generation and processing, computer languages (BASIC, FORTRAN), programming and library programs, terminal and batch procedures, elementary statistics; will undertake operations of their own on material supplied; and will consider particular quantitative studies in history in terms of techniques used. No previous knowledge of computers or college mathematics required. Prerequisite: admission as an undergraduate major or graduate student in history or permission of instructor. 4 credits.

791. HISTORY-EDUCATION—PROBLEMS IN THE TEACHING OF HIGH SCHOOL HISTORY AND OTHER SOCIAL STUDIES

Bibliography and new interpretations of history; the social studies curriculum, past and present; aims and objectives in the social studies; selection and organization of teaching material; teaching and testing techniques. Special emphasis on teaching American history and the problems of American democracy. This course may not be used to satisfy major requirements. 4 credits.

795, 796. INDEPENDENT STUDY

(1) Early American History, (2) American National History, (3) Canada, (4) Latin America, (5) Medieval History, (6) Early Modern Europe, (7) Modern European History, (8) Ancient History, (9) Far East and India, (10) Near East and Africa, (11) European Historiography, (12) American Historiography, (13) Russia, (14) World History, (15) English History.

Students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered may undertake an independent study project in that area. In order to register for independent study, the student must obtain the permission of his major adviser and a member of the faculty who agrees to supervise his study. 4 or 8 credits.

797 (797). COLLOQUIA IN HISTORY

Selected topics in American, European, and non-Western history. Open to advanced undergraduate and graduate students. Prerequisite: permission of instructor. Depending on the particular subject, may be used to satisfy the major requirements in American, European, or non-Western history. 4 credits.

Home Economics (22)

Chairman: Elizabeth A. Snell

ASSOCIATE PROFESSORS: M. Elizabeth Rand, *emeritus*; Mary E. Holder, Elizabeth A. Snell

ASSISTANT PROFESSORS: Larry J. Hansen, Judith A. Schickedanz

INSTRUCTORS: Juanita M. Costa, Carol D. Courser, Judith A. Dawson, Victor R. Messier, Linda Schomaker

LECTURER: Helen P. Hall

407 (607). PROFESSIONAL SEMINARS

Designed to help the student define and clarify professional and educational objectives, to become acquainted with the philosophy, focus, and issues in home economics and with professional opportunities in the field. A student may enroll in the first half of the course in the freshman or sophomore year and the second half in the junior or senior year. Field trips and guest speakers will be an integral part of the course. HE 407: fee for field trips, \$10. 2 credits each semester, NLG.

415 (415). BASIC CLOTHING CONSTRUCTION

Self-paced programmed instruction laboratory. Experimental approaches to clothing construction. The student will demonstrate specified competencies. 2 credits. Credit/Fail.

(418) 418. FOOD PREPARATION

Fundamental principles of food preparation and service, including meal planning. Application of these principles through laboratory experiences. Prerequisite: Home Economics major. 2 lectures; 1 laboratory; 2 credits. Laboratory fee \$10.

419. MEAL MANAGEMENT

Problems involved in the planning, selection, and serving of meals. Emphasis on the management of time, money, and energy. Prerequisite: Home Economics major. Lab fee \$5. 1 lecture; 1 laboratory; 2 credits.

506. PRINCIPLES OF NUTRITION

A study of the fundamental principles underlying the nutrition of man and animals; the functions of the various nutrients in the maintenance, growth, and production of the animal body and the metabolic disorders resulting from their deficiency; the digestion, absorption, intermediary metabolism, and excretion of individual nutrients will be discussed within this framework. Mr. Repka. Prerequisite: Human Physiology and some knowledge of organic chemistry. (Also offered as Animal Science 506.) 3 lectures; 1 laboratory; 4 credits.

507 (507). INTRODUCTORY FIELD EXPERIENCE

A supervised experience in the community which provides opportunity for students to explore various career opportunities in nurse-y schools, day care centers, cooperative extension, programs for the handicapped, youth groups, schools, community and family welfare agencies, hospitals, and others. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits.

Home Economics

514. TEXTILES

Factors which affect the acquisition and use of clothing and textile products. Special consideration given to textile fiber and fabric properties, producer-retailer-consumer interrelationships, and the textile industry. Laboratory and field trips fee, \$9. 4 credits.

525 (525). HUMAN DEVELOPMENT

An examination of theories concerning the development and guidance of the child from conception through aging. 4 credits.

531 (531). ENVIRONMENTICS

A study of the physical, social, and psychological aspects of the environment in terms of *user-needs*. Application to a problem in practical analysis. 4 credits.

557 (557). CONSUMER EDUCATION

The role and responsibility of the consumer in contemporary society. An examination of the decision-making framework through which the consumer may acquire skills in identifying and evaluating alternative choices in an increasingly complex market system. Emphasis on influences of the larger environment as it affects and is affected by consumer choice-making. Student-developed problems will focus on some of the current social and economic issues that affect the lives of individuals. 4 credits.

573 (573). HUMAN NUTRITION

The basic principles of nutrition and their application in meeting nutritional needs during the various stages of the life cycle. 4 credits.

575. NORMAL AND THERAPEUTIC NUTRITION

The functions, acquisition, and utilization of essential nutrients and the relation of nutrition to health during the various stages of the life cycle with some consideration of the dietary treatment of certain diseases. Prerequisite: permission of instructor or nursing major. 4 credits.

583 (583). THE YOUNG ADULT

Relevant issues as identified by the students will be investigated through guided reading, guest lecturers, small group discussions, and individual projects. 4 credits.

615. SPECIALIZED CLOTHING CONSTRUCTION

The interrelationship of methods, processes, and techniques involved in pattern designing and advanced clothing construction. Laboratory experiences are provided for application of and experimentation with selected principles. Prerequisite: Home Economics 415, exemption test, or permission of instructor. 4 credits.

(626) 626. THE YOUNG CHILD

Normal development and behavior with emphasis on the research concerning infancy and early childhood. The student will design and conduct an individual study with young children. Prerequisite: Home Economics 525 or equivalent. 4 credits.

627 (627). CREATIVE ACTIVITIES IN PRESCHOOL PROGRAMS

An exploration of how needs of young children are met through creative activities. The focus will be an appreciation and understanding of the creative process and guidance of activities as a basis of curriculum development in preschool programs. The student will observe and participate in preschool programs. Prerequisite: Home Economics 626, home economics major, or permission of instructor. 4 credits.

657 (657). MANAGEMENT AND DECISION MAKING IN THE FAMILY

An examination of family concepts and their application to the management dynamics of family decision-making. Opportunities will be provided for direct experience in family situations. 4 credits.

671. INTRODUCTION TO FOOD SCIENCE

Introduction to the experimental study of food, application of the principles underlying food preparation, and experimentation in comparative food preparation. Prerequisite: Home Economics 418 or equivalent and some knowledge of organic chemistry. Laboratory fee \$8. 3 lectures; 1 laboratory; 4 credits.

674. QUANTITY FOOD PURCHASING AND PRODUCTION

Principles and methods of quantity food purchasing and production. Laboratory experiences in University dining halls. Prerequisite: basic food preparation and permission of instructor. 4 credits.

683 (683). FAMILY RELATIONS

An examination of theories and supporting research concerning dynamics and patterns of interaction, role behavior, and development in families in specific. Prerequisite: a course in the behavioral sciences. 4 credits.

685. ONE SEMESTER AT THE MERRILL-PALMER INSTITUTE

A junior or senior student in the Department of Home Economics may attend the Merrill-Palmer Institute in Detroit, Michigan, for one year or one semester.

695 (695). INDEPENDENT STUDY

A student who has shown special ability in a selected area of home economics may, with department approval, elect to work on a problem of special concern in the area of his or her choice. Regular conferences with an adviser are required. Prerequisite: department permission. One or more semesters. 2 or 4 credits.

(696) 696. FIELD EXPERIENCE

Field work for one semester with an agency, institution, or organization concerned with the welfare of families and individuals. The student will plan this experience with the department adviser and apply for approval for the field work. The student will live in or near the community in which he/she is working and will pay regular University tuition. Approval will depend on recommendation of faculty members and the interest and commitment of the student. Limited to home economics juniors or seniors. Not more than 16 credits.

707 (707). PRACTICUM WITH CHILDREN AND FAMILIES

A planned supervised experience with children or families at both participating and observing levels. The practicum is designed to increase the students' awareness and understanding of the ways human beings grow and behave and the dynamics of the family. Weekly discussions will be combined with individual and small group supervisory conferences. Students have the opportunity to choose a focus for their practicum from among the following areas: 1. Young children, e.g., preschool program; 2. School-age children; 3. Adolescents; 4. Children and parents; 5. Low-income families, e.g., management experiences. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits, maximum of 6 credits in one area.

709. BIOCHEMISTRY OF NUTRITION

An in-depth study of the intermediary metabolism of nutrients with emphasis on energy metabolism. Coverage includes transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism in normal and abnormal states; obesity and control of hunger and appetite. Mr. Repka. Prerequisite: college course in biochemistry. (Also offered as Animal Science 709). 3 lectures; 4 credits.

(715). CLOTHING IN RELATION TO HUMAN BEHAVIOR

The analysis of research and theory in the social psychological aspects of clothing. An exploration and study of clothing behavior of individuals and groups. Special

Home Economics

emphasis given to stages of the life cycle, development of the self, and the phenomenon of fashion. 4 credits.

725. PRESCHOOL PROGRAMS

The organization and operation of programs for young children. Theoretical knowledge about children and educational techniques will be related to the curriculum, facilities, and administration in a variety of group programs for young children. Prerequisite: home economics major or permission of instructor and Home Economics 627. 4 credits.

754. PERSONAL AND FAMILY FINANCE

Major financial alternatives available to families during the various stages of the family life cycle. 4 credits.

757. CONSUMER PROBLEMS

A model for analyzing consumer problems from the perspective of family, business, and government interests. The application of theoretical knowledge to the solution of consumer problems. Prerequisite: 8 credits in consumer studies and permission of instructor. 4 credits.

774. CLINICAL DIETETICS

Application of principles of normal nutrition to clinical problems with description of altered nutrient requirements in human disease. Diet therapy as an applied aspect of clinical nutrition is considered. Prerequisite: Home Economics 573 and 506, a college course in biochemistry, and consent of the instructor. 3 lectures; 1 laboratory; 4 credits.

(776) 776. NUTRITION—A WORLD VIEW

The major nutritional problems facing the world today. Consideration of protein-calorie malnutrition; obesity; nutritional status of adolescents; and special nutritional problems of pregnancy, infancy, childhood, and the aging. Use of the scientific literature to examine methods of assessing nutritional needs, nutritional status, and problems of current national and international interest. An exploration of various approaches and materials used in nutrition education. Prerequisite: Home Economics 506, 573, or 575; or consent of the instructor. 4 credits.

(786). DYNAMICS OF FAMILY CHANGE

An examination of the theories and supporting research for the assessment of family interaction patterns. Planned intervention techniques will be discussed. The secondary focus is on the students' examination of their interaction processes and their possible effect on intervention efforts. Prerequisite: Home Economics 683, Psychology 545. 4 credits.

791 (791). METHODS OF TEACHING FAMILY LIFE AND HOME ECONOMICS

Home economics education in the school program, curriculum materials, methods, and resources in teaching home economics. Offered each semester as part of the secondary student-teaching Block Program and as an independent course in alternate years. 4 credits.

793. SEX EDUCATION IN HOME, SCHOOL, AND COMMUNITY

An exploration of human sexuality and of programs, materials, and methods for sex education in the home, school, and community. Intended for students planning careers in teaching, nursing, or social work. Prerequisite: Biology 409 and permission of instructor. 4 credits.

Hotel Administration (32)

Program Director: Mel Sandler

ASSOCIATE PROFESSORS: Mel Sandler

ASSISTANT PROFESSOR: Frank Bucci

ADJUNCT ASSISTANT PROFESSOR: Barry D. Kaplan

INSTRUCTOR: Eric Orkin

403. ELEMENTS OF INSTITUTIONAL ADMINISTRATION

The various components of the services sector with emphasis upon the lodging and feeding segment. Laboratory experience enhances the understanding of production-service facilities and personnel performance. 4 credits.

518. FINANCIAL ANALYSIS AND CONTROLS

A specific approach to the unique controllership of the lodging and feeding industries, demonstrating concern for perishable commodities as related to the personal nature of production and service, time factors, and the mobile characteristic of the customer. Prerequisite: Administration 517. 4 credits.

556. MANAGEMENT OF PHYSICAL STRUCTURES

Stresses analysis of the components of physical structures as functional units through logical development of principles rather than application of formulae and rigid rules. The concept of building management is presented as demonstrating the interdependence of planning, construction, equipment, maintenance, personnel, and the customer. 4 credits.

655. MANAGEMENT FOR TRANSIENT, LEISURE, AND INSTITUTIONAL SERVICES

Feasibility planning, development, financing, and organization of facilities. Rate-structure determination, i.e., analysis of demand as against variable costs of operation and fixed-cost considerations, such as the economic life of structures. Case studies provide observation of production and cost functions, human motivation, and institutional behavior, with the customers present. 4 credits.

666. MARKETS AND PROMOTION OF PUBLIC SERVICES

Aspects of the services market with emphasis on consumer behavior. Internal and external stimulation of sales in competitive and non-competitive markets, and the vagaries of environmental concept. Experimental techniques embodied in industry sponsored sales-blitz activities. 4 credits.

667. FUNCTIONAL MANAGEMENT

Experiences in organizational behavior within the framework of functional services. The responsibility of management is assumed in various roles involving marketing, promotion, sales, production, personnel, and customer attitudes. 4 credits.

695. INDEPENDENT ANALYSIS

An independent study and research project for honor students performed for the advancement of knowledge in the lodging and feeding fields. Prerequisite: senior standing and permission of instructor. 4 credits.

698 (698). SEMINAR

Special topics in hotel and institutional management. In-depth exploration of developments related to the service industries augmented by use of case studies. Prerequisite: Hotel Administration major with senior standing or consent of adviser and instructor. Course may be limited to 20. 4 credits.

Institute of Natural and Environmental Resources

Humanities (69)

Courses Coordinated by the Chairman of the
Humanities Division, College of Liberal Arts

501-502. HUMANITIES

A course in general education sponsored by the departments of the Humanities Division. It aims to develop an appreciation of literature, the visual arts, and philosophy, and to provoke further study into the roots of Western civilization. Some of the authors studied in 501 include Homer, the Greek Tragedians, Plato, Aristotle, the Stoics, the Bible, and Virgil. In 502, Dante, Castiglione, Machiavelli, Cervantes, Montaigne, Racine, Moliere, Pope, Goethe, Wordsworth, Flaubert, Zola, Tolstoi, Ibsen, and Chekhov, as well as the most important developments in Western art. Weekly lecture series, slides, films, and visits to Boston museums. Open to freshmen. Course coordinator: R. A. Casás. 4 credits.

503. HUMANITIES OF THE TWENTIETH CENTURY

A course in general education sponsored by the departments of the Humanities Division. It continues the aims and methods of Humanities 501-502, but it focuses on the literatures, philosophies, and arts of Western civilization in the last hundred years. Prerequisite: Humanities 502 or another course in the history of literature, philosophy, or the arts. 4 credits.

595. SPECIAL STUDIES IN THE HUMANITIES

Subjects of interdisciplinary interest in the humanities, sponsored by the departments of the Humanities Division. The subject will vary from semester to semester. The course may be repeated for credit. 4 credits.

699. SENIOR PROJECT IN HUMANITIES

Independent work under a faculty adviser culminating in a senior project. Open only to senior Humanities majors. 2, 4, or 6 credits.

Institute of Natural and Environmental Resources

Director: David P. Olson

PROFESSORS: Richard A. Andrews, James P. Barrett, James R. Bowring, Paul E. Bruins, Gordon L. Byers, William H. Drew, Francis R. Hall, Otis F. Hall, William F. Henry, John L. Hill, Harold W. Hocker, Jr., Allan B. Prince

ASSOCIATE PROFESSORS: Owen B. Durgin, Nicholas Engalichev, Bennett B. Foster, Edmund F. Jansen, David P. Olson, Nobel K. Peterson, M. Marcel Reeves, Oliver P. Wallace, Silas B. Weeks, Richard R. Weyrick

ASSISTANT PROFESSORS: Robert D. Harter, H. Stevan Logsdon, William W. Mautz, Douglas E. Morris, Roger P. Sloan

ADJUNCT PROFESSOR: George E. Frick

ADJUNCT ASSOCIATE PROFESSORS: C. Anthony Federer, William B. Leak, Nelson L. LeRay, Robert S. Pierce

ADJUNCT ASSISTANT PROFESSOR: Peter W. Garrett

Institute of Natural and Environmental Resources (27)

511. COMPUTATION METHODS IN NATURAL RESOURCES

Principles and practice in computer programming using BASIC and FORTRAN on

Institute of Natural and Environmental Resources

remote terminals. Solution of forestry and other natural resource problems. Staff. No credit if Math 403 is taken. 1 lecture; 1 laboratory; 2 credits.

528. APPLIED STATISTICS I

Development of elementary statistical techniques through the analysis of prepared data. Topics reviewed include numeric scales; continuous and discrete probability distributions; distributions of sample statistics; small-sample theory; elementary analysis of variance; regression; correlation, their non-parametric analogues; and chi-square. Mr. Durgin. 2 lectures; 4 credits.

581. METHODS IN LAND SURVEYING

An applied course in principles and field methods of land surveying for the natural resource manager. Principles of measurement of distance, direction, and elevation. Instrumentation and computation, legal aspects of land description and boundary. Mr. Jenkins. Prerequisite: Forest Resources 542 or permission of instructor. 2 lectures; 1 4-hour laboratory; 4 credits.

635. CONTEMPORARY CONSERVATION ISSUES

Man's technology, applied to the wildland renewable resources, causes biological and social conflicts because men's objectives, relative to these resources, differ. Game, timber, water, minerals, and soil contribute to economic growth but this growth places conflicting demands on our eco-systems. Elective for all students except freshmen. Mr. Wallace, Mr. Bruns. 3 lectures; 4 credits.

637. PRACTICUM IN ENVIRONMENTAL CONSERVATION

Independent project involving participation in an environmental conservation activity during the senior year. Students plan, present, and discuss their activities. Project must be oriented to helping people understand and improve environmental quality. Individual or group projects may be developed with any faculty member within or outside INER. Research projects are not acceptable. Environmental Conservation faculty. Prerequisite: senior standing. 1 lecture; 1 laboratory; 4 credits.

676. ECONOMICS OF WATER USE AND QUALITY MANAGEMENT

Water use is economically assessed in current and prospective institutional framework. Includes 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. Mr. Andrews. Prerequisite: Elementary biological or physical science (or Soil and Water 504) and elementary economics. Two 1½-hour lectures; 4 credits.

701 (701). STATISTICAL METHODS I

An introduction to the analysis of variance and general linear models. Topics will include measured numbers, the nature of statistical evidence, sampling distributions, and principles of statistical inference. Emphasis will be on the application of specific linear models to given sets of data. Prerequisites: upper division undergraduate or graduate standing. Mr. Durgin. 4 credits.

702. NATURAL RESOURCES POLICY

Contemporary issues in the management and allocation of natural resources. The impact of human activity and demands on resources, including agricultural and forest lands, water, wildlife, fisheries, and minerals. Historical perspective as it contributes to an understanding of current public and private resource policies. Prerequisite: permission of instructor. Mr. Bruns, Mr. Weyrick, Mr. Bowring, Mr. Drew. 4 credits.

709. SOILS AND COMMUNITY PLANNING

A "Town Plan" and a soils map are studied by students to develop individual reports of land use. Introduction to the soils of New Hampshire, basic information on the U.S.D.A. soil classification system, and the Soil Conservation Service criteria for rating soils for multiple use: housing, recreation, sewerage, effluent disposal,

Forest Resources

conservation, transportation, surface runoff, and other soil-use problems common to rural and urban communities. A representative of a town-planning firm and federal and state soil scientists are guest lecturers. Mr. Peterson. 2 lectures; 2 credits.

711. STATISTICAL METHODS II

An intermediate course in statistics. Topics include 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. Prerequisite: INER 528 or equivalent. Mr. Barrett. 2 1/2 hour seminars; 1 laboratory; 4 credits.

712. SAMPLING TECHNIQUES

A study of the techniques of sampling a finite population. Topics include choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Prerequisite: INER 528 or equivalent. Mr. Barrett. 2 1/2 hour seminars; 1 laboratory; 4 credits.

735. POLLUTION OF WATER: CAUSES AND CONTROL

A combination of individual study and guided classroom discussion to explore problems in environmental pollution. Major emphasis is on the scientific and technological aspects of pollution and pollution control. Topics include the sources, effects, and control of water pollution; as well as its social, economic, and legal implications. Mr. Harter. Prerequisite: senior or graduate standing. Two lectures and weekly papers; 4 credits.

753. OPERATIONS CONTROL AND ANALYSIS

Theory and use of the more important quantitative tools used to aid decision-making in natural resource-based production activities. Development and analysis of cost functions, forecasting, linear programming, Monte Carlo simulation, PERT. Transportation fee. Prerequisites: knowledge of computer use and programming, a course in microeconomics (e.g. Forest Resources 544), and elementary statistics. Mr. Foster. 3-hours lecture; 2-hours lab; 4 credits.

758. REMOTE SENSING

Imaging with photographic and non-photographic sensors. Emphasis is on the interpretation of aerial photography and on conventional photogrammetric techniques. Applications of remote sensing to resources management, including forestry, agriculture, geology, engineering, wildlife, and land-use planning. Transportation fee. Field and indoor laboratory work arranged to fit the disciplinary interest of the student. Mr. Bruns. 3 hours lecture; 3-hour laboratory; 4 credits.

797. FOREST RECREATION SEMINAR

The recreational use of non-urban lands. Economics of public and private developments. Planning for state and private recreational use, emphasizing social aspects. A class project recreation plan is developed. Prerequisite: junior standing and permission of instructor. Mr. Wallace. Two 1/2-hour sessions; 4 credits.

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425. DENDROLOGY

The identification, classification, and silvical characteristics of trees and shrubs in autumn and winter. An introduction to plant taxonomy, ecological succession, and plant geography. The principal forest regions of North America. Required of freshmen in forestry and wildlife. A class transportation fee is charged. Mr. Mautz. 2 lectures; 2 laboratories; 4 credits.

- 426. WOOD TECHNOLOGY**
Introduction to microstructure; physical, chemical, and mechanical properties; and seasoning and preservation of wood. Identification of commercially important timbers and wood quality evaluation. A class transportation fee is charged. Mr. Hill. 6 hours per week; 4 credits.
- 527. SILVICS**
The ecological basis of silviculture; classification of forest communities; environmental factors and their influence on forest vegetation; influence of vegetation on environment. A class transportation fee is charged. Prerequisite: Botany 411, Forest Resources 425 or Botany 566, Soil and Water Science 501 taken concurrently. Mr. Hocker. 3 lectures; 1 laboratory; 4 credits.
- 542. FORESTLAND SURVEYING**
Forest and land measuring equipment and techniques, preparation of maps, public land survey, courthouse deed search. Two-week field session in June. A class transportation fee is charged. Mr. Foster. 2 credits.
- 544. FOREST ECONOMICS**
Economics involved in the supply and demand for forest products, services. Forestry and the general economy, economics of the firm, forest valuation, taxation. Prerequisite: Principles of Economics. Mr. Foster. 3 hours of lecture; 2 hours of laboratory; 4 credits.
- 629. SILVICULTURE**
The theory and techniques of applying ecological knowledge to the control of establishment, composition, and growth of forest stands for economic purposes. A class transportation fee is charged. Prerequisite: Forest Resources 425 and 527. Mr. Hocker. 2 lectures; 2 laboratories; 4 credits.
- 634. WILDLIFE ECOLOGY**
The biological principles and human factors affecting wildlife and fish populations, and an introduction to the theory and practice of wildlife management. Includes a survey of common fish and wildlife species, research problems, and management techniques. Prerequisite: a basic course in biology, botany, or zoology, or consent of instructor. A class transportation fee is charged. Mr. Olson. 2 lectures; recitation; laboratory; 4 credits.
- 644. FOREST BIOMETRICS**
Application of mathematical, statistical, and computer techniques in forest resource measurements and inventory. Course includes area sampling, point sampling, and photogrammetric techniques. A class transportation fee is charged. Prerequisite: calculus, computer techniques, and Forest Resources 542. Mr. Barrett. 2 1/2 hour seminars; 1 laboratory; 4 credits.
- 660. FOREST FIRE PROTECTION**
Principles and techniques of forest fire prevention, behavior, and effective control. Weather phenomena related to fire and other aspects of forest damage. Fire effects and use. Transportation fee. Prerequisite: Forest Resources 527 or 629, Soil and Water 501. Mr. Weyrick. 2 lectures; 1 laboratory (10 weeks of semester); 2 credits.
- 672. ECOLOGICAL ENERGETICS**
Processes and phenomena involved with the flow of energy through ecological systems. Basic concepts and laws of thermodynamics and their application to biological systems which include both animals and plants; photosynthesis; respiration; trophic structures; productivity; and ecological efficiency. Man's use of energy, present and future, and his effects on energy flow in the eco-system. Prerequisite: An ecology course or permission of instructor. Mr. Mautz. 3 lectures; 1 laboratory; 4 credits.

Forest Resources

695, 696. INVESTIGATIONS IN FORESTRY

Work to be arranged according to the needs of individual students. 1. Forest Ecology; 2. Photogrammetry; 3. Forest Utilization; 4. Game Management; 5. Mensuration; 6. Forest Economics; 7. Forest Management; 8. Operations Control and Analysis; 9. Recreation; 10. Policy; 11. Wildlife Physiology. Prerequisite: permission of instructor. Staff. Hours arranged. 2 or 4 credits.

720. FOREST TREE IMPROVEMENT

The genetics of forest tree improvement with emphasis on variation in natural populations, the basis for selection of desired characters, and the fundamentals of controlled breeding. The application of principles will be directed toward silviculture, management, and utilization. Prerequisite: permission of instructor. Mr. Hocker. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered in 1975-76.)

737. GAME MANAGEMENT I

Biological characteristics, habitat usage, research, and management techniques of *upland game birds and big game mammals*. Students should be prepared for weekend field trips to wildlife areas in New England. Transportation fee. Prerequisite: wildlife management major or permission of instructor. Mr. Logsdon. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

738. GAME MANAGEMENT II

Biological characteristics, habitat usage, research and management techniques of *small game mammals, furbearers, and waterfowl*. Students should be prepared for weekend field trips to wildlife areas in New England. Transportation fee. Prerequisite: wildlife management major or permission of instructor. Mr. Longsdon. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

745. FOREST MANAGEMENT

Production control in forests with many uses and management objectives. Problems in forest production regulation and economic analysis. Practice of forest administration. Professional responsibilities and opportunities. Prerequisite: completion of junior year in forestry curriculum. A class transportation fee is charged. Mr. Hall. 3 lectures; 1 laboratory; 4 credits.

754. WOOD PRODUCTS MANUFACTURE AND MARKETING

The wood products manufacturing industry from harvesting and procurement of raw material to finished product processes with emphasis on management decisions, marketing, and promotion problems. Visits to harvesting operations and manufacturing plants in New England. Transportation fee. Prerequisite: Forest Resources 426. Mr. Hill. 3 lectures; 1 laboratory; 4 credits.

764. FOREST INDUSTRY ECONOMICS

Application of business methods and economics in the establishment and operation of a forest industry; planning for minimum cost operations and the profitable use of capital in a forest enterprise. Each student will develop a project: an industrial plant. Prerequisite: senior standing and permission of instructor. Mr. Wallace. 2 one-hour sessions; 1 laboratory; 4 credits.

798. FOREST RESOURCES MANAGEMENT SEMINAR

Population trends and human needs in relation to forest land productivity for timber, wildlife, water, recreation, and grazing. Class organized for group planning to maximize forest productivity for the state of New Hampshire. Prerequisite: Forest Resources 745. Mr. Wallace. 2 lectures; 1 laboratory; 4 credits.

Resource Economics (25)

401. MACRO AND ENVIRONMENTAL ECONOMICS

Introduction to aggregate economics and tools to solve environmental economic problems. Economic scarcity, inflation, unemployment, monetary and fiscal policy, taxation, and economic growth are studied during first ten weeks. Remainder of semester is on external costs; use and misuse of resources; and relationships among economic growth, environmental quality, and policies to reduce pollution. Mr. Jansen and Mr. Morris. (No credit if Economics 401 has been taken.) 4 credits.

402. ECONOMICS OF RESOURCE USE AND GROWTH

The roles of labor, capital, and technology in growth and development. The economics of food production, food marketing, and consumer decision-making. National policy for food prices, land use, and resource development. Mr. Henry. 3 1½-hour lectures; 4 credits.

501. AGRICULTURAL BUSINESS

Structure, organization, and performance in the U. S. agricultural business sector. Major emphasis is placed on agricultural commodity marketing systems. Demand estimation, pricing policies, consumer characteristics, and related topics. Problems and case materials are used. 3 lectures; 4 credits.

504. MANAGEMENT OF FARM AND RELATED RESOURCE-BASED BUSINESS

Planning, operation, and control of firms in the institutional environment of commercial agriculture. Emphasis is on organizing the farm firm; planning adjustments, use and analysis of records, and taxation. Laboratory experience in budgeting changes, analyzing alternatives, estimating credit needs, and farm appraisal. Prerequisite: Economics 402 or Resource Economics 402 or permission of instructor. 2 lectures; 1 laboratory; 4 credits.

506. POPULATION, FOOD, AND RESOURCE USE IN DEVELOPING COUNTRIES

The economic, technical, cultural, social, and political factors that influence food supplies, resource use, income distribution, and growth potentials in the developing countries. The solution of population and food problems is given emphasis. Specific topics include: the population explosion; strategies for expanding food supplies; social and institutional constraints; strategies and policies for economic development. Mr. Jansen. 3 lectures; 4 credits.

507. INTRODUCTION TO COMMUNITY PROBLEMS

Major social problems of communities as they adjust to external changes. Institutions, trade, political control, and taxation form a framework for use by planners and background for further studies. Mr. Jansen. Mr. Weeks. 4 lectures; 4 credits.

508. APPLIED COMMUNITY DEVELOPMENT

This course provides students with an opportunity to work in an actual community situation to learn how to apply the various concepts and principles that have relevance in community development. Emphasis is on assisting individuals and groups in communities in identifying needs and problems, establishing attainable and objective goals, assessing requirements and resources, and formulating programs for development. Methods of collection, analysis, and integration of pertinent primary and secondary economic, social, political, and physical data for community development are covered. Mr. Weeks and Mr. Jansen. Prerequisite: Resource Economics 507 or permission of instructor. 3 lectures; 4 credits.

701. APPLIED STATISTICS I

Use of elementary statistical techniques in analysis of prepared data. Topics surveyed include elementary probability; discrete and continuous probability distribution; distributions of sample statistics; small-sample theory; elementary analysis of

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variance, regression, correlation; chi square; and non-parametric analogues of regression and analysis of variance. Mr. Durgin. 3 lectures; 4 credits.

705. STRUCTURE AND PLANNED CHANGE IN NON-URBAN COMMUNITIES

Application of community development theory, concepts, and principles using appropriate research methodologies. Student designed projects provide for participation in community-development activities. Weekly synthesizing seminar sessions provide a forum for discussing student problems and reporting on findings, experience, and progress. May include placement in field agency or institution. Mr. Le Ray. Prerequisite: Resource Economics 508 or permission of instructor. 4 credits.

706. ECONOMICS OF RESOURCE DEVELOPMENT

The classical and modern theories of economic development. Economic problems of land and resources in relation to market location, urban-rural conflicting demands, and conservation and water supply. Population mobility, capital needs, and the roles of public and private leadership will complete the framework for discussion of the major resource development problems of New England. Staff. Prerequisite: Economics 401. 4 credits.

707. RESEARCH METHODS IN SOCIAL SCIENCE

The scientific method of research. Analysis of research problems in social sciences. The design of research and the application of research techniques to identifying and solving problems. Can be used in place of Sociology 702. Mr. Drew. Prerequisite: three hours of statistics. 4 credits.

717. LAW OF COMMUNITY AND REGIONAL PLANNING

A review of the law pertaining to community and regional planning: the common law, the Constitution, and the powers of the executive, legislative, and judicial branches with respect to property law including eminent domain, land-use planning, urban renewal, zoning, environmental protection laws, housing, and building codes, etc. Designed to make the non-lawyer aware of the influence and operation of the legal system in communities to enable him to deal with competing interests within it. Mr. Tucker. 4 credits.

756. REGIONAL ECONOMIC ANALYSIS

Concepts and methods of delimiting regional economies, theories of regional growth, methods of measuring regional economic activity, empirical approaches to regional economic planning and development, and public policies for regional economies. Primary emphasis will be placed on empirical research studies. Mr. Morris. Prerequisite: intermediate economic theory, elementary statistics, elementary calculus, elementary linear programming, or permission of instructor. 4 credits.

795, 796. INVESTIGATIONS IN RESOURCE ECONOMICS

Special assignments in readings, investigations, or field problems. May be repeated. 1. Community Development. 2. Economic Development Programs. 3. Economics of Natural Resources. 4. Human Resource Development. 5. Legal Problems of Resource Development. 6. Natural Resources Policy. 7. Production and Marketing of Agricultural Products. 8. Public Resource Policy. 9. Resource Investment Policy. 10. Water Economics. Prerequisite: permission of instructor. 2 to 4 credits.

Soil and Water Science (26)

Hydrology

504. FRESH WATER RESOURCES

Background for students desiring to develop a better understanding of freshwater resources. The subject is approached from the viewpoint of the hydrologic cycle and hydrologic budget or water balance. Major topics include precipitation, evaporation,

- evapotranspiration, infiltration, groundwater, and runoff. Consideration is given to control systems and planning for water resource development. Mr. Byers. 3 lectures; 1 laboratory; 4 credits.
- 601. CHEMICAL ANALYSIS OF WATER**
Methods in water-chemical analysis. Common procedures for the analysis of the more important water-chemical quantities. Prerequisite: permission of instructor. Mr. Hall. 1 lecture; 1 laboratory; 2 credits.
- 703. SOIL AND WATER ENGINEERING**
The treatment of engineering principles relating to the control of water. Major topics include precipitation and steam-flow measurement, hydrograph development, estimating run-off from a watershed, and the design of structures to control this run-off. Laboratory sessions are designed to acquaint the student with instrumentation and problem analysis. Mr. Byers. 3 lectures; 1 laboratory; 4 credits.
- 705. PRINCIPLES OF HYDROLOGY**
Physical and chemical processes and energy relations involved in the movement of water through the rainfall-runoff segment of the hydrologic cycle. Major emphasis is on surface outflow from a watershed with consideration given to sediment transport, nutrient cycling, and water quality. Laboratory sessions include flow measurement, hydrometeorologic measurements, hydrograph analysis, and study of a selected watershed. Mr. F. R. Hall. 3 lectures; 1 laboratory; 4 credits.
- 710. GROUND-WATER HYDROLOGY**
Introduction to the principles governing the occurrence, location, and development of ground water. Major topics include well hydraulics, geophysical exploration, and chemical quality of water. Brief treatment given of water law and economics. Laboratory sessions are designed to illustrate principles by use of fluid and electrical models, geophysical instruments, and selected problems. Mr. Hall. Basic course for hydrology majors, but other qualified students welcome. 3 lectures; 1 laboratory; 4 credits.

Soil Science

- 501. INTRODUCTORY SOILS**
Soils as related to the environment in terms of the physical, chemical, and biological aspects. The laboratories are coordinated with the lecture material. Mr. Peterson. 3 lectures; 1 laboratory; 4 credits.
- 502. SOIL-PLANT RELATIONSHIPS**
Soils in relation to the requirements for optimum growth of plants; methods of determining the amount of nutrient elements in soils available to plants; and recognition of plant symptoms of nutrient deficiency. Transportation fee. Mr. Harter, Mr. Peterson. Recommended that 502 be taken in conjunction with 501; however, 501 is not a prerequisite. 3 lectures; 1 laboratory; 4 credits.
- 602. CHEMICAL ANALYSIS OF SOIL**
Methods in soil chemical analysis. Common procedures for the analysis of the more important chemical quantities in soil will be covered. Prerequisite: permission of instructor. Mr. Harter. 1 lecture; 1 laboratory; 2 credits.
- 701. PHYSICS OF SOILS**
The treatment of soil as a physical system. Major topics include: textural and structural analysis of soils, water flow and retention, and heat and gas transfer processes in soils. The influence of soil physical properties on plant growth. Laboratory deals with methods of soil physical analysis. Prerequisite: Soil and Water 501 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

Mathematics

702. CHEMISTRY OF SOILS

Chemical properties of soils in relation to their composition and use as a vital resource. Colloidal phenomena and its relation to exchange and fixation of elements in soil. Major topics include: cation exchange, capacity and source of negative charge, the nature of soil acidity, the chemistry of nitrogen and phosphorous in the soil, and modern methods of soil chemical analysis. Mr. Harter. Prerequisite: Quantitative Analysis or permission of instructor. 3 lectures; 3 credits.

704. SOIL CLASSIFICATION AND MAPPING

The genesis, morphology, classification, and mapping of soils with emphasis on major classification systems used in the United States and throughout the world as they relate to man's uses of the soil. Transportation fee. Mr. Peterson. Prerequisite: Soil and Water 501 and an introductory geology course, or by permission of instructor. 3 lectures; 1 laboratory; 4 credits.

795, 796. INDEPENDENT WORK IN SOIL AND WATER SCIENCE

Students with a major in the Department are required to take 795 and 796 for two credits per semester in their senior year. The student may choose his faculty consultant and topic from the options listed below. Students with an interest in some aspect of soil and water science from other departments may also enroll in 795-796 for two credits per course.

1. Soil-Plant Relationships, Mr. Peterson.
2. Physics of Soils.
3. Hydrology, Mr. Byers and Mr. Hall.
4. Chemistry of Water, Mr. Hall.
5. Chemistry of Soils, Mr. Harter.
6. Soil Classification, Mr. Peterson.

Italian

(See French and Italian)

Japanese

(See German and Russian)

Latin

(See Spanish and Classics)

Mathematics (51)

Chairman: M. Evans Munroe

PROFESSORS: William L. Kichline, *emeritus*; Richard Balomenos, Edward H. Batho, A. H. Copeland, Jr., A. Robb Jacoby, Richard E. Johnson, Shan S. Kuo, M. Evans Munroe, James Radlow, Shepley L. Ross, Robert J. Silverman

ASSOCIATE PROFESSORS: Homer Bechtell, Albert B. Bennett, Jr., William E. Bonnie, David M. Burton, Loren D. Meeker, Eric Nordgren, Robert O. Kimball, Samuel D. Shore

ASSISTANT PROFESSORS: William E. Geeslin, Kenneth L. Lange, Berrien Moore III, Frederick J. Robinson, Albert O. Shar, Donovan Van Osdol

INSTRUCTOR: Katherine Skambis

401. ELEMENTARY MATH I

For students without previous high school mathematics. A basic course covering fractions, exponents and radicals, factoring linear equations, areas and volume of geometric figures. (May not be taken for credit by students who have had one year or more of college preparatory mathematics in secondary school.) 4 credits.

402. ELEMENTARY MATH II

For students with no more than one year of high school mathematics. A basic algebra course covering absolute value, inequalities, quadratic equations, two dimensional coordinate system, distance, slope, curve sketching, systems of equations, polynomials of higher order. Prerequisite: Math 401 or equivalent. (May not be taken for credit by students who have had two years or more of college preparatory mathematics in secondary school.) 4 credits.

403. INTRODUCTION TO DIGITAL COMPUTER PROGRAMMING

Development of algorithms and programs. Basic programming and programming structure utilizing the FORTRAN IV language; introduction to the use of an operating system, computer solution of numerical and non-numerical problems. Course is designed for students not intending to pursue further studies in computer science. No credit toward a Mathematics major. 2 credits.

405. ELEMENTARY FUNCTIONS

For students who wish to strengthen their understanding of mathematical concepts as a preparation for calculus. Exponential, logarithmic and trigonometric functions, trigonometric identities and equations, inverse functions, rational functions, graphs. Prerequisite: Math 402 or two years of high school mathematics. (May not be taken for credit by students who have had 3 years or more of college preparatory mathematics in secondary school.) 4 credits.

410. DIGITAL COMPUTER SYSTEMS

Development of algorithms and programs. Basic programming and program structure utilizing the FORTRAN IV language. Use of programming systems and operating systems. Data representation and the use of number systems in computers. Basic computer organization. Survey of computers, languages, and applications. Computer solution of numerical and non-numerical problems using the IBM 360's operating system. Good for major credit only in interdisciplinary programs. 4 credits.

416. MATHEMATICS OF BUSINESS AND ECONOMICS

Topics in analytic geometry, integrals and derivatives, partial derivatives, max-min problems (in one and several dimensions), areas. There is a special testing program so that the student can proceed at his own pace. Prerequisite: 3 entrance units in college preparatory mathematics. No credit toward a Mathematics major. 4 credits. Credit/Fail.

419. EVOLUTION OF MATHEMATICS

A chronological development of mathematics from antiquity to the present day, with emphasis on the origins of the various methods and branches. The course will attempt to determine how and why mathematical concepts, such as number and geometry, evolved. Prerequisite: 3 entrance units in college preparatory mathematics. No credit toward a Mathematics major. 4 credits.

420. FUNDAMENTAL MATHEMATICS

A presentation of basic ideas in several branches of mathematics; sets and functions, calculus, linear algebra, linear programming, abstract algebra. Prerequisite: 3 entrance units in college preparatory mathematics. No credit toward a Mathematics major. 4 credits.

Mathematics

427. CALCULUS I

First course in analytic geometry and calculus. Instruction is offered at various paces and there is a special testing program so that the student can proceed at his own pace. Prerequisite: at least 3 entrance units of college preparatory mathematics including trigonometry. 4 credits. NLG. Credit/Fail.

428. CALCULUS II

Conclusion of introductory course in calculus of functions of one argument. Instruction is offered at various paces and there is a special testing program so that the student can proceed at his own pace. Prerequisite: Mathematics 427. 4 credits. NLG. Credit/Fail.

429-430. HONORS CALCULUS

Calculus of functions of one argument with careful attention to underlying theory and practice with techniques and applications. Prerequisite: consent of the instructor. 4 credits.

510. MATHEMATICAL COMPUTER PROBLEMS

Computer programming, including the FORTRAN IV language; introduction to a variety of computer applications in mathematics. Cannot be taken for credit if credit received for Mathematics 410. Prerequisite: Mathematics 527 completed or taken concurrently. 4 credits.

527. DIFFERENTIAL EQUATIONS WITH LINEAR ALGEBRA

An introduction to both subjects which stresses the interplay between them. Linear differential equations, matrix algebra, linear transformations and change of basis, eigenvalues, linear systems, series solution of differential equations. Prerequisite: Mathematics 428. 4 credits.

528. MULTIDIMENSIONAL CALCULUS

Theory, methods, and applications of partial differentiation; composite functions and chain rules; maxima and minima; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; integral theorems. Prerequisite: Mathematics 527. 4 credits.

531. INTRODUCTION TO ABSTRACT MATHEMATICS

Fundamental concepts of logic and set theory with applications to the development of the real number system. Prerequisite: Mathematics 428. 4 credits.

611. ASSEMBLER LANGUAGE PROGRAMMING

Study of assembler-language coding and programming techniques. Data representation, systems organization, program segmentation, linkage of control sections, manipulation of bits or bytes, micro- and macro-programming. Input/output using system macros. Interrupts. Computer projects to illustrate programming techniques. Prerequisite: Math 410 (or 510). 4 credits.

612. DATA STRUCTURES AND PROCESSES

Programming techniques and program structure utilizing a higher-level language such as PL/I. Procedures, blocks, groups, list processing, and string processing. Data organization, record-oriented and stream-oriented data transmission, conversion techniques, and storage allocation. Organization of data structures, areas, structure mapping, pre-processing techniques, linkage with other language modules, and conditions and interrupt processing. Laboratory work includes computer solution of illustrative problems. Prerequisite: Math 611. 4 credits.

621. NUMBER SYSTEMS FOR ELEMENTARY SCHOOL TEACHERS

Counting and set concepts, number systems, inductive and deductive reasoning, mathematical systems, whole numbers, numeration systems, algorithms for computing, number theory, fractions, decimal numeration, negative numbers, real

numbers, finite number systems. A mathematical laboratory approach is used and the Math Lab resources may be used by students for their school experiences. Prerequisite: consent of instructor. Credit towards a mathematics major only for elementary mathematics-education majors. 4 credits

622. GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS

Deductive systems, metric geometry, metric system, precision and relative error, congruence, symmetry, parallelism and similarity, indirect measurements, polygons and circles, polyhedra and spheres, five regular polyhedra, spherical geometry, conic sections, transformations. The course format is similar to that used in Mathematics 621. Prerequisite: Mathematics 621. Credit towards a mathematics major only for elementary mathematics-education majors. 4 credits.

623. TOPICS FOR ELEMENTARY SCHOOL TEACHERS

Modulo arithmetic, logic and flow charting, coordinate systems, graphing equations and inequalities, graphing systems of equations, linear equations and applications, quadratic equations and applications, symmetries in coordinate systems, graphing conic sections, combinations, permutations, probability, expectation. Normal curves, standard deviations, statistical averages, statistical graphs. The course format is similar to that used in Mathematics 621. Prerequisite: Mathematics 621. Credit towards a mathematics major only for elementary mathematics-education majors. 4 credits.

636. PROBABILITY AND STATISTICS

Sample spaces (discrete only), events, combinations, conditional probability, independence, distributions, expectation, statistical description, random variables, sampling, estimation, tests, and applications of statistics in research. Good for major credit in Mathematics-Education only. 4 credits.

645-646. ANALYSIS FOR APPLICATIONS

Applied matrix theory; eigenvalue problems and their applications in mathematics, physics, and engineering; systems of linear ordinary differential equations; initial-boundary-value problems of mathematical physics; Sturm-Liouville problems; series expansions by orthogonal functions; Green's functions; numerical methods. Prerequisites: Mathematics 527-528. 4 credits.

647. COMPLEX ANALYSIS FOR APPLICATIONS

Complex numbers; complex integration; infinite series; contour integration; conformal mapping; Fourier and Laplace transforms; Wiener-Hopf techniques. Prerequisite: Mathematics 528. 4 credits.

656. INTRODUCTION TO NUMBER THEORY

Unique factorization, linear and quadratic congruences, quadratic reciprocity law, arithmetic functions, quadratic forms, an introduction to algebraic numbers. Prerequisite: Mathematics 531. 4 credits. (Alternate years; offered in 1974-75.)

657. GEOMETRY I

Fundamental properties of Euclidean geometry from an advanced standpoint. Prerequisite: Mathematics 531. 4 credits.

658. GEOMETRY II

Systems of postulates of various geometries, geometric invariants, synthetic and analytic projective geometry, introduction to non-Euclidean geometry. Prerequisite: Mathematics 531. 4 credits. (Alternate years; offered in 1975-76.)

682. NONLINEAR DIFFERENTIAL EQUATIONS

Phase plane analysis of linear and nonlinear autonomous systems; critical points; limit cycles; periodic solutions; approximate methods for second order nonlinear ordinary differential equations; stability and asymptotic behavior of solutions of linear and nonlinear equations. Prerequisite: Mathematics 527. 4 credits. (Alternate years; offered in 1975-76.)

Mathematics

696. INDEPENDENT STUDY

Individual study projects in various areas of mathematics as determined to be of interest and value to the student and the department. Supervision is by an appropriate faculty member. Consent of the faculty supervisor and department chairman is required. 1-6 credits.

698. SENIOR SEMINAR

Individual study on special topics. Preparation and presentation of reports on topics assigned. Prerequisite: senior standing in mathematics. (Offered only in Mathematics-Education.) 4 credits.

703. MATHEMATICS-EDUCATION, K-6

Psychological theories of teaching mathematics in the elementary school; examination of elementary curriculum projects; use of laboratory approach in teaching; survey of mathematics education including the history, present theories, education objectives, and research in the elementary school mathematics program. Prerequisite: Math 621 or equivalent. 2-4 credits.

710. ADVANCED PROGRAMMING SYSTEMS

Review of batch-process systems programs, their components, operating characteristics, and limitations. Examines the software organization of computer systems. Overall structure of multiprogramming systems, implementation techniques for parallel processing, study of problems arising in multiaccessing and multiprocessing. View of core management, file system design and management, and system accounting. Study of design of system modules and interfaces. Prerequisite: Math 611. 4 credits.

711. PROGRAMMING LANG. & COMPILER CONSTRUCTION

Introduction to recursive processes; a sketch of PL/I and ALGOL. Formal syntax and Backus-Naur form, syntax directed compilers, semantic routines, symbol table structures, resource allocation, parsing algorithm, code generation, and optimization of translator writing system. Associated computer laboratory work. Prerequisite: Mathematics 710. 4 credits.

735. PROBABILITY

Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prerequisite: Mathematics 528. 4 credits.

736. STATISTICS

Sampling theory, estimation of parameters, testing of hypotheses, non-parametric methods. Prerequisite: Mathematics 735. 4 credits.

753, 754. NUMERICAL METHODS AND COMPUTERS

This course is oriented toward the use of numerical analysis on digital computers (with laboratory). Computer organization, algorithmic languages, and compilers, solution of polynomial and transcendental equations, numerical solutions of differential equations, linear systems of equations, eigenvalues and eigenvectors, polynomial interpolation, quadrature, curve fitting, discussion of errors, systems simulations, and mathematical optimization techniques. Selected algorithms will be programmed for solution on high-speed computers in the Computation Center. Prerequisites for 753: Mathematics 410 or 510 and 428. Prerequisites for 754: Mathematics 410 or 510 and 527. 4 credits.

761. ABSTRACT ALGEBRA

A study of the basic properties of groups, rings, fields, and their homomorphisms. Prerequisite: Mathematics 531. 4 credits.

- 762. LINEAR ALGEBRA**
 Vector spaces, linear transformations, matrices, determinants, dual spaces, eigenvalues, spectral and canonical decomposition theorems. Cannot be taken for credit if credit received for Mathematics 645. Prerequisite: Mathematics 761. 4 credits.
- 764. ADVANCED ALGEBRA**
 Vector spaces, modules over principal ideal domains, structure of finitely-generated modules, finite abelian groups, elementary theory of fields. Prerequisite: Mathematics 761. 4 credits. (Alternate years; offered in 1974-75.)
- 767. ONE-DIMENSIONAL REAL ANALYSIS**
 Theory of limits, continuity, differentiability, integrability, series, uniform convergence. Prerequisites: Mathematics 528, 531. 4 credits.
- 768. ABSTRACT ANALYSIS**
 Metric spaces, function spaces, theory of uniform limits. Prerequisite: Mathematics 767. 4 credits. (Alternate years; offered in 1975-76.)
- 769. MULTIDIMENSIONAL REAL ANALYSIS**
 Partial derivatives, multiple integrals, line and surface integrals, Fourier series. Prerequisite: Mathematics 767. 4 credits. (Alternate years; offered in 1974-75.)
- 776. LOGIC**
 Development of formal mathematics. Discussion within that system of formal systems. Consistency, completeness, decidability. Prerequisite: Mathematics 531. 4 credits. (Alternate years; offered in 1975-76.)
- 780. THEORY OF ORDINARY DIFFERENTIAL EQUATIONS**
 Fundamental existence and uniqueness theorems; linear systems and higher order linear equations; Wronskian theory; classical Sturm Theorem and generalizations; boundary value problems for second order linear equations. Prerequisite: Mathematics 767. 4 credits. (Alternate years; offered in 1974-75.)
- 781. PARTIAL DIFFERENTIAL EQUATIONS**
 First order equations; linear second order equations; Cauchy problem; Dirichlet problem; application to physics. Prerequisite: Mathematics 767. 4 credits. (Alternate years; offered in 1975-76.)
- 784. TOPOLOGY**
 Basic topological notions, connectedness, compactness, metrizable, with special emphasis on the real line and plane. Prerequisite: Mathematics 531. 4 credits.
- 785. ALGEBRAIC METHODS IN TOPOLOGY**
 Topics to be selected from: topology of manifolds, topological groups, homology, knot theory. Prerequisite: Mathematics 784. 4 credits. (Alternate years; offered in 1975-76.)
- 786. CALCULUS ON MANIFOLDS**
 Differentiable manifolds; differential forms; exterior and Grassman algebras; integration of differential forms; Stokes theorem; closed and exact differential forms. Cannot be taken for credit if credit is received for Mathematics 769. Prerequisites: Mathematics 762 and 767. 4 credits. (Alternate years; offered in 1974-75.)
- 787. DIFFERENTIAL GEOMETRY**
 Introduction to Lie groups and frame bundles; differential invariants of surfaces and curves; local theory of surfaces. Prerequisite: Mathematics 786. 4 credits. (Alternate years; offered in 1974-75.)

Mechanical Engineering

788. COMPLEX ANALYSIS

Complex functions, sequences, limits, differentiability and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Cannot be taken for credit if credit received for Mathematics 647. Prerequisite: Mathematics 767. 4 credits.

791. MATHEMATICS-EDUCATION

A study of secondary school mathematics curriculum problems and the recommendations of various study groups concerning secondary school mathematics. Prerequisites: Education 481 and 657. 4 credits.

Mechanical Engineering (52)

Chairman: William Mosberg

PROFESSORS: Edward T. Donovan, *emeritus*; E. Howard Stolworthy, *emeritus*; Victor D. Azzi, Robert W. Corell, Godfrey H. Savage, Charles K. Taft, Asim Yildiz

ASSOCIATE PROFESSORS: E. Eugene Allmendinger, Wayne M. Beasley, Frederick G. Hochgraf, Tenho S. Kauppinen, William Mosberg, Russell L. Valentine, John A. Wilson

ASSISTANT PROFESSORS: Barbaros Celikkol, William E. Clark, Harvard B. Emery, David E. Limbert

341. INTRODUCTION TO MANUFACTURING

A course to orient students so that they can safely operate basic machine tools on design projects or in a home workshop. Two 2½-hour sessions per week for 6 weeks (offered twice each semester). 0 credit.

401. INTRODUCTION TO MECHANICAL ENGINEERING

Mechanical engineering: its goals and its interactions with contemporary society. Basic concepts of broad scope are presented and developed to assure a sound background for future course work in the field. Lectures, case studies, and laboratories involving several of the faculty. Required of Mechanical Engineering freshmen. Open to others by permission of the department. 4 credits.

413. ENGINEERING GRAPHICS

Communication of engineering information and concepts by multiview drawings, pictorial views, sketches, and graphs. 1 laboratory; 2 credits.

414. ENGINEERING GRAPHICS

The analysis of various engineering problems employing the fundamentals of descriptive geometry. Prerequisite: Mechanical Engineering 413. 1 laboratory; 2 credits.

441 (441). ENGINEERING GRAPHICS

Communication of engineering information and three-dimensional concepts by multiview drawings, pictorial views, sketches, and graphs; including the fundamentals of descriptive geometry. 2 laboratories; 4 credits.

503 (503). THERMODYNAMICS I

The fundamental laws of thermodynamics and their relation to working substances. Prerequisite: Mathematics 428. 4 credits.

504. THERMODYNAMICS II

A comprehensive study of the laws of thermodynamics and their application to real systems, presented as lectures and experimental studies; behavior of ideal and real

media; thermodynamics of non-reactive and reactive mixtures. Prerequisite: Mechanical Engineering 503. 4 credits.

508. FLUID DYNAMICS

Introduction to the dynamics and thermodynamics of compressible and incompressible fluid flow; analysis of the behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prerequisites: Mechanical Engineering 503 and 524. 4 credits.

523-524. MECHANICS I AND II

The static and dynamic behavior of rigid and deformable bodies. Equilibrium, compatibility, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods; stress and deformation in materials and simple structural elements. Review of particle dynamics; kinematics and kinetics of rigid bodies in two and three dimensions. Prerequisites: Mathematics 427, Physics 407. 4 credits.

541. MANUFACTURING PROCESSES AND DESIGN

Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. ½-hour lecture before 2-hour laboratory (2 times per week); 4 credits.

542. METHODS IN MANUFACTURING

A project course for students who wish to obtain more experience on machine tools. Prerequisite: Mechanical Engineering 341 or 541. Two 2½-hour laboratories per week; 2 credits.

561. INTRODUCTION TO MATERIALS SCIENCE

Theoretical and experimental studies of the structure and thermodynamics of solids. 3 lectures; 1 laboratory; 4 credits.

562. INTRODUCTION TO MATERIALS ENGINEERING

Critical aspects of the physics and chemistry of selected processes in materials technology. Phase transformations in ceramics, phase transformations in ferrous alloys, sintering, solidification, semiconductor device fabrication. Extended lab hours for plant visits. 3 hours; 1 laboratory; 4 credits.

643-644. ELEMENTS OF DESIGN I AND II

Synthesis, analysis, and design of machine components. Development of engineering judgment; selection of materials; kinematic arrangements; design factors; failure criteria; fluctuating loads; design for finite and infinite life; stress concentration; statistical methods. Prerequisites: Mechanical Engineering 523 and 524. 2 1-hour periods; 1 2-hour period; 4 credits.

646. DETERMINISTIC AND STOCHASTIC MEASUREMENT

The dynamic analysis of instrumentation systems, the resulting dynamic measurement errors, measurement system synthesis for specified dynamic accuracy and methods of correcting data which has dynamic errors. Introduction to the description of stochastic processes. Fourier transforms, power spectral density and auto-correlation functions and their application to measurements on systems with random excitation. 4 credits.

691. ECONOMIC DECISION MAKING IN ENGINEERING

The principles that form the basis for making engineering decisions to obtain the most favorable economic results. Prerequisite: senior standing. 4 credits.

695 a-d-696 a-d. MECHANICAL ENGINEERING UNDERGRADUATE PROJECTS AND INDEPENDENT STUDY

Course numbers refer to topics in a) thermal science, b) solid mechanics, c) engineering design, and d) materials, respectively. 2-4 credits.

Mechanical Engineering

697-698. MECHANICAL ENGINEERING SEMINAR

2-4 credits.

699. UNDERGRADUATE THESIS

2-4 credits.

701. MACROSCOPIC THERMODYNAMICS

A continuation of the study of thermodynamic principles using an analytic, postulational approach and Legendre transformations to obtain the thermodynamic potentials. 4 credits.

702. STATISTICAL THERMODYNAMICS

An introduction to statistical thermodynamics. Prerequisite: Mechanical Engineering 503. 4 credits.

703. HEAT TRANSFER

Analysis of heat transfer phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Prerequisite: Mechanical Engineering 508 or taken concurrently. 4 credits.

704. EXPERIMENTAL HEAT TRANSFER

Experimental methods in the study and solution of heat transfer problems, including a critical comparison with analytical and other methods. Literature surveys and written and oral presentation of results will be emphasized. Prerequisite: Mechanical Engineering 703. 4 credits.

707. ANALYTICAL FLUID DYNAMICS

An analytical study of the dynamic behavior of fluids. Topics include potential flow, development of the Navier-Stokes equations, turbulence, and boundary-layer theory. Prerequisite: Mechanical Engineering 508. 4 credits.

708. GAS DYNAMICS

Basic equations of motion of one-dimensional, subsonic and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. Prerequisite: Mechanical Engineering 508. 4 credits.

715. INTERNAL COMBUSTION ENGINES

Application of basic and engineering science to the engineering problems of spark and compression ignition engines, design, management, and reporting of experimental studies. Prerequisite: Mechanical Engineering 503. 4 credits.

716. PROPULSION SYSTEMS

Application of basic engineering sciences to the engineering problems of propulsion systems. Prerequisite: Mechanical Engineering 508. 4 credits.

717. CRYOGENICS

The phenomena and processes associated with very low temperatures. Application of basic engineering sciences to the problems of low temperature refrigeration, liquefaction, separation, and storage; transport of cryogenic fluids; measurement systems; vacuum technology. Prerequisite: Mechanical Engineering 503. 4 credits.

723. ADVANCED DYNAMICS

A traditional course in classical mechanics with an orientation 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 credits.

724. INTRODUCTION TO VIBRATIONS

The theory of discrete vibrating systems is treated in depth. Review of linear system concepts and detailed treatment of the 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 are made both to structural and mechanical systems. 4 credits.

726. EXPERIMENTAL MECHANICS

Experimental methods and their underlying theoretical bases are developed and applied to the measurement of stress, strain, and motion. Topics covered include transmitted and scattered-light photoelasticity, strain gage applications, brittle coating and grid techniques, dynamic measurements and associated instrumentation. 4 credits.

727. ADVANCED MECHANICS OF SOLIDS

Advanced topics in the mechanics of solids are treated in depth; beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 credits.

730. MECHANICAL BEHAVIOR OF MATERIALS

The elastic and inelastic behavior of materials, both organic and inorganic, is studied from the micromechanics and macromechanics points of view. Concepts of stress, strain, and constitutive relations are reviewed and related to recent developments in dislocation theory and other phenomena on the atomic scale and to continuum mechanics on the macroscopic scale. Mechanical behavior including elasticity, plasticity, viscoelasticity, creep, fracture, and damping will be treated. Anisotropic and heterogeneous materials such as composite materials will be studied in detail. 4 credits.

737. OCEAN MECHANICS I

Ocean as a continuous medium, its mechanical and thermodynamic properties are presented. Shallow and deep ocean modeling for the investigation of gravity waves and sound waves along with the varying mechanical and thermodynamic properties are discussed. Ocean subbottom and its soil mechanical as well as sound propagation properties are introduced. Ocean instrumentation and rudimentary data collecting and processing procedures are given and computer usage is emphasized. Prerequisites: Mechanical Engineering 523, 524; Mechanical Engineering 508; Mathematics 527, 528. 4 credits.

738. OCEAN MECHANICS II

Ocean dynamical laws are generalized to include temperature and salinity variations in the water column. Conservation laws with generalized equation of state are developed. Air-sea interaction, and energy transport phenomena, reflection from different coastal geometry, harbour resonances, internal currents. Sound reflection from subbottom, sound probing techniques to determine subbottom properties by ray theory and generalization of subbottom soil from an elastic to a viscoelastic medium. Prerequisite: Mechanical Engineering 737. Mechanical Engineering 781 is desirable but not required. 4 credits.

741. CONTROL OF PHYSICAL SYSTEMS

The mathematical modeling of hydraulic, pneumatic, and fluidic control elements and control systems. Methods are developed for the analysis of systems using gases or liquids as the working fluid. Methods for the synthesis of the parameters of the control elements used in automatic control systems are developed and methods of design of these systems are discussed. 4 credits.

Mechanical Engineering

751. NAVAL ARCHITECTURE IN OCEAN ENGINEERING

Naval architectural principles related to surface and submerged vehicles are developed—including hydrostatic characteristics, fundamentals of powering, and rules and regulations of importance to this aspect of ocean engineering. Prerequisites: Mechanical Engineering 508 or permission of instructor. 4 credits.

752. SUBMERSIBLE VEHICLE SYSTEMS DESIGN

A lecture and design course. Lectures review material pertinent to design including a historical perspective, environmental factors, hydromechanic and structural principles, materials, intra-vehicle systems, extra-vehicle systems, operating considerations, pre-design and design procedures. Conceptual and basic preliminary designs of selected submersible vehicles are prepared by student teams. 4 credits.

757. COASTAL ENGINEERING AND PROCESSES

Fundamentals of water waves and their effects. Development of governing equations for surface waves and laboratory tank demonstration of wave trains, beat waves, and wave spectra. Estuarial and coastal processes including wave refraction and long shore transport of sediments simulated by computer models. Effects of structures on waves and functional design of structures including towers, breakwaters, and ocean outfall. 4 credits.

761. X-RAY DIFFRACTION

The physics of x-ray diffraction, the reciprocal lattice, lattice parameter determinations, space group identification, phase identification, characterization of preferred orientation. 3 lectures; 1 laboratory; 4 credits.

763. MICROSTRUCTURE OF SOLIDS

Basic concepts and measurements of microstructures; statistically exact expressions for points, lines, surfaces, and volumes; random, partially oriented and oriented structures; particle and grain characteristics and distributions; projected images and shape specification. 4 credits.

766. PHYSICAL CERAMICS

Characteristics of crystalline and non-crystalline ceramic solids; defect structures; diffusion in ceramic materials; nucleation, crystal growth, and solid-state reactions; kinetics of grain growth, sintering, and vitrification. 4 credits.

781. MATHEMATICAL METHODS IN ENGINEERING SCIENCE—I

Mathematical methods in engineering sciences are discussed, including methods for solution of discrete and continuous systems. Course includes a 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 credits.

793 a-d—794 a-d. SPECIAL TOPICS IN ENGINEERING

Course numbers refer to topics in a) thermodynamics, b) mechanics, c) engineering design, and d) materials, respectively. Content of these courses may vary from year to year. 2-4 credits.

795 a-d—796 a-d. INDEPENDENT STUDY

Course numbers refer to topics in a) thermal science, b) solid mechanics, c) engineering design, and d) materials, respectively. 2-4 credits.

Medical Technology (37)

LECTURER: John C. Neff

School of Medical Technology, Hanover, N.H.

ADJUNCT ASSISTANT PROFESSOR: E. Elizabeth French

CLINICAL INSTRUCTOR: Elizabeth A. Ward

LECTURERS: Nancy C. Bigelow, Miriam K. Fogg, Gertrude M. Marquay, Jane E. Perkins

(401). INTRODUCTION TO MEDICAL TECHNOLOGY

Presentation of information about the profession of medical technology, the various phases of laboratory medicine involved, its functions and responsibilities as a unit of the health team. Taught by lectures, films, demonstrations, and field trips. For second semester freshman and sophomore majors in medical technology. Mr. Neff. 0 credits.

710. MEDICAL MYCOLOGY

The morphological, cultural, biochemical, serological, and pathogenic characteristics of fungi that cause human and animal diseases. Prerequisite: permission of instructor. 2 lectures; 1 laboratory; 4 credits.

761-762. CLINICAL LABORATORY METHODS

An 11-month course in medical technology taken at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. This course starts about July 6, and includes lectures and laboratory work in bacteriology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. Credits will be allowed when the University has received a transcript of the candidate's record and upon certification by the Director of the School and the Supervisor of the Medical Technology curriculum that the work has been successfully completed. This course qualifies a candidate for the examination for the Medical Technology Certificate administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists. 32 credits. *This course cannot be taken for graduate credit.*

Microbiology (70)

Chairman: Theodore G. Metcalf

PROFESSORS: William R. Chesbro, Galen E. Jones, Theodore G. Metcalf, Lawrence W. Slanetz

ASSISTANT PROFESSORS: Thomas Pistole, Robert M. Zsigray

501. PUBLIC HEALTH AND SANITATION

The nature and types of microbes which cause infectious diseases; the prevalence, transmission, and control of these diseases. Sanitation of water, sewage, food, and air. Community hygiene and public health administration. Prerequisite: Biology 401, 402 or permission of instructor. 4 credits.

503. GENERAL MICROBIOLOGY

Principles of microbiology; morphology, physiology, genetics, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Prerequisite: Chemistry 401-402 or equivalent. 2 lectures; 2 laboratories; 4 credits.

Microbiology

600. ENVIRONMENTAL MICROBIOLOGY

The roles of microorganisms as agents which may enhance or deteriorate the quality of the environment from the human standpoint; the detection, identification, and regulation of microorganisms important in pollution control in water, in contamination and spoilage of foods and other items of utility, in the quality of air, and in the production of foods and other products; the role of law, legal standards, and/or governmental agencies in promoting and maintaining the microbiological quality of the environment. Prerequisite: Microbiology 503. 2 lectures; 2 laboratories; 4 credits.

701. ADVANCED MICROBIOLOGY

The growth, nutrition, and metabolism of microorganisms; consideration of cell structure and localization of function; aspects of genetic and non-genetic regulation of metabolism; study of the influence of chemical and physical factors of the environment upon microorganisms. Prerequisite: Microbiology 503. 2 lectures; 1 laboratory; 4 credits.

702. PATHOGENIC MICROBIOLOGY

The morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Prerequisite: Microbiology 503. 2 lectures; 2 laboratories; 4 credits.

705. IMMUNOLOGY AND SEROLOGY

The defensive elements possessed by men and animals which serve to protect them from infectious microorganisms. The principles of serological techniques used in the recognition and identification of biological materials including microorganisms. The preparation of vaccines and the production of antisera in animals. Prerequisite: Microbiology 702. 2 lectures; 2 laboratories; 4 credits.

706. VIROLOGY

The animal and plant viruses, including bacteriophages and the rickettsiae; a consideration of techniques for the propagation and recognition of animal viruses; a study of the interactions between virus and host cell and the application to problems of plant or animal infections caused by viruses. Prerequisite: Microbiology 702. 1 lecture; 3 laboratories; 4 credits.

707. MARINE MICROBIOLOGY

Characterization of microorganisms in the sea including their taxonomy, physiology, and ecology; sampling, enumeration, distribution; and the effects of the marine environment upon the microbial population. Prerequisite: Microbiology 503 and organic chemistry. 2 lectures; 1 laboratory; 4 credits.

708. MICROBIAL BIOGEOCHEMISTRY

Geochemical processes modified or governed by biochemical processes catalyzed by microorganisms in the sea and soil; transformations of carbon, nitrogen, oxygen, hydrogen, sulfur, phosphorus, silicon, and trace elements. Specialized aspects of geological microbiology including petroleum microbiology, natural gas production, sulfur formation, ferromanganese nodules, corrosion, and fossil microorganisms will be considered. Prerequisite: Microbiology 503 and a course in earth sciences. 2 lectures; 1 laboratory; 4 credits.

795, 796. PROBLEMS IN MICROBIOLOGY

Special problems, depending upon the training and desire of the student. Prerequisite: permission of department chairman and staff concerned. 4 credits.

Military Science (98)
Reserve Officers Training Corps

PROFESSOR OF MILITARY SCIENCE: Lieutenant Colonel Wilfred W. West

LECTURERS: Major James J. Jameson, Major Henry C. Gilmore Jr., Captain Michael T. Byrnes

ADMINISTRATIVE: Sergeant Major William J. Cronin, Master Sergeant Andre J. St. Laurent, Staff Sergeant Robert R. Cordell, N. E. Bernier, Property Officer

332. PROFESSIONAL DEVELOPMENT AND ENRICHMENT SUBJECT

Applicatory exercises emphasizing the duties and responsibilities of junior Army leaders and orientation on each of the branches of the Army. Cadets should register for Administration 411 as enrichment subject. 1 laboratory; 0 credit.

342. PROFESSIONAL DEVELOPMENT AND ENRICHMENT SUBJECT

Application of leadership principles and management tools, stressing responsibilities of the leader and affording experience and developing potential through the planning and execution of practical exercises and confrontation with actual leadership problems. The enrichment subject may be an elective or one that is required in the student's normal academic curriculum and should be selected after consultation with the student's adviser and military instructor. Prerequisite: permission of instructor. 1 laboratory; 0 credit.

413. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY I

Organization of the United States defense establishment and its role in national security. Introduction to the organization, mission, and doctrine of the U.S. Army and its role in relation to other armed services and to civilian control of the military. 1 laboratory (required only of cadets, optional for other students); 1 lecture; 1 credit.

414. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY II

Mission, organization, and functions of major Army commands and the roles of separate operating agencies. Basis of organization and composition of Army units structured for combat operations. Prerequisites: Military Science 413 or permission of instructor. 1 laboratory (required only of cadets, optional for other students); 1 lecture; 1 credit.

525. AMERICAN MILITARY HISTORY I

A study of the development of American military institutions, policies, experiences, and traditions in peace and war from the Colonial period to the end of the 19th Century and the role of the military in the establishment, expansion, preservation, and development of the nation. Emphasis will be on the relationship between the military and other aspects of American society and on the central importance of leadership in determining the conduct and outcome of war. 1 laboratory (required only of cadets, optional for other students); 2 lectures; 2 credits.

526. AMERICAN MILITARY HISTORY II

A study of the development of American military institutions and policies during the twentieth century as the nation became a world power. Emphasis will be on the shifting role of the military from defense to prevention of war through military power. Prerequisites: Military Science 521 or permission of instructor. 1 laboratory (required only of cadets, optional for other students); 2 lectures; 2 credits.

632. MILITARY LEADERSHIP AND MANAGEMENT

The principles of management and leadership. Human relations and sensitivity in the military. Interpersonal communications and group inter-reaction as it relates to the military organization. Authoritarian versus participative leadership. Self actualization

Music

and fulfillment in military organizations and how they relate to the accomplishment of assigned missions. Examination of various leadership models. Discussion of the variables which tend to interact on each mode. Theory and practice of military teaching methods. Prerequisites: Administration 411 or permission of instructor. 1 laboratory (required only of cadets); 3 lectures; 4 credits.

641. SEMINAR ON LEADERSHIP AND MANAGEMENT

The theory and dynamics of the military team concept and the leader's role in making this concept work. Analysis of selected contemporary leadership and management problems in the military service in light of the position of the United States in world affairs. Military justice system. 3 seminars; 1 laboratory (required of cadets); 4 credits.

Music

Chairman: Paul F. Verrette

PROFESSORS: Karl Bratton, *emeritus*; Donald E. Steele, John D. Wicks

ASSOCIATE PROFESSORS: Irving D. Bartley, *emeritus*; Alan Grishman, Cleveland Howard, Keith Polk, Mary Rasmussen, John Rogers, John Whitlock

ASSISTANT PROFESSORS: Mark DeVoto, Ruth Edwards, Stanley Hettinger, Ada-Louise Rogers, David Seiler, Niel Sir, Paul Verrette, Henry Wing, Jr.

INSTRUCTOR: James R. West

LECTURERS: Donald Bravo, Gordon Cole, Lynda Copeland, Bruce Coppock, Fred Dotton, John Skelton, Patricia Stedry

History, Literature, and Appreciation (71)

401. INTRODUCTION TO MUSIC

A fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective is utilized in cultivating the skill of listening, but the main emphasis is on confronting significant works of musical art on their own terms. Some participation in the musical life of the University community is also required. Not open to music majors. 4 credits.

402. SURVEY OF MUSIC HISTORY

A survey of the historical development of musical style in relation to the whole fabric of Western civilization. Prerequisite: Music 401. Not open to music majors. 4 credits.

501, 502. HISTORY AND LITERATURE OF MUSIC

An introduction to the styles, forms, and techniques of composition in Western music. Required of all music majors. 4 credits.

511. SURVEY OF MUSIC IN AMERICA

The development of music in the United States 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 credits.

513. INTRODUCTION TO THE MUSIC OF AFRICA AND ASIA

A survey of the folk and classical music of various ethnic cultures, particularly those of Japan, India, and sub-Saharan Africa. 4 credits.

595. SPECIAL TOPICS IN MUSIC LITERATURE

This course allows both music majors and non-majors to explore any of a variety of topics mutually agreed upon by students and instructor. The subjects will be in areas not easily covered in courses operating in the usual historical framework. Conferences and papers as required by the instructor in charge. May be repeated for credit. Prerequisite: permission of instructor. 1-4 credits.

701. MUSIC OF THE MEDIEVAL PERIOD

The nature of the beginnings of polyphony. The pre-eminent influence of the church in the thirteenth century and the rising secular movement in the fourteenth. Music as a dominant force in the political and social life of the Middle Ages. 4 credits.

703. MUSIC OF THE RENAISSANCE

A study of the works of the composers of the fifteenth and sixteenth centuries from Dunstable to Palestrina. 4 credits.

705. MUSIC OF THE BAROQUE

A study of the music of Europe from de Rore to Bach. 4 credits.

707. MUSIC OF THE CLASSICAL PERIOD

The growth of musical styles and forms from early classical, baroque-influenced composers through the high classicism of Haydn and Mozart, to the budding romanticism of the young Beethoven. The class will hear representative works in the areas of symphony, concerto, and opera. 4 credits.

709. MUSIC OF THE ROMANTIC PERIOD

The symphonies, concerti, chamber music, and keyboard works of Beethoven, Berlioz, Schubert, Mendelssohn, Schumann, Brahms, Franck, Chopin, and Liszt. Romantic elements contained in the development of harmony, orchestration, sonority, expressive content. The rise of the short piano piece, the German art song, the symphonic poem, nationalism in music. 4 credits.

711. MUSIC OF THE TWENTIETH CENTURY

A study of contemporary music including its literature, its trends, and an analysis of techniques, styles, forms, and expression. 4 credits.

721. THE LIFE AND WORKS OF BEETHOVEN

The piano sonatas, the concerti, symphonies, and string quartets. Lectures, analysis, reports, required readings, and listening. 4 credits.

732. THE ART SONG

A study of the history and literature of the solo song with piano accompaniment. The course is intended to provide a broad background in the various national styles of the nineteenth and twentieth centuries as well as deeper study of the central core of the art song—the German Lied. 4 credits.

733. SURVEY OF OPERA

An investigation of representative masterpieces of this art form through listening, reading, and discussion. 4 credits.

735, 736. SURVEY OF PIANOFORTE LITERATURE

The history and development of keyboard literature from Bach to the present. Discussion and performance of the works of Bach; the sonatas and concerti of Haydn, Mozart, Beethoven, Schubert, the romantic composers, and of contemporary writers. 4 credits.

795. SPECIAL STUDIES IN MUSIC LITERATURE

Presuming a sound musical background, this course allows the student to investigate independently and in depth any of a vast range of subjects. Barring duplication of material, this course may be repeated for credit. Prerequisite: permission of instructor. 1-4 credits.

Music

Performance (71)

Registration for musical organization courses 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.

Private lessons are based on half-hour 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 lessons (this fee applies for courses numbered 541 through 550). The fee includes the use of a practice room for the required preparation.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Music Department and instructor. Enrollment is limited in these courses. A student may register for credit in successive semesters.

441 (441). CONCERT CHOIR—TECHNIQUES AND LITERATURE

A choral group devoted to study and performance of the best classical and modern choral literature. Recommended for men and women voice majors. Open to all interested students. Prerequisite: permission of instructor. 2 laboratories; 1 credit.

442 (442). CHAMBER CHORUS

A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present. The chorus participates from time to time with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental work. Prerequisite: permission of instructor. 2 laboratories; 1 credit.

444 (444). THE NEWHAMPSHIREMEN

The male chorus of the University. Open to all students interested in singing the finest of literature in this medium and who fulfill the requirements of a tryout. Recommended for all men voice majors. Prerequisite: permission of instructor. 2 laboratories; 1 credit. Credit/Fail.

445. SUMMER SESSION CHORUS AND BASIC CONDUCTING

A choral group devoted to the study and performance of the best classical and modern choral literature. The basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. 1 credit. (Special Summer Session course which may be repeated.)

448 (448). OPERA WORKSHOP

Experience in operatic singing, acting, and production techniques is offered through performance of both complete operas and operatic excerpts. Prerequisite: permission of instructor. 1 credit.

450 (450). UNIVERSITY OF NEW HAMPSHIRE SYMPHONY—TECHNIQUES AND LITERATURE

The orchestra, open to all students on the basis of individual auditions, presents several concerts during the year of repertoire ranging from the great standard symphonic literature to experimental multi-media composition. Prerequisite: permission of conductor. 2 laboratories; 1 credit.

451 (451). UNIVERSITY OF NEW HAMPSHIRE TRAINING ORCHESTRA

The training orchestra is designed for music education majors but is open to all who wish to develop instrumental proficiency on their major or secondary instruments. The course provides ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for participation in the UNH Symphony. 1 laboratory; 1 credit.

- 452. UNIVERSITY OF NEW HAMPSHIRE SYMPHONIC WIND ENSEMBLE**
The Wind Ensemble studies and performs the finest in wind instrument literature and is open to all students on the basis of audition. Performances include campus concerts and tour appearances throughout New England. Prerequisite: permission of instructor. 4 laboratories; 1 credit.
- 453. UNIVERSITY BAND**
The University Band repertoire is chosen from the standard band literature and includes original band music, transcriptions, marches, etc. The University Band functions as a musical outlet for those students whose program does not permit music as a major interest, but are interested in maintaining their playing proficiency and continuing their study of music. Prerequisite: permission of instructor. 2 laboratories; 1 credit.
- 454. UNIVERSITY OF NEW HAMPSHIRE MARCHING BAND**
The Marching Band is open to all students and performs during the football season at home and away games. Rehearsals of the Marching Band conclude at the end of the football season. Prerequisite: permission of instructor. Students planning to remain in the band program at the conclusion of the football season should register for Music 452 or 453. 4 laboratories; 0 credit.
- 455 (455). PIANO ENSEMBLE—TECHNIQUES AND LITERATURE**
A laboratory course in ensemble playing and accompaniment. Drawing from available student instrumentalists and singers, the pianist learns the art of performing in trios, duo sonatas, two-piano works, and gains experience in Lieder accompaniment. 1 credit.
- 456 (456). STRING ENSEMBLE—TECHNIQUES AND LITERATURE**
- 457 (457). WOODWIND ENSEMBLE—TECHNIQUES AND LITERATURE**
- 458 (458). BRASS ENSEMBLE—TECHNIQUES AND LITERATURE**
- 459 (459). PERCUSSION ENSEMBLE—TECHNIQUES AND LITERATURE**
- 460 (460). JAZZ ENSEMBLE—TECHNIQUES AND LITERATURE**
In these five courses, groups of instrumentalists gain experience in the performance of literature for the smaller ensemble. Prerequisite: permission of instructor. 1 credit.
- 467 (467). FUNCTIONAL PIANO**
Basic instruction for music majors with no previous keyboard training. The subject matter is drawn from the following: pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sightreading, transposition, and modulation. The format may involve both class instruction and periodic short individual lessons depending upon the increasing facility of the student. The course may be repeated until the Music Education proficiency level is attained to a maximum of 4 credits. Prerequisite: permission of instructor. 1 credit.
- 541 (541). VOICE**
Instruction in voice will seek to develop those qualities which are essential for intelligent interpretation, such as correct posture, breathing, pure tone, resonance, clear enunciation, and technical facility. Each voice is given the treatment best suited to its individual needs. A higher ideal than the perfection of mere mechanical skill is sought, namely a musical style of singing and a thorough appreciation of the best works of the masters, both classic and modern. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.
- 542 (542). PIANO**
The methods of presentation and the material used vary with each pupil and his degree of advancement. Emphasis is placed on musical values, musicianship, and sound piano technique. For this purpose, the literature employed is selected from the masters. Musical understanding is developed and quality of performance is stressed.

Music

With the attainment of advanced technique, the student's repertory is broadened to include works of all periods of literature. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

543 (543). HARPSICHORD

Instruction on the Adams harpsichord, the lessons covering harpsichord technique and early keyboard repertoire, with emphasis on keyboard practices of the eighteenth century. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

544 (544). ORGAN

Thorough training in the fundamentals of manual and pedal technique primarily through a graded approach to baroque and modern organ compositions. Advanced students will also receive training in service playing, improvisation, and figured bass realization. Prerequisite: permission of instructor. 1, 2, or 4 credits.

545 (545). VIOLIN, VIOLA

Students receive a thorough technical foundation on the violin or viola with emphasis on musicianship and musical values. The choice of literature, drawn from the great instrumental repertoire, will depend on the individual student's background and ability. Prior experience is a prerequisite. Permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

546 (546). VIOLONCELLO; STRING BASS

Objectives are based primarily on the student's ability and experience. A general awareness of the instrument as regards technique and tone are the first essential prerequisites. These elements will gradually broaden to include the attention and cultivation of the student's musical perception and repertoire. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

547 (547). WOODWIND

Instruction in the technique and literature for the flute, oboe, clarinet, bassoon, and saxophone. Ability and previous background determine a student's course of study. Competence in basic fundamentals of tone production, embouchure, articulation, and phrasing leads to concentration in the solo and chamber music repertoire for each instrument. The development of sound musicianship through study of music representative of all periods and styles is stressed. At least one public solo performance each semester is required. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

548 (548). BRASS

Instruction in any of the following instruments: trumpet, trombone, French horn, baritone, and tuba. Correct tone production, articulation, and musical interpretation are stressed. Prerequisite: permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

549 (549). PERCUSSION

Snare drum rudiments. The technique, tuning, and sticking of the timpani. Cymbals and all other percussion effects (claves, maracas, triangle, tambourine, wood-block, etc.), chimes, glockenspiel, bells, bell lyre, and xylophone. Prerequisite: permission of instructor. 1, 2, or 4 credits.

550 (550). HARP

Instruction includes exercises for the development of technique and emphasizes the literature for the harp both in solo and ensemble work. This course is offered by special arrangement with the chairman of the Music Department. 1 or 2 lessons; 1, 2, or 4 credits.

551-552. CONDUCTING METHODS

The development of conducting—physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and

condensed scores, study of transposition, psychology of rehearsal. Prerequisite: Music 571-572 and junior standing. 2 credits.

754 (754). COLLEGIUM MUSICUM

A flexible group of instrumentalists and singers organized to perform small ensemble music from all periods, with emphasis on Renaissance and baroque music. Prerequisite: permission of instructor. 1 credit.

755 (755). PERFORMANCE STUDIES IN MEDIEVAL MUSIC

An investigation of music for vocal, vocal-instrumental, and instrumental ensemble, circa 1100 to 1450, and its realization in performance, especially with regard to rhythm, *musica ficta*, notation, melodic ornamentation, improvised polyphony, and the clear projection of a polyphonic texture. Course work includes an evaluation of the writings of selected medieval theorists and modern scholars; practical exercises in transcription; and performance on reconstructions of medieval instruments, especially the organ, harp, psaltery, rebec, vielle, and recorder. 2 or 4 credits.

756 (756). PERFORMANCE STUDIES IN RENAISSANCE MUSIC

An approach to the problems of musical performance, circa 1450 to 1600, via the small vocal, vocal-instrumental, and instrumental ensemble, with special reference to rhythm and tempo, *musica ficta*, text underlay, articulation, diminution, tablature notation, and effective distribution of voices and instruments. Course work includes a survey of performance manuals, iconographical sources, and current research; development of editing technique through the preparation of transcriptions; and an opportunity to perform on representative musical instruments of the period, notably the organ, harpsichord, lute, viols, recorders, cornets, and trombones. 2 or 4 credits.

757 (757). PERFORMANCE STUDIES IN BAROQUE MUSIC

A study of performance practices in solo keyboard works, sonatas *a 2* and *a 3* and solo cantatas, circa 1640 to 1750, concentrating on ornamentation, realization of figured basses, improvisation, articulation, rhythm, keyboard registration, and the influence of the construction of baroque musical instruments (including the organ) on sonority and technique. Course work includes an examination of manuscripts (on microfilm), prints, treatises, and iconographical sources and the editing and realization of selected works for recital performance. 2 or 4 credits.

758 (758). PERFORMANCE STUDIES IN CLASSICAL MUSIC

An intensive examination of musical styles, circa 1760 to 1815, through the performance of keyboard music and instrumental chamber music, emphasizing the relationship between structure and interpretation, late eighteenth century conventions of ornamentation and articulation, a survey of tutors and relevant theoretical writing, and a critique of currently published editions and editing techniques. 2 or 4 credits.

759 (759). PERFORMANCE STUDIES IN NINETEENTH CENTURY MUSIC

The art of performing and coaching *Lieder*, piano music, and instrumental chamber music from Schubert through Debussy, with special consideration given to effective ensemble, traditions of interpretation, and the influence of structure on performance. 2 or 4 credits.

760 (760). PERFORMANCE STUDIES IN TWENTIETH CENTURY MUSIC

Performance of representative twentieth century compositions for small instrumental or vocal-instrumental ensemble, with intensive work in structural analysis, rhythmic ensemble coordination, dynamic and articulation control, new instrumental techniques, notation, improvisation, and the interaction between jazz and European styles. 2 or 4 credits.

Music

Theory and Composition (71)

471-472. THEORY I

Introduction to the tonal system: a study of the principles of voice-leading and harmonic progression through the analysis, realization, and composition of one-, two-, and four-voiced textures. The concept of triad inversion as well as the consonant diatonic harmonies of the major and minor modes are covered. Three weekly recitation sections devoted to compositional and analytic work and two weekly lab sections devoted to development of aural skills are required of each student. Prerequisite: permission of instructor. 4 credits.

571-572. THEORY II

A continuation of Music 471-472. Compositional and analytic work stresses the treatment of dissonance within the tonal system; accessory tones, seventh chords, tonicization, modulation, the basic principles of chromatic harmony, and the harmonization of chorale melodies are covered. Appropriate aural skills are stressed in two weekly lab sections. Prerequisite: Music 472 or permission of instructor. 4 credits.

771-772. COUNTERPOINT

A study of the contrapuntal techniques of tonal music. Principles of melodic construction and of dissonance treatment are introduced 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. Prerequisite: Music 572 or permission of instructor. 2 credits.

773. CANON AND FUGUE

A continuation of Music 772. The procedures of polyphonic tonal textures are studied through the analysis and composition of canons and fugues. Prerequisite: Music 772 or permission of instructor. 2 credits.

775-776. COMPOSITION

An introduction to compositional problems. The student constructs phrases, periods, and short compositions following classical models. Problems of text-setting are covered. Prerequisite: Music 572 or permission of instructor. 3 credits.

777-778. ADVANCED COMPOSITION

A continuation of Music 776. The student works on individual compositional projects in an idiom appropriate to his interests and abilities. Prerequisite: Music 776 and permission of instructor. 3 credits.

779. ORCHESTRATION

The characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students will be expected to study appropriate scores, to write arrangements utilizing these various groupings, and to have these arrangements performed if at all possible. Some aspects of vocal writing will also be covered. Prerequisite: Music 572 or permission of instructor. 4 credits.

781. FORM AND ANALYSIS

A consideration of various formal and textural elements both as concepts and within the context of musical examples. Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line, and formal articulation. Prerequisite: Music 572 or permission of instructor. 4 credits.

785. ELECTRONIC SOUND SYNTHESIS

A practical course in the creation of sounds by electronic and computer synthesis. The course will be divided into three sections. Part I will deal with "traditional" or "analog" electronic sound synthesis with students having the opportunity to work

with the Buchla Synthesizer in the UNH Electronic Music Studio. Part II will deal with the following areas of computer sound synthesis: (1) elementary programming in FORTRAN, (2) the logic of computer sound synthesis, and (3) programming in MUSIC4BF. Students will have the opportunity to run programs on the IBM 360/50 computer and its associated 12-bit digital/analog converter. Part III will be devoted to supervised independent study in one or both of the above areas. Prerequisite: permission of instructor. 4 credits.

Music Education (72)

540. BEGINNING TECHNIQUES IN VOICE

This course is designed to develop the basic techniques of voice production. Individual work is emphasized. A working knowledge of an instrument is required. This course is desirable for but not restricted to Music Education majors. Prerequisite: permission of instructor. 2 credits.

545, 546. BEGINNING TECHNIQUES IN STRING INSTRUMENTS

Class and individual instruction on stringed instruments. Students are expected to practice four hours per week as a basic course requirement. Students will receive training on the violin, viola, and cello. The course will explore classroom procedures, the establishment of string programs, and the evaluation of available methods materials. 2 credits.

595. SPECIAL PROJECTS IN MUSIC EDUCATION

A course to allow an undergraduate to undertake individual investigation, research, or study in any aspect of music education in which he has particular need or interest. Projects of a creative nature may be included. Prerequisite: permission of instructor. 1-4 credits.

741-742. TECHNIQUES AND METHODS IN CHORAL MUSIC

A lecture-workshop course concerning problems in the organization and performance of high school, college, and community choruses. Emphasis is placed on techniques of choral conducting and rehearsal, repertory, and materials. 2 credits.

743. MATERIALS AND METHODS IN PIANO MUSIC

A course designed to give 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 credits.

745-746. TECHNIQUES AND METHODS IN STRING INSTRUMENTS

Class and individual instruction on stringed instruments. Students are expected to practice four hours per week as a basic course requirement. A high level of instrumental proficiency results from intensive training on the violin, viola, cello, and double bass, enabling participants to perform in string ensembles. The course will explore classroom procedures, the establishment of string programs, and the evaluation of available methods materials. 2 credits.

747-748. TECHNIQUES AND METHODS IN WOODWIND INSTRUMENTS

Basic fundamentals of performance in woodwind instruments, techniques of class instruction, associated acoustical problems, and study of woodwind literature. Emphasis in the first semester will be on clarinet, flute, and saxophone. The double reed instruments will be emphasized in the second semester. 2 credits.

749-750. TECHNIQUES AND METHODS IN BRASS INSTRUMENTS

A 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, in conjunction with a survey of the methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high

Nursing

school players of brass instruments. Qualified advanced students may elect honors work in composition, arranging, and ensemble coaching. 4 credits.

751. TECHNIQUES AND METHODS IN PERCUSSION INSTRUMENTS

The basic skills necessary for performance on snare drum, timpani, mallet instruments and the other percussion instruments used in bands and orchestras. Materials and methods of instruction are included. 2 credits.

785. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER

For the non-specialist interested in utilizing music in the classroom. The correlation and integration of music in the school curriculum, and the basic skills and techniques necessary. 4 credits.

787. THE TEACHING OF ELEMENTARY SCHOOL MUSIC

Aims, scope, and organization of materials and activities in the elementary schools. Modern trends in educational philosophy, development of the child's voice, and demonstration of materials and methods for the various grades. Observation and teaching in schools. Seminar and laboratory. 2 credits.

791. THE TEACHING OF SECONDARY SCHOOL MUSIC

The application of educational principles to the teaching and learning of music and the organization of the music curriculum on the junior and senior high school levels. The adolescent voice, the classification of voices, the selection of vocal and instrumental materials, and the building of unified concert programs. Problems of administration, management, and the relationship of the teacher to school and community. Observation of music programs in secondary schools. 4 credits.

795. SPECIAL STUDIES IN MUSIC EDUCATION

A course allowing upper-level students to explore individually or in groups areas related to their specific professional interests. Prerequisite: permission of instructor. 1-4 credits.

796. ORGANIZATION AND ADMINISTRATION OF SCHOOL MUSIC GROUPS

Problems of organizing and administering school orchestras, bands, glee clubs, choruses, and small ensembles, such as objectives, motivation, schedule, discipline, equipment, programs, finances, rehearsal techniques, contests and festivals, materials, personnel selection, and grades. 4 credits.

Nursing (38)

Chairman: Carol J. Gray

PROFESSOR: Carol J. Gray

ASSOCIATE PROFESSORS: Mary Louise Fernald, Marguerite Fogg, Ann Kelley, Arlowayne Swort

ASSISTANT PROFESSORS: Dolores Bowers, Meigs Dickman, Barbara Kelley, Juliette Petillo, Martha Rowe, Rosemary Wang, Nancy Watkins

INSTRUCTORS: Barbara Cavanaugh, Evelyn Fitzpatrick, Elizabeth Vittands

402. NURSING

An exploration of nursing as a helping profession to assist students reach decisions about nursing interest and ability, and to develop a rationale for choosing nursing as a career. For freshman students interested in a nursing major. D. Bowers. 2 lectures; 2 credits.

503-504. FUNDAMENTALS OF NURSING

Basic professional skills needed by the nurse. Emphasis is placed on skills of observation and communication, on interviewing with a purpose, and on understanding basic dynamics of behavior related to illness and disability. A. Kelley. 1 lecture; 1 laboratory; 2 credits.

601-602. FAMILY NURSING

A course to gain new knowledge and skill and to adapt previous learning in giving total family health care. A broad focus enables the student to demonstrate personal and professional responsibility in a relationship with individuals and families. Maintenance of health through infancy, childhood, adolescence, and child-bearing, stressing developmental tasks of each age. Clinical experiences use local hospitals and community agencies. Ms. Fogg. Prerequisite: Nursing 503-504. 2 lectures; 2 laboratories; 6 credits. (Variable credits for registered nurses who pass challenge examinations for this course.)

603-604. MEDICAL-SURGICAL NURSING

A combined clinical nursing and theory course. Planning and giving nursing care to meet needs of individuals with health problems; observing and participating in various health services with multi-disciplinary health workers. A study of some of our society's major health problems; departures from normal physiological function, health maintenance and prevention of illness. R. Wang. Prerequisite: Nursing 503-504. 2 lectures; 2 laboratories; 6 credits.

621 (621). MENTAL HEALTH-PSYCHIATRIC NURSING

Information and clinical experiences in mental health-psychiatric nursing. The nursing process in relation to the care of patients coping with stress and maladaptive patterns of behavior; development of psychiatric nursing knowledge and skills. The nurse's role as a therapeutic agent; preventive, rehabilitative, community, and family aspects of care as they relate to the therapeutic process. Clinical learning experiences in community and institutional settings. M. Dickman. Prerequisite: Nursing 602. 2 lectures; 1 laboratory; 8 credits.

631 (631). COMMUNITY NURSING

The care of patients and families in the home and community. Concurrent with 621 and building upon knowledge from all previous nursing courses, this course enables the student to add new knowledge and skills in Community Nursing. Opportunities will be provided for students' involvement in community health programming. A variety of community health agencies and other health facilities are used for practice and observation. N. Watkins, J. Petillo. Prerequisite: Nursing 602. 2 lectures; 1 laboratory; 8 credits.

701-702. CONTEMPORARY PROBLEMS

An opportunity for the student to reassess, broaden, and integrate her nursing knowledge by an organized study of contemporary nursing practices and their implications for the role of the nurse and the nursing process. Emphasis is placed on the personal and professional responsibilities of the graduate nurse. Opportunity will be provided for students to apply theoretical knowledge to contemporary nursing roles. Nursing faculty. Prerequisite: Nursing 602 and 604. 3 lectures; 4 credits.

Occupational Education

Occupational Education (23)

Program Supervisor: William H. Annis

PROFESSORS: Samuel Hoitt, *emeritus*; William H. Annis, Maynard Heckel

ASSOCIATE PROFESSOR: Jesse James

ASSISTANT PROFESSOR: Nicholas L. Paul

THOMPSON SCHOOL PROFESSOR: Paul A. Gilman

THOMPSON SCHOOL ASSOCIATE PROFESSOR: Lewis Roberts, Jr.

402. FABRICATION TECHNOLOGY

A study of welding, cold-metal working, sheet-metal working, wood working, and plastics in relation to the building or repair of structures and machines. Prerequisite: permission of instructor. 2 recitations; 2 laboratories; 4 credits.

500. OCCUPATIONAL COMPETENCY EXAMINATION AND EVALUATION

An examination and/or evaluation to determine the level of competency within occupational clusters. Restricted to Occupational Education majors. Permission required prior to enrollment. 0-30 credits.

550. PRINCIPLES OF OCCUPATIONAL EDUCATION

The technical and professional qualifications of teachers of occupational education and the Cooperative Extension Service. The federal and state legislation affecting these programs at the local level. Two field trips to schools and/or extension meetings are required. 4 credits.

650. MICRO-TEACHING IN VOCATIONAL EDUCATION

The organization and presentation of micro-lessons to provide preliminary experience and practice in teaching. Students are exposed to the variables of classroom teaching under controlled conditions. Each student is required to teach five lessons in his subject-matter area to small groups of students. Video taping is utilized for immediate feedback. Required for majors and minors in Occupational Education. Prerequisite: Education 481 and 657 or permission of instructor. 4 credits.

695. INVESTIGATIONS IN OCCUPATIONAL EDUCATION

(1) Secondary Education, (2) Post Secondary Education, (3) Adult Education, (4) Career Education, (5) Exemplary Education, (6) Cooperative Education, (7) Disadvantaged and Handicapped Education. An opportunity is provided for undergraduate students to address a special problem in one of the areas listed. Elective after consultation with the instructor. May be repeated. 2-4 credits.

696. FIELD EXPERIENCE

Field work with an agency, institution, or organization to gain technical and/or professional competence not otherwise available. The student will plan this experience with his departmental adviser. Approval of credit will be subject to recommendation of faculty members and performance of student. Limited to Occupational Education majors and minors. Permission required. 2-16 credits. (May be repeated up to 16 credits.)

750. SHOP ORGANIZATION AND CONTROL METHODS

Shop organization and control methods to promote efficiency in the control of instruction, equipment, and materials. 4 credits.

783. PREPARATION FOR CONDUCTING AND SUPERVISING ADULT-EDUCATION PROGRAMS

The techniques of adult education in terms of identifying needs, program planning, methods of teaching, supervision, and evaluation. Prerequisite: Occupational Education 550 or permission of instructor. 4 credits.

Occupational Therapy

784. THE COMMUNITY-JUNIOR AND VOCATIONAL-TECHNICAL COLLEGES

A study of the rise and development of the community-junior college and the two-year vocational-technical college in American education; their history, potential, philosophy, and functions. 4 credits.

785. ADVANCED METHODS AND MATERIALS OF INSTRUCTION

The organization of instruction to meet individual and student needs; development and use of resource files and instructional materials. Evaluation in teaching occupational education. Open to teachers of vocational-technical education and others by permission of instructor. 4 credits.

786. CONCEPTS OF OCCUPATIONAL EDUCATION

The development of vocational-technical education in the United States with emphasis on the socio-economic influences responsible for its establishment. The federal and state requirements for programs on the secondary and post-secondary schools will be discussed. Coordination of programs with general education and other vocational fields. 4 credits.

791. PLANNING FOR TEACHING

The organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, the function of consulting committees, working with youth groups, and program evaluation. This course is scheduled concurrently with Education 658, 659, and 694. Prerequisite: Occupational Education 650. 4 credits.

796. INVESTIGATIONS IN OCCUPATIONAL EDUCATION (1) SECONDARY EDUCATION (2) POST SECONDARY EDUCATION (3) ADULT EDUCATION (4) EXTENSION EDUCATION (5) EXEMPLARY PROGRAMS (6) COOPERATIVE EDUCATION PROGRAMS (7) DISADVANTAGED AND HANDICAPPED EDUCATION PROGRAMS

An opportunity is provided for a student to study a special problem in one of the areas listed. Elective after consultation with the instructor. Hours to be arranged. May be repeated. 2 to 4 credits.

798. OCCUPATIONAL EDUCATION SEMINAR

Study of research and development in Occupational Education includes student and faculty presentations and discussions. Required of Occupational Education majors. 0 credits.

Occupational Therapy (39)

Chairman: Ann D. Ury

ASSOCIATE PROFESSORS: R. Virginia Bell, Ann D. Ury

ASSISTANT PROFESSORS: Marjorie B. Dussault, Jessica Siegars

INSTRUCTOR: Judith Ward

PRE-CLINICAL INSTRUCTORS: Elizabeth Crepeau, Elsilyn B. Miller

SUPERVISOR OF FIELD WORK EXPERIENCE: Laurel G. Bunker

MEDICAL LECTURERS: William Amman, M.D., *Ear, Nose, Throat*; Luigi N. Dolcino, M.D., *Psychiatry*; Allan W. Handy, M.D., *Pathology*; Charles H. Howarth, M.D., *General Medicine and Surgery*; Gerald Shattuck, M.D., *Pediatrics*; Ingvars J. Vittands, M.D., *Orthopedics*; Paul C. Young, M.D., *Pathology*

ASSOCIATED PRE-CLINICAL FACILITIES: Manchester Rehabilitation Center, New Hampshire Hospital, Maine Medical Center, Dover Drop-In Center, Rockingham School For Special Children, Wentworth-Douglas Hospital, Exeter Area Visiting Nurse Association

Occupational Therapy

The following courses are for occupational therapy students; elective for others by permission of the department chairman.

400. PRE-CLINICAL I: PRE-CLINICAL IN NORMAL CHILD DEVELOPMENT

All sophomores will spend the equivalent of one week in first semester involved with the development of normal children. Regular meetings to discuss experiences and in addition to appropriate written reports. Prerequisite: permission of the instructor. 1 credit.

412. ACTIVITY ANALYSIS

Experience in the analysis of activity and its relationships to physical and emotional aspects of humans. Development of skills in learning, teaching, and supervising activities and activity programs. Staff. Prerequisite: permission of the instructor. 2 laboratories; 2 credits.

510. OCCUPATIONAL THERAPY—THEORY I

Developmental concepts and historical perspectives of the basic theories and techniques of occupational therapy. The fundamentals of evaluation, testing, and problem solving; the central role of the patient in planning and administering treatment. Lecture presentations are correlated with clinical observation and supervised clinical participation. Staff. Prerequisite: Occupational Therapy 400. 3 lectures; 1 laboratory; 4 credits.

515. TREATMENT MEDIA I—CRAFTS

An introduction to craft techniques in selected basic activities, including printing, leatherwork, and ceramics. The analysis of crafts in relation to their potential, as treatment tools. Methods of teaching basic procedures and skills to patients. Minimum laboratory fee \$12. Staff. Prerequisite: Occupational Therapy 510. 2 laboratories; 4 credits.

(531) 531. GROUP PROCESS

Dynamics and development of group relationships are studied with emphasis on self awareness and sensitivity to others. The meaning of group processes in Occupational Therapy practice; role development and leadership concepts may be explored. Will be presented as a laboratory or lecture course. Ms. Dussault. 2 recitations; 2 credits.

581. INTRODUCTION TO MEDICAL CONCEPTS

Introduction to basic concepts of disease and disease process with emphasis placed on identification of factors relevant to OT problem-solving process. A lecture with recitation or laboratory format is used. Appropriate medical lecturers and occupational therapy faculty. Prerequisites: Occupational Therapy 412, 510; Zoology 507-508; and junior standing in the major. 4 credits.

582. DEVELOPMENTAL CONCEPTS IN REHABILITATION MEDICINE

Functional disabilities in a medical-model framework in relation to the developmental tasks from pediatric through geriatric age groups. Specific OT treatment goals will be discussed and practiced in the laboratory. Lecture-laboratory presentation. Appropriate medical lecturers and occupational therapy faculty. Prerequisite: Physical Education 652, Occupational Therapy 581, and junior standing in the major. 4 credits.

(583) 583. OCCUPATIONAL THERAPY—THEORY—MEDICAL LECTURES—PSYCHIATRY

Clinical psychiatric conditions presented by a psychiatrist. Both adult and childhood disabilities are discussed with patient presentations when possible. Lectures and recitations review and stress those aspects of the material most important in occupational therapy practice. Supervised patient contact in a clinic setting will be arranged. Prerequisite: Child Development, Psychology 545, and junior standing in the major. 4 credits.

588. PRE-CLINICAL II—THREE ONE-WEEK PRE-CLINICALS

During freshman, sophomore and junior years the student is required to spend a total of three weeks in a clinical setting. These are done in school breaks, or summers. A written evaluation is required for each. Prerequisite: admission to the occupational therapy program and permission of the instructor. 1 credit.

624. OCCUPATIONAL THERAPY—THEORY III—PSYCHO-SOCIAL TREATMENT METHODS

The application of psychiatry and psychology to the practice of occupational therapy with psychosocially disabled patients. Learning theory, group dynamics, treatment, and rehabilitation techniques. Application of theory and training in evaluative techniques is presented and practiced in the clinical setting. Ms. Dussault. Prerequisite: Occupational Therapy 583. 4 credits.

633. OCCUPATIONAL THERAPY—THEORY IV

A lecture laboratory presentation of selected orthopedic and rehabilitation medicine problems with concurrent study of applicable OT Rx techniques, including fractures, amputations, arthritis, burns, and other orthopedic conditions. Appropriate medical lecturers and occupational therapy faculty. Prerequisite: senior standing in the major. 4 credits.

634. OCCUPATIONAL THERAPY—THEORY V—ADVANCED PHYSICAL DYSFUNCTION

A lecture-laboratory presentation considering advanced OT treatment-planning with neurological and sensory motor disabilities (re: spinal cord injuries, cerebral palsy, learning disabilities). Concepts of community practice will be introduced. Appropriate medical lecturers and occupational therapy faculty. Prerequisite: Physical Education 606 and Occupational Therapy 633. 4 credits.

698. SENIOR SEMINAR

A two-semester seminar. Topics: senior thesis, research methods, supervisory and consultive functions of the OTR, community practice, professional relationships, administrative procedures, and selected current professional issues. Staff. Prerequisite: senior standing in the major. 4 credits.

Ocean Engineering

See Interdisciplinary and Experimental Programs, page 128

Oceanography

See Interdisciplinary and Experimental Programs, page 128

Philosophy (73)

Chairman: Asher Moore

PROFESSORS: Donald C. Babcock, *emeritus*; Asher Moore

ASSOCIATE PROFESSORS: Paul Brockelman, Duane Whittier

ASSISTANT PROFESSORS: Frank Birmingham, R. V. Dusek, Robert C. Scharff, Yutaka Yamamoto

LECTURER: Judith Lunsford Bangs

Philosophy

(405). THE PHILOSOPHIC DIMENSION

The effort of the course is to give the student a self-contained experience of authentic philosophic thought. Under critical guidance, students are encouraged to reflect on their own experience philosophically and to compare their reflections with those of others. Advanced students act as workshop leaders and tutors. They are available to guide the less experienced into the philosophic dimension, to show them how to use the tools of philosophic inquiry, and to evaluate their work. One lecture per week, plus a core of reading, provide a common groundwork upon which individual students and groups can build. Open only to freshmen and sophomores. 4 credits.

(406). THE PHILOSOPHIC DIMENSION

In format Philosophy 406 is identical to 405 and meets for the same weekly lecture, but workshops and tutorials are distinct. Open only to juniors and seniors. 4 credits.

410 (410). INTRODUCTION TO PHILOSOPHY

An examination of representative philosophies and of some of the persistent problems of philosophy. An introductory course designed to acquaint the student with the nature of philosophy and to help him think about his experience philosophically. 4 credits.

412 (412). INTRODUCTION TO LOGIC

An introduction to the principles of good reasoning, including practice in their application. Open to freshmen and sophomores. 4 credits.

(495). TUTORIAL READING

Reading of selected books under the direction and guidance of a member of the Department of Philosophy. The books offered for tutorial reading may be in any area the instructor chooses. Open normally to freshmen and sophomores only. Tutorial Reading may be offered on an independent study basis with permission of instructor. 4 credits.

(510). PHILOSOPHY OF RELIGION

A philosophical study of the nature and significance of religious experience, with historical and systematic analysis of such traditional problems of philosophical theology as faith and reason, evil, and the existence of God. A part of this course will consist of an intensive phenomenological study of the religious experience and an attempt to deal with the traditional problems from this point of view. Not open to freshmen. 4 credits.

(512). LOGIC AND SCIENTIFIC METHOD

A course in the logic of science and mathematics. The problems of induction and the paradoxes of logic are emphasized. The nature of probability logic and the character of axiom systems are treated in relation to the methodology and foundations of the empirical sciences. The course is especially suggested for students who are familiar with elementary mathematics (algebra, calculus, or Mathematics 420). Freshmen who have had calculus in high school or who have permission of the instructor may elect the course. 4 credits.

(520). INTRODUCTION TO ORIENTAL PHILOSOPHY

A philosophical introduction to the systems of ideas in the Orient (Hinduism, Buddhism, Confucianism, Taoism, etc.). Not open to freshmen. 4 credits.

522. PHILOSOPHY OF ART

The nature of art; the nature of creation and appreciation; the art media; judgments of worth; the relation of expression, form and subject; the relevance of aesthetic experience to the larger philosophical picture. Not open to freshmen. 4 credits.

530. ETHICAL THEORIES

The problems of moral philosophy through the critical examination of important traditional and contemporary theories of ethics. Not open to freshmen. 4 credits.

535. SOCIAL AND POLITICAL PHILOSOPHY

An examination of the distinctively philosophical problems encountered in social and political philosophy through the study of representative figures in the history of this branch of philosophy. An essential aim of this course will be to bring the student to serious and intensive reflection upon his own social and political philosophy. Not open to freshmen. 4 credits.

(545). SEMANTICS: THE PHILOSOPHY OF LANGUAGE

The meaning of meaning, the nature of linguistic communication, the nature of truth, the various functions of language, and the role of symbols in science, art, myth, and ritual. 4 credits.

(550). SYMBOLIC LOGIC

The principles and techniques of modern logic, with special attention to their philosophical significance. Discussion of sentential calculus, class calculus, truth tables, and lower functional calculus as well as the nature of deductive systems and the problems of formal consistency. 4 credits.

(570). ANCIENT PHILOSOPHY

The beginnings of western philosophy and the great philosophers of Greece and Rome. Prerequisite: permission of instructor. 4 credits.

(575). PHILOSOPHY OF EDUCATION

An introductory philosophical study of the nature, significance, and place of education within the human condition. The fundamental purpose of this course is to help each student begin to work out and articulate his or her own attitude toward the basic issues which lie at the heart of education at all levels. Although this course is open to any undergraduate without prerequisite, it is especially aimed at those students who want to explore or intend to enter the field of education and who seek to broaden their understanding of the purpose and significance of education. 4 credits.

(580). MODERN PHILOSOPHY

Western philosophy from the Renaissance through the eighteenth century. Prerequisite: Philosophy 570. 4 credits.

(600). PHILOSOPHY THROUGH LITERATURE

The philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. 4 credits.

630. PHILOSOPHY OF SCIENCE

A discussion of various philosophical problems raised by science. For example, the status of theoretical terms, the role of mathematics in science, the nature of scientific concepts of space and time, the relations of science to common sense, the relation of theory to observation, the logic of scientific discovery, the nature of historical changes in scientific world-view, the relation of the logic of science to the psychology and history of science. 4 credits.

(650). STUDIES IN SYSTEMATIC PHILOSOPHY

Advanced study of particular philosophic problems. The Department is prepared to offer work in the following problem-areas: religion, logic, scientific method, aesthetics, education, ethics, social and political philosophy, semantics, metaphysics, epistemology, philosophy of history, philosophy of mind. At least one section of Philosophy 650 will usually be offered each semester. The specific subject of a given

Physical Education

offering may be ascertained from the departmental office. Barring duplication of subject, the course may be repeated for credit. Prerequisite: advanced standing in philosophy *and* permission of instructor. 4 credits.

(670). STUDIES IN HISTORY OF PHILOSOPHY

Advanced study of individual philosophers, movements, or schools, in the history of philosophy. The department offers work in the following periods: ancient and medieval, rationalism, empiricism, and Kant and the nineteenth century. Work in each of these periods will be offered approximately every third semester. The specific subject of a given offering may be ascertained from the departmental office. Barring duplication of subject, the course may be repeated for credit. Prerequisite: advanced standing in philosophy *and* permission of instructor. 4 credits.

(680). STUDIES IN CONTEMPORARY PHILOSOPHY

Advanced study of contemporary individuals, movements, or schools. The department offers work in the following areas: analytic philosophy, continental philosophy, naturalism. Work in each area is offered approximately every third semester. The specific subject of a given offering may be ascertained from the departmental office. Barring duplication of subject, the course may be repeated for credit. Prerequisite: advanced standing in philosophy *and* permission of instructor. 4 credits.

(699). SENIOR THESIS

Independent work under a faculty adviser culminating in a senior thesis. Open only to philosophy majors with department approval. 4 credits.

795, 796. INDIVIDUAL STUDY

Students who are adequately prepared to do independent philosophical work involving extensive reading and writing may do advanced work on an individual basis. Before registering for this course the student must formulate a project and secure the consent of a member of the department who will supervise his work. Conferences and/or written work as required by the supervisor. Credits to be arranged.

Physical Education (40)

Chairman: Robert Kertzer

PROFESSORS: Marion C. Beckwith, Evelyn Browne

ASSOCIATE PROFESSORS: Caroline Wooster, *emerita*; Katherine Amsden, Gavin H. Carter, Phyllis A. Hoff, Robert Kertzer, Robert E. Wear, Walter E. Weiland

ASSISTANT PROFESSORS: Thomas R. Barstow, Gail A. Bigglestone, Donald E. Heyliger, Karen Hogarth, Daniel W. Jones, Jr., Elizabeth E. Knowlton, Joyce Mills, Jean M. Morrison, Nancy C. Rupp, D. Allen Waterfield

LECTURERS: Louis A. Datilio, Jean M. Rilling

Faculty from the Department of Intercollegiate Athletics

PROFESSOR: Paul C. Sweet, *emeritus*

ASSISTANT PROFESSORS: Dwight E. Aultman, Lionel J. Carbonneau, Theodore W. Connor, Irvin T. Hess

LECTURERS: M. William Bowes, Ralph J. Cavalucci, John Copeland, Joseph J. Coppola, Gerard J. Friel, Robert C. Norton, J. David O'Connor

The Major Program

Prospective physical education majors should refer to page 111 for information regarding the Non-Teacher Certification Degree Option and the Teacher Certification Program.

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, dance, aquatics, conditioning, and gymnastics courses, many of which are offered on a coeducational basis. A student may elect up to two credits of activity coursework per semester. Courses offered in the fall, winter I, winter II, and spring seasons include: aquatics (basic instruction, diving, senior life saving, water safety instructor, synchronized swimming, and SCUBA), archery, badminton, bowling, dance (folk, square, and modern), field hockey, figure control, figure skating, fitness laboratory, foil fencing, general skating, golf, gymnastics, handball, hiking/orienteering, ice hockey, lacrosse, outdoor education, paddleball, physical education activities for children, riflery, skiing, ski conditioning, ski touring, softball, squash, tennis, trampoline, volleyball, weight training.

The Department supplies special uniforms. Students are required to furnish such items as sneakers and bathing caps. A \$35 fee is charged for SCUBA; fees are also charged for off-campus activities such as skiing. Students with physical limitations are encouraged to participate in the program on a modified basis.

Women's Intercollegiate Sports Program

The purpose of the Women's Intercollegiate Sports Program is to provide all students, whatever their ability, with the exception of the rank beginner, with the opportunity to practice and/or play in a competitive program designed to provide a representative team to compete against other colleges or universities.

A variety of individual and team sports experiences are provided in the eight representative teams: fall—tennis, field hockey, and volleyball; winter—skiing, basketball, swimming, and gymnastics; and spring—lacrosse.

Performing Groups

Performing groups, sponsored by the Department of Physical Education, include the Contemporary Dance Group and the Synchronized Swimming Club. These groups are open to all interested students and give annual performances.

Elective Physical Education

410-455. ELECTIVE PHYSICAL EDUCATION

Activity coursework in physical education. Activities selected from sports, conditioning, aquatics, and gymnastics areas. Open to all undergraduate students. 3 hours. Credit/Fail.

Half-Semester Courses (.5 credits each)

410. ARCHERY	420. SKIING—BEGINNING†
411. FIGURE SKATING—BEGINNING	421. SKIING—INTERMEDIATE
412. FIGURE SKATING—ELEMENTARY/ INTERMEDIATE	422. SKIING—ADVANCED
413. FITNESS LAB—BICYCLING	423. SKIING—RACING
414. GENERAL SKATING	424. SKI TOURING
415. GOLF—BEGINNING	425. TENNIS—BEGINNING
416. GOLF—INTERMEDIATE	426. TENNIS—ELEMENTARY
417. ICE HOCKEY	427. TENNIS—INTERMEDIATE
418. SKI CONDITIONING	428. TENNIS—ADVANCED
419. SKIING—BEGINNING*	429. SPECIAL TOPIC
	430. SPECIAL TOPIC

Physical Education

Full Semester Courses (1 credit each)

435. BADMINTON	446. SCUBA—ADVANCED
436. BOWLING	447. SENIOR LIFESAVING
437. COURT GAMES (HANDBALL PADDLEBALL, SQUASH)	448. SWIMMING—BASIC
438. FENCING—BEGINNING	449. SYNCHRONIZED SWIMMING
439. FENCING—ELEMENTARY	450. TRAMPOLINE
440. FIGURE CONTROL	451. VOLLEYBALL
441. GYMNASTICS	452. WEIGHT TRAINING AND CONDITIONING
442. HIKING/ORIENTEERING	453. YOGA
443. OUTDOOR EDUCATION	454. SPECIAL TOPIC
444. RIFLERY	455. SPECIAL TOPIC
445. SCUBA—BEGINNING	

* On Campus

† Gunstock

Specialized Physical Education Coursework for Majors

479. **SOCCER—SPEEDBALL/VOLLEYBALL**
Performance skills and beginning teaching methods in soccer, speedball, and volleyball. 3 hours; 1 credit. Credit/Fail.
481. **EDUCATIONAL GYMNASTICS**
Performance skills and beginning teaching methods in movement education. 3 hours; 1 credit. Credit/Fail.
482. **GYMNASTICS (WOMEN)**
Performance skills and beginning teaching methods in gymnastics. 3 hours; 1 credit. Credit/Fail.
483. **FIELD HOCKEY II/BASKETBALL II**
Performance skills and beginning teaching methods in field hockey and basketball. 3 hours; 1 credit. Credit/Fail.
484. **LACROSSE/ELECTIVE**
Performance skills and beginning teaching methods in lacrosse combined with an opportunity to elect an activity for the first half of the semester. 3 hours; 1 credit. Credit/Fail.
485. **GOLF/BADMINTON**
Performance skills and beginning teaching methods in golf and badminton. 3 hours; 1 credit. Credit/Fail.
486. **ACTIVITIES FOR ELEMENTARY SCHOOL/TENNIS II**
Performance skills and beginning teaching methods in elementary school physical education and tennis. 3 hours; 1 credit. Credit/Fail.
488. **FOLK DANCE/TRACK AND FIELD**
Performance skills and beginning teaching methods in folk dance and track and field. 3 hours; 1 credit. Credit/Fail.
489. **BASEBALL/WRESTLING**
Performance skills and beginning teaching methods in baseball and wrestling. 3 hours; 1 credit. Credit/Fail.
490. **VOLLEYBALL/BASKETBALL**
Performance skills and beginning teaching methods in volleyball and basketball. 3 hours; 1 credit. Credit/Fail.

Physical Education

491. **TRACK AND FIELD**
Performance skills and beginning teaching methods in track and field. 3 hours; 1 credit. Credit/Fail.
493. **TENNIS I/BADMINTON**
Performance skills and beginning teaching methods in tennis and badminton. 3 hours; 1 credit. Credit/Fail.
494. **HANDBALL/SOCCER**
Performance skills and beginning teaching methods in handball and soccer. 3 hours; 1 credit. Credit/Fail.
495. **GOLF/FOLK DANCE**
Performance skills and beginning teaching methods in golf and folk dance. 3 hours; 1 credit. Credit/Fail.
496. **SQUASH/TENNIS II**
Performance skills and beginning teaching methods in squash and tennis. 3 hours; 1 credit. Credit/Fail.
498. **GYMNASTICS (MEN)**
Performance skills and beginning teaching methods in gymnastics. 3 hours; 1 credit. Credit/Fail.

Theory Courses—Physical Education

500. **PRINCIPLES OF PHYSICAL EDUCATION**
An approach to the field of physical education and related areas through a study of the evolutionary and historical factors affecting its development from pre-historic times to the present day. The place of physical education in the academic community and its relation to the aims and objectives of general education, the world of sports, and athletics will be considered. Staff. 4 credits.
510. **MEDICAL ASPECTS OF SPORTS AND PHYSICAL EDUCATION**
The etiology, pathology, treatment, and prognosis of sports injuries are discussed and related to preventive measures. The various problems encountered in teaching physical education to the physically and mentally handicapped are related to the different pathologies of each disability. Mr. Aultman. 4 credits.
520. **WATER SAFETY INSTRUCTORS' COURSE**
Conducted through the auspices of the American Red Cross, the course includes analysis of aquatic techniques and methods of teaching swimming, diving, and lifesaving. Instructor authorization is awarded to candidates who demonstrate a high caliber of personal skill, knowledge, and teaching ability in aquatics. Ms. Hoff. Prerequisite: current senior lifesaving certification. 2 credits.
521. **THEORY OF COACHING BASKETBALL**
Theory and practice in the fundamentals of individual offense and defense. The various styles of team offense and defense and rules of the game. Problems in handling and conditioning a team. Mr. Friel. Prerequisite: Physical Education 490. 2 credits.
522. **THEORY OF COACHING FOOTBALL**
Analysis of various systems of play. Instruction in team and individual offensive and defensive fundamentals. The theory and strategy of team play, coaching methods, physical conditioning, and rules. Football staff. Open to physical education majors only. 2 credits.

Physical Education

523. THEORY OF COACHING HOCKEY

Theory and practice in the fundamentals of team offense and defense, the fundamentals of each position, coaching methods, physical conditioning, and rules. Mr. Carter. 2 credits.

524. THEORY OF COACHING BASEBALL

Theoretical and practical consideration of basic principles of batting and fielding, the fundamentals of each position, special stress on problems of team play, coaching methods, physical conditioning, and rules. Mr. Conner. Prerequisite: Physical Education 489. 2 credits.

525. THEORY OF COACHING SOCCER

Combination of lectures and on-the-field demonstrations to help teachers and coaches view practices and concepts used in modern soccer. Material covered will include the following: fundamental and advanced skills and techniques, offensive and defensive principles of team play, tactical formations and strategy, methods of training and practicing, rules of the game. Mr. Heyliger. Prerequisite: Physical Education 494. 2 credits.

526. THEORY OF COACHING WRESTLING

Theory, practical teaching methods, and the development of advanced skills in an individual sport. The course will emphasize theory and practical application of wrestling skills and techniques from basic maneuvers to the more advanced. The basic objective of the program will be to develop sufficient skills and knowledge to teach and coach wrestling. Mr. Hess. Prerequisite: Physical Education 489. 2 credits.

527. AQUATIC LEADERSHIP TRAINING

The course is designed to survey the methods, organization, and administration of both American Red Cross and YMCA aquatic programs. Topics covered include methods of teaching swimming, diving, and lifesaving; program planning; officiating; operation and maintenance of swimming pools; camp waterfront; health and safety aspects of the aquatic program; legal problems; skin and SCUBA diving; drown-proofing. Mr. Waterfield. Prerequisite: senior lifesaving certificate. 2 credits.

528. THEORY OF COACHING TRACK AND FIELD

Instruction and practical demonstration in starting, sprinting, middle-distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin throwing Methods of preparing contestants for the various events. Mr. Copeland. Prerequisite: Physical Education 491. 2 credits.

529. THEORY OF COACHING GYMNASTICS

The theory, practical teaching methods, and officiating of competitive gymnastics. Emphasis will be placed on the construction of gymnastic routines, from the elementary to the international level. Practical work sessions will be held. Mr. Datilio. Prerequisite: Physical Education 498. 2 credits.

530. THEORY OF COACHING SWIMMING AND DIVING

A thorough analysis of the techniques of coaching swimming and diving. Course includes a systematic treatment of the philosophy, historical development, and psychological theories of coaching aquatics. Much emphasis is placed on the mechanical and kinesiological aspects of the competitive strokes and required and optional dives, both low and high board. Mr. Waterfield. Prerequisite: Physical Education 447. 2 credits.

532. LABANOTATION

The study and practice of recording human movement by the method of *Labanotation*. Ms. Morrison. Prerequisite: intermediate modern dance or permission of instructor. 2 credits.

533. **DANCE COMPOSITION I**
A practical, developmental approach to the process of creating dance. Ms. Morrison. Prerequisite: intermediate modern dance. 2 credits.
534. **DANCE COMPOSITION II**
Choreographic methods with an emphasis on the use of music and group design. Ms. Morrison. Prerequisite: Physical Education 533. 2 credits.
540. **MOTOR EFFICIENCY AND IMPAIRMENT IN CHILDREN AND ADOLESCENTS**
An investigation of motor development and motor behavior in normal populations of children at all age levels; an interpretation of perceptual-motor dysfunction, analysis of perceptual-motor training programs, and determination of the role of movement in cognitive development. Ms. Hoff. 4 credits. (Alternate years; offered in 1975-76.)
551. **ANALYSIS OF RHYTHM**
A theoretical consideration of the factors which affect and effect rhythm with application to a variety of media. Ms. Knowlton. 2 credits.
554. **THEORY OF TEACHING DANCE**
A study of the methods, materials, techniques, and theories of teaching dance. The first half of the course covers dance as an art form; the second half, recreational dance. Ms. Morrison and Ms. Hogarth. Prerequisite: beginning, intermediate modern dance; folk, square, and social dance. 2-4 credits.
563. **THE THEORY OF TEACHING PHYSICAL EDUCATION IN THE SECONDARY SCHOOL**
The implications and practical application of various teaching methods which may be employed in the teaching of Physical Education. A combination of classroom and laboratory experiences will be used. A practicum will be included in selected areas. Ms. Rupp. Prerequisite: a specified activity sequence. 4 credits.
582. **PERSONAL AND COMMUNITY HEALTH**
The individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. 4 credits.
606. **NEUROLOGY**
Practical study of morphology, physiology, and histology of the human nervous system, for students in occupational therapy. Prerequisite: Zoology 508. Mr. Jones. 4 credits.
620. **PHYSIOLOGY OF EXERCISE**
The acute and chronic physiological effects of exercise. Emphasis will be on respiration, circulation, and energy metabolism. Lectures will be supplemented by laboratory sessions demonstrating physiological adaptation to the demands of muscular activity. Mr. Kertzer. Prerequisite: Zoology 508. 4 credits.
625. **DYNAMICS OF HUMAN MOVEMENT**
A kinesiological consideration of factors which affect efficiency in human movement. Theoretical and technical information on both cinematographic and non-cinematographic forms of analysis. Laboratory experiences in the analysis of selected movement events and sequences (sports, dance, everyday movement). Ms. Knowlton. Prerequisite: Zoology 507. (Not open to students who have taken Physical Education 652.) 2 lectures; 1 laboratory; 4 credits.
630. **EVOLUTION OF SPORT**
An inquiry into the origins and development of sport as an institution in selected geographical areas of the world. Such topics as: the relationship of sports to war, art, and religion; the ritualistic role of sport in time and place; the historic use of sports by nation are among those which will be discussed. This course is designed primarily for non-major students. Ms. Browne. Open to juniors, seniors, and by permission of instructor. 4 credits.

Physical Education

633. SOCIAL FOUNDATIONS OF SPORT AND PHYSICAL ACTIVITY

An investigation of the interdependence of human movement experiences, as exemplified in sport, play, and games, and various cultural, subcultural, and social factors. Mr. Weiland. Prerequisite: Sociology 400. 4 credits. (Alternate years; offered in 1975-76.)

635. CONTEMPORARY LITERATURE IN THE SOCIO-CULTURAL ASPECTS OF SPORT AND PLAY

A selective review of contemporary literature dealing with the socio-cultural aspects of sport and play. The literature will be critically analyzed in light of current theory in sport, play, and related areas of study. Students will have the opportunity to pursue in-depth study in a related topic. Ms. Knowlton. Prerequisite: permission of instructor. 4 credits. (Alternate years; offered in 1975-76.)

637. SPORT—AN ETHOLOGICAL APPROACH

A survey of the new science of Ethology (animal behavior). The application of ethological principles to the development and conduct of sports in the world today. The relation of ethological principles to those in other disciplines such as psychology, sociology. There will be guest speakers and class discussion. Ms. Browne. Prerequisite: Sociology 411 or permission of instructor. 4 credits. (Alternate years; offered in 1974-75.)

641. THE DANCE

A philosophical consideration of the trends in dance as a performing art. Ms. Morrison. 4 credits.

644. CHOREOGRAPHY

A theoretical and practical consideration of the creative and aesthetic aspects of the Dance. For those students who have taken Physical Education 533 laboratory experiences will consist of advanced choreographic projects. Ms. Morrison. Prerequisite: Intermediate modern dance or consent of instructor. 1 lecture; 2 laboratories; 4 credits.

652. KINESIOLOGY

The science of human motion. Detailed analysis of human muscular anatomy and a consideration of the actions of skeletal muscles in light of recent electromyographic evidence. Application of selected concepts of muscle physiology and biomechanics to physical education activities. Mr. Kertzer and Mr. Jones. Prerequisite: Zoology 507. (Not open to students who have taken Physical Education 625.) 4 credits.

656. PROBLEMS OF HEALTH EDUCATION

A survey of total school health: environment, services, and education. Methods, materials, and principles of teaching school health from kindergarten through grade 12. Open to physical education majors and others by permission of instructor. Staff. 2 credits.

665. ADMINISTRATION OF PHYSICAL EDUCATION IN SECONDARY SCHOOLS

Administrative methods in the conduct of physical education, health education, and recreation. The planning of programs and policies in the light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Staff. 4 credits.

668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION

Procedures used in interpretation and administration of measurement techniques in physical education. Essential elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Ms. Amsden and Mr. Weiland. 4 credits.

- 692. THE THEORY OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL**
The methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school. Mr. Barstow, Ms. Hogarth, Ms. Mills. 4 credits.
- 696. INDEPENDENT STUDY**
An opportunity for students who are Physical Education majors to pursue in depth study with faculty supervision. Staff. Prerequisite: junior standing, approval of the major adviser, and the faculty of the area concerned. 2-4 credits.
- 697. SENIOR SEMINAR IN PHYSICAL EDUCATION**
Discussion, analysis and evaluation of current materials, ideas, and problems pertinent to the teacher preparation curriculum. This course is included in the student teaching block. Staff. Open only to senior Physical Education teacher preparation majors who have been accepted for student teaching. 4 credits. Credit/Fail.
- 720. INTERPRETATION AND ASSESSMENT OF PHYSICAL FITNESS**
Physical fitness as it applies to the well-being of all people, young and old. Practical programs of conditioning and fitness as a unique contribution of physical education to the general program of education in the school. The contribution of physical fitness to total personal fitness; the components of physical fitness and conditioning; the place of physical fitness in the school physical education program; current tests of physical fitness; the planning and implementation of fitness programs for the public school curriculum. Practical fitness conditioning and rehabilitation of individuals of all ages, particularly those in college and adult programs. Mr. Wear. 4 credits.
- 730. CURRICULUM PLANNING IN PHYSICAL EDUCATION**
Study of the criteria and factors involved in the planning and construction of school physical education programs. Mr. Carter. 4 credits.
- 760. EVOLUTION AND CULTURAL FOUNDATIONS OF PHYSICAL EDUCATION**
A study of evolutionary and cultural forces shaping the conduct and content of physical education programs in selected societies today. The course will give the student an opportunity to explore in depth the field of sport, dance, and physical education in the light of new knowledge in the field of ethology and the behavioral sciences. Ms. Browne. 4 credits.
- 775. PERCEPTUAL MOTOR LEARNING**
The variables which affect the learning and performance of skilled activity, including ability and motivational characteristics of the learner, and the processes which enhance skill acquisition. Ms. Hoff. Prerequisite: Psychology 401. 3 lectures; 1 laboratory; 4 credits.
- 780. PSYCHOLOGICAL FACTORS IN SPORT**
An investigation of the factors related to outstanding athletic achievement, the psychological variables involved in competition, and the actions and interactions of sport, spectator, and athlete. Ms. Hoff. Prerequisite: Psychology 401 or Physical Education 775, and permission of instructor. 3 lectures per week; 4 credits.
- 791. HISTORY OF PHYSICAL EDUCATION**
A comprehensive history of physical education from ancient Egypt to modern times. Particular emphasis is to be placed on the influences of Greece, Rome, the Renaissance and Reformation periods, and modern European Nationalism. A critical analysis of sequential events and the beliefs of leaders in the development of systems of physical education. Ms. Amsden. 4 credits.

Physics

Physics (53)

Chairman: John E. Mulhern Jr.

PROFESSORS: Harry H. Hall, *emeritus*; Edward L. Chupp, Robert E. Houston, Jr., Richard L. Kaufmann, Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., William R. Webber

ASSOCIATE PROFESSORS: Roger L. Arnoldy, L. Christian Balling, David G. Clark, Harvey K. Shepard, Robert E. Simpson

ASSISTANT PROFESSORS: John F. Dawson, Edmond C. Roelof, Richard St. Onge, John J. Wright

401-402. INTRODUCTION TO PHYSICS I AND II

A broad survey of both classical and modern physics with emphasis on the latter. Designed to enable the student to appreciate the role of physics in the society and technology of today. While emphasis is placed upon the fundamental laws of nature on which all science is based, the interrelationships between other disciplines will be stressed. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

403-404. INTRODUCTORY PHYSICS FOR BIOLOGISTS

A broad survey of physics with an emphasis on using physical principles to understand biological situations. The operation of a number of instruments, such as optical and electron microscopes, which play vital roles in obtaining biological information 2 lectures; 1 recitation; 1 laboratory; 4 credits.

405 (405). CONCEPTS OF PHYSICS

A descriptive course investigating a limited number of important physical systems. Emphasis will be placed on how the system is to be investigated and the patterns in which the results fall. The intuitive concepts used in investigations will be traced into their application in modern physics. Every effort will be made to relate the patterns of thought in physics to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 credits.

406 (406). INTRODUCTION TO MODERN ASTRONOMY

A brief descriptive course covering 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. 4 credits.

407-408. GENERAL PHYSICS I AND II

An elementary course emphasizing mechanics as the foundation underlying all physics; selected topics from electrostatics and electromagnetism are also presented. Prerequisite: Math 427-428 passed or taken concurrently. Physics 407: 3 lectures; 2 recitations; 1 laboratory. Physics 408: 2 lectures; 2 recitations; 1 laboratory; 4 credits.

411. HOUSEHOLD PHYSICS

A practical, non-mathematical course designed to introduce students to the physical principles necessary to understand how and why common devices work, with emphasis on household appliances and automobile. Extensive use will be made of classroom demonstrations and laboratories to illustrate the theories involved and their practical applications. Prerequisite: permission of instructor. (Students may receive credit for either 411 or 412, but not both.) 3 lectures; 1 laboratory; 4 credits.

412. TECHNICAL PHYSICS

An applied physics course similar in content to Physics 411 but with more emphasis on industrial machinery and instruments. Recommended for Thompson School

- students. Prerequisites: algebra, trigonometry, permission of instructor. (Students may receive credit for either 411 or 412, but not both.) 3 lectures; 1 laboratory; 4 credits.
- 505. GENERAL PHYSICS III**
 Selected topics from wave motion, kinetic theory, and classical physics. An introduction to the study of systems of many particles. Prerequisite: Physics 408 and Mathematics 527 passed or taken concurrently. 3 lectures; 2 recitations; 1 laboratory; 4 credits.
- 506. GENERAL PHYSICS IV**
 An introduction to quantum physics, including special relativity, the structure of atoms and nuclei, and the basic ideas of quantum mechanics. Prerequisite: Physics 408 and Mathematics 527. 2 lectures; 1 recitation; 1 laboratory; 4 credits.
- 510. INTRODUCTION TO MODERN COSMOLOGY**
 Cosmology concerns the structure and history of the universe. This study of cosmology is presented in a manner intelligible to students with only a modest knowledge of mathematics and physics; in particular, calculus is not required. Initially several topics in astronomy are reviewed at an elementary level including the physics of the Sun and stars; the Milky Way; and associated phenomena, external galaxies and astronomical distances, and expansion of the universe. The more recent discoveries concerning radio galaxies, quasi-stellar objects, cosmic black body radiation, x-rays, and gamma rays precede a discussion of Newtonian and general relativistic cosmological models. Some specific models discussed include the steady-state, big-bang theories and matter-antimatter models. Field trips will be taken to nearby astronomical observatories. 4 credits.
- 602. THERMAL PHYSICS**
 This course will include both a classical and a statistical approach to the subject of Thermodynamics. Kinetic Theory. Prerequisites: Physics 408 or equivalent; Mathematics 528. 4 credits.
- 605-606. EXPERIMENTAL PHYSICS I AND II**
 Experiments in electrical measurements and circuits, passive and active circuit elements, optics, and atomic physics. Prerequisite: Physics 616 taken concurrently. 2 lectures; 2 laboratories; 4 credits.
- 607. PHYSICAL OPTICS**
 The electromagnetic theory of light, interference, diffraction, polarization, related phenomena, and nonlinear optics. Prerequisite: Mathematics 528. 4 credits.
- 609-610. EXPERIMENTAL PHYSICS III AND IV**
 Work of a project nature. Special problems are assigned to the individual student. Prerequisite: senior standing in physics. 2 laboratories; 4 credits.
- 613, 614. SPECIAL TOPICS I AND II**
 Any selected topics not covered sufficiently well in a general course may be studied. Prerequisite: senior standing in physics. Variable credits; 1-3 credits.
- 616. PHYSICAL MECHANICS I**
 An analytical treatment of classical mechanics covering the dynamics of particles and rigid bodies. Some specific topics include Newton's laws, conservation theorems, oscillations, central force problem, generalized coordinates, and Lagrange's equations. Prerequisites: Physics 505 or equivalent; Math. 528 passed or taken concurrently. 4 credits.
- 617. PHYSICAL MECHANICS II**
 Selected topics of classical mechanics including wave motion, coupled oscillation, and vector field theory. Prerequisite: Physics 616 or equivalent. 4 credits.

Plant Science

618. INTRODUCTION TO SOLID STATE PHYSICS

A brief summary of the theory underlying the behavior of solids will be given. Emphasis will be placed on transport theory and the interaction of radiation and matter. The operation of semiconducting and superconducting devices and lasers will be considered. Prerequisites: Mathematics 527, Physics 506, or equivalent. 4 credits.

695-696. DIRECTED STUDY

Individual study projects in physics under the direction of a faculty adviser. Permission of the department required. Variable credits; 1-8 credits.

701. INTRODUCTION TO QUANTUM MECHANICS

An introduction to quantum mechanics with applications to atomic and molecular spectra. Prerequisite: consent of instructor. 4 credits.

702. ATOMIC AND NUCLEAR PHYSICS

Natural radioactivity, nuclear reactions and scattering, models of the nucleus, high energy nuclear physics, cosmic rays. Prerequisite: Physics 701. 4 credits.

703-704. ELECTRICITY AND MAGNETISM I AND II

Foundation of electromagnetic theory, including electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction to electro dynamics. Prerequisite: consent of instructor. 4 credits.

Plant Science (24)

Chairman: Lincoln C. Peirce

PROFESSORS: Ford S. Prince, *emeritus*; R. Eggert, *emeritus*; Gerald M. Dunn, Clarence A. Langer, Lincoln C. Peirce, Owen M. Rogers, Douglas G. Routley

ASSOCIATE PROFESSORS: George O. Estes, James B. Loy, James R. Mitchell, Jerry A. Warren, Otho S. Wells

ASSISTANT PROFESSORS: Yun Tzu Kiang, David Koch, James E. Pollard

421. CONCEPTS OF PLANT GROWTH

Development of genetic and physiological concepts underlying plant growth and response of plants in natural and modified environments. Open to all students. Mr. Estes. 3 lectures; 1 laboratory; 4 credits.

427. LANDSCAPING THE HOME GROUNDS

The design and maintenance of small properties with emphasis on the principles of arrangement and the use and identification of plant materials in the beautification of home surroundings. Mr. Rogers. 2 lectures; 4 credits.

522. ENVIRONMENT AND PLANT RESPONSE

Discussion of plant responses to environmental stress considering light, temperature, water, and atmospheric resources; the role of plants in the conservation and efficient utilization of environmental resources; pollution effects on plants. Laboratory will involve instrumental measurement of environmental factors and plant responses to modified natural and controlled environments, including greenhouse and growth chamber. Mr. Koch. 3 lectures; 1 laboratory; 4 credits.

525-526. PLANT CULTURE—THEORY AND PRACTICE

The techniques of growing plants outdoors and in the greenhouse. Topics include plant breeding and propagation; insect, disease, and weed control; vegetable, fruit,

flower, and lawn culture; and greenhouse practices. Mr. Routley and staff. Plant Science majors only. Prerequisite: Plant Science 421 or equivalent and permission of instructor. 1 laboratory; 2 credits.

535. HISTORY AND USE OF CULTIVATED PLANTS

The importance of cultivated plants in civilizations from both a historical and utilitarian viewpoint. Plants and plant products discussed will include cereal and forage crops, temperate and tropical fruits and nuts, vegetables, vegetable oils, dyes, latex products, and fibers. Open to all students. Mr. Loy. 2 lectures; 1 laboratory; 4 credits.

565. RECREATIONAL TURF

Management of fine turf grasses and their adaptation for recreational and aesthetic use. Open to all students. Mr. Knoop. 3 lectures; 4 credits.

606. PLANT PHYSIOLOGY

An introduction to the function of higher plants with an emphasis on water relations; metabolism; growth and development. Botany and Plant Science Staff. Ms. Biggs (Botany) and Mr. Pollard (Plant Science). Prerequisite: Botany 411, 503 or Plant Science 421 and one year of chemistry or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

607. WEED SCIENCE

Introduction to biology of weeds, identification of common weeds, weeds in relation to man, injurious effects of weeds. Principles of preventive, cultural, biological, and chemical control of weeds; the properties and functions of herbicides; herbicides and environment. Mr. Kiang and staff. Prerequisite: chemistry and biology or equivalent or permission of instructor. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered fall 1975.)

678. ORNAMENTAL PLANTS

The important ornamental plants, their growth characteristics, culture, and use. Mr. Rogers. Prerequisite: Botany 566 or equivalent. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered second semester 1974-75.)

695 (695). TOPICS IN CROP PRODUCTION

Growth, culture, and management of fruit, vegetable, forage, or grain crops. A course series presented in the form of lectures, discussions, and readings with projects, labs, and/or field trips designed to give students practical experience. Prerequisite: Plant Science 421 or equivalent. R-1 Fruit Crops, Mr. Pollard, 4 credits. R-2 Vegetable Crops, Mr. Peirce, 3 credits. R-3 Forage Crops, Mr. Koch, 4 credits. R-4 Grain Crops, Mr. Koch, 3 credits.

705. POPULATION GENETICS

The population growth and regulation; the distribution of genes in populations; factors affecting gene frequency, such as mode of inheritance, mating systems, mutation, migration, genetic drift, selection, and linkage disequilibrium; genetic load, cost of natural selection, and ecological genetics. Mr. Kiang. Prerequisite: Zoology 604 (Principles of Genetics) and Forest Resources 528 (Applied Statistics I), or equivalents, or permission of instructor. 4 lectures; 4 credits.

708. PLANT NUTRITION

Nutrient requirements of plants; ion uptake, translocation and assimilation mechanisms; role of elements in metabolic processes. Genetic and environmental factors governing nutrient absorption and composition of plants. Mineral element and soil-plant relationships governing nutrient availability; growth, yield, and crop quality as influenced by nutrient status; characteristics and formulation of commercial fertilizers. Laboratory emphasis on analytical procedures and instrumentation for soil and plant tissue analysis. Prerequisites: plant physiology, organic chemistry, soils. Mr. Estes. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered spring 1976.)

Plant Science

732. DEVELOPMENTAL GENETICS

Fundamental concepts concerning gene action in relation to development, with emphasis on plant organisms. Topics will include isozymes and differentiation, chromosomal proteins and gene regulation, temporal specificity of gene action, nuclear-cytoplasmic interactions, chemical gradients and gene activation, and gene control of differentiation. Prerequisite: Introductory Genetics and Introductory Physiology. Mr. Loy. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered spring 1975.)

740. EVOLUTIONARY BIOLOGY

The synthetic theory of evolutionary processes in the origin of life, species, and higher groups; sources of genetic variability, population structure, causes of evolution; ecological adaptation in animals, plants, and man; evolution of communities; molecular evolution and rates of evolution. Mr. Kiang. Prerequisite: Zoology 604, or equivalent or permission of instructor. 4 lectures; 4 credits. (Alternate years; offered spring 1976.)

762. PLANT METABOLISM

The function, occurrence, synthesis and degradation of plant constituents. Emphasis is placed on respiration and photosynthesis and the metabolism of nitrogenous and aromatic compounds. Biochemical mechanisms such as those involved in seed dormancy, fruit ripening, and disease resistance are discussed in relation to their roles in plant survival. Mr. Routley. Prerequisite: Biochemistry 751 or equivalent. 2 or 4 credits.

769. PLANT GROWTH REGULATORS

Study of hormones and plant growth substances; relationship of differentiation and development of plant tissues. Mr. Routley. Prerequisite: plant physiology, biochemistry. 2 lectures; 2 laboratories; 4 credits. (Alternate years; offered fall 1975.)

773. METHODS AND THEORY OF PLANT BREEDING

Theory and use of plant breeding systems with emphasis on quantitative plant improvement. Mr. Peirce. Prerequisites: genetics, statistics or permission of instructor. 3 lectures; 3 credits. (Alternate years; offered fall 1974.)

776. RADIOISOTOPE TECHNIQUES FOR LIFE SCIENCES

Fundamental concepts and laboratory practice on the application of radioisotopes to biological systems. Techniques include detection and measurement principles, liquid scintillation spectrometry and autoradiography, gamma-ray spectrometry, radiochromatogram scanning, and tissue distribution of radioisotopes in whole animals. Mr. Estes. Prerequisite: general inorganic chemistry and general physics. 2 lectures; 2 laboratories; 4 credits.

795, 796. ADVANCED TOPICS IN PLANT SCIENCE

A flexible course structure permitting independent research, study or group discussion of advanced technical or scientific topics. Students should consult with appropriate course coordinator before registering. 2 or 4 credits. R-1 Physiology—Mr. Estes, Mr. Koch, Mr. Pollard, Mr. Routley; R-2 Genetics—Mr. Dunn, Mr. Kiang, Mr. Peirce, Mr. Loy, Mr. Rogers; R-3 Plant Utilization—Staff.

Political Science (75)

Chairman: Bernard K. Gordon

PROFESSORS: John T. Holden, *emeritus*; Robert B. Dishman, Bernard K. Gordon, George K. Romoser, Allan Spitz

ASSOCIATE PROFESSORS: John R. Kayser, David L. Larson, Lawrence W. O'Connell, John H. Woodruff, Frederic W. Wurzburg

ASSISTANT PROFESSORS: Robert E. Craig, Joseph P. Ford, David W. Moore, B. Thomas Trout, Susan O. White

INSTRUCTORS: Warren R. Brown, Philip Ginsburg

Except for the introductory courses (401-402), Political Science offerings are listed by fields at the 500, 600, and 700 level. For detailed information and guidance on these designations see the Political Science description in the catalog section, "Majors in the Bachelor of Arts Program." Generally, courses numbered "500" in each field are prerequisite to further courses in that field; courses numbered "600" and above are not open to freshmen; and courses numbered "700" are not open to freshmen and sophomores. Seminars (790-799) are open only to seniors. Courses relevant to more than one field are cross-listed; courses listed with an asterisk (*) may not be taught each year.

401. INTRODUCTION TO POLITICAL SCIENCE

The nature of politics and political science, including its vocabulary and purpose. Attention to political institutions, thought, ideologies, and behavior, as well as behavior among levels of governments. Required of all majors in political science. 4 credits.

402. AMERICAN NATIONAL GOVERNMENT

The institutions and processes of national government in the United States, but including political behavior at the local and state levels. Required of all majors in political science, *except by waiver after successful completion of an examination* prepared and administered by the Department and successful completion of Political Science 531. 4 credits.

Political Thought (Courses numbered 500-519; 600-619; 700-719)

501. POLITICAL THOUGHT AND POLITICAL ACTION: INTRODUCTION TO POLITICAL PHILOSOPHY

An examination of the relationship between philosophy and politics. The course will consider the theoretical assumptions of political life, as reflected in the thought of Plato or Aristotle; Machiavelli; Hobbes or Locke; Rousseau or Nietzsche; Hegel or Marx. Attention will be given to illustrations of political movements, including the ideological attempt to combine theory and practice. Prerequisite for majors: 401 and 402 (or 531), and required of majors intending further study in this field. Not open to freshmen except by instructor's permission. 4 credits.

Intermediate and Advanced Courses in Political Thought. Prerequisite for majors: Political Science 501; for non-majors: a previous course in Political Science, or, with the consent of the instructor, successful completion of a course in a related field. 600-level courses not open to freshmen; 700-level courses not open to freshmen or sophomores.

600. CLASSICAL AND MEDIEVAL POLITICAL THOUGHT

The development of western political thought. Intensive study of Greek, Roman, and medieval thinkers, including Socrates, Plato, Aristotle, Cicero, St. Augustine, St. Thomas. 4 credits.

Political Science

601. POST-RENAISSANCE POLITICAL THOUGHT

The development of modern conceptions of politics, and the philosophical premises upon which those theories are based, as reflected in the work of major theorists from Machiavelli through Rousseau. 4 credits.

602. CONTEMPORARY POLITICAL THOUGHT AND IDEOLOGIES

Major thinkers from Hegel and Marx to the present, with emphasis on the genesis of contemporary ideologies. 4 credits.

***603. THE DEVELOPMENT OF AMERICAN POLITICAL THOUGHT**

The basis and development of American political thought, including the contributions of the Colonial experience, Puritanism, revolutionary theories, the constitutional debate, the slavery issue, the frontier mentality, and the emergence of an industrial society. 4 credits.

***621. LOGIC OF EMPIRICAL INQUIRY**

(See listing under Scope and Methods.) 4 credits.

700. POLITICAL THOUGHT AND CULTURE

The relation between man's artistic and social endeavors and forms and his political thought. Study of politics and literature through figures such as Aristophanes, Swift, Shakespeare, and contemporary writers. 4 credits.

701. THE SCIENTIFIC STUDY OF POLITICS: ITS PHILOSOPHICAL DEVELOPMENT

An analysis of scientific political science, considering formulations and criticisms of this approach. The course begins with Aristotle, and reviews the development of modern scientific method from Bacon to the present. 4 credits.

***702. IDEOLOGIES AND DISSENT IN AMERICA AND THE WEST**

Movements of commitment, dissent, and protest since the late nineteenth century, particularly attacks upon liberal theory and practice in America and Europe. 4 credits.

797, 798. SECTION 1: SEMINAR IN POLITICAL THOUGHT

Advanced treatment and individual research in Political Thought. Not open to freshmen, sophomores, or juniors. 4 credits.

Scope and Methods (Courses numbered 520-529; 620-629; 720-729)
Intermediate and Advanced Courses in Scope and Methods.

***621. LOGIC OF EMPIRICAL INQUIRY**

The empirical mode of procedure for analysis and explanation of political reality. Prerequisite for majors: 401 and 402 (or 531); for non-majors, consent of instructor. 4 credits.

***720. METHODS OF RESEARCH IN POLITICAL BEHAVIOR**

Methodology and techniques in evaluating political behavior, surveys, experimental designs, and basic data processing. Aspects of computer technology and political research. 4 credits.

701. SCIENTIFIC STUDY OF POLITICS: ITS PHILOSOPHICAL DEVELOPMENT

(See listing under Political Thought.) 4 credits.

732. THE PSYCHOLOGY OF POLITICAL BEHAVIOR

(See listing under American Politics.) 4 credits.

793. CONTEMPORARY POLITICAL ANALYSIS

Various forms of contemporary political analysis, with attention both to methods of empirical inquiry and explanation and to modes of justification. Intended for

advanced students; normally open to seniors and graduate students only, except upon permission of instructor. 4 credits.

American Politics (Courses numbered 530-549; 630-649; 730-749)

531. AMERICAN PUBLIC POLICY

Attention to major problems facing American policy-makers today, with emphasis on the processes by which institutions and groups resolve and deal with such issues as urban decline; crime, unemployment; civil rights. Prerequisite for majors: 401 and either 402 or successful completion of an examination (prepared and administered by the Department) dealing with the institutions of American government. Required of majors intending further study in American politics. 4 credits.

Intermediate and Advanced Courses in American Politics. Prerequisite for majors: Political Science 531. For non-majors, a previous course in Political Science, or, with consent of the instructor, successful completion of a related course in another field. 600-level courses not open to freshmen; 700-level courses not open to freshmen and sophomores.

630. STATE GOVERNMENT AND POLITICS

Comparative analysis of the environment and workings of American state politics. Attention to state legislatures, bureaucracies, interest-group influence, and problems of taxation. 4 credits.

631. LOCAL GOVERNMENT AND POLITICS

Theory, structure, and politics of American local government, including municipalities, counties, and special districts. Attention to community decision-making, political participation, and selected policy areas such as land-use control and taxation. 4 credits.

632. AMERICAN PRESIDENCY

Role and powers of the American presidency in domestic and foreign affairs. The president as administrator, policy-maker, and political leader. Executive-Congressional relations. 4 credits.

633. AMERICAN CONGRESS

Structure, powers, and decisional processes of the American Congress. Attention to committee structure, representational roles, legislative oversight and party cleavage. 4 credits.

634. POLITICAL PARTIES AND VOTING BEHAVIOR

Functions, organization, operation, and bases of electoral support of American political parties. 4 credits.

635. THE POLITICS OF CRIME AND JUSTICE

Criminal justice under various legal institutions. Contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the legal process. 4 credits.

636. SUPREME COURT AND THE JUDICIAL PROCESS

The Supreme Court as interpreter of law and arbiter among forces in American politics. 4 credits.

730. ADMINISTRATIVE PROCESS

The administrative and bureaucratic process in public life. Principal concepts of administration and the relationship of group behavior and policy development to the administrative process. 4 credits.

731. URBAN AND METROPOLITAN POLITICS

Planning and management of the urban community. Attention to intergovernmental relations, administrative functions, and general urban problems. 4 credits.

Political Science

- 732. PSYCHOLOGY OF POLITICAL BEHAVIOR**
Cultural, social, economic, and emotional forces molding the citizen's political activity. 4 credits.
- 733. INTERGOVERNMENTAL RELATIONS AND FEDERALISM**
Interrelationship of national, state, and local governments in the context of the American federal system. Patterns of regionalism, interstate cooperation and conflict, and the evolution of federal relations. 4 credits.
- *734. ELECTION PRACTICUM**
Analysis of the electoral process with field work in political campaigns. Not offered every year. Permission of instructor. 4 credits.
- *735. AMERICAN PLURALISM**
Analysis and critique of theories of American pluralism. Attention to the role of private power in American politics and alternative elitist models of decision making. 4 credits.
- 758. COMPARATIVE JUDICIAL PROCESS**
(See listing under Comparative Politics.) 4 credits.
- 759. COMPARATIVE LEGISLATIVE BEHAVIOR**
(See listing under Comparative Politics.) 4 credits.
- 797, 798. SECTION 2: SEMINAR IN AMERICAN POLITICS**
Advanced treatment and individual research in American Politics. Not open to freshmen, sophomores, or juniors. 4 credits.
- 797, 798. SECTION 6: SEMINAR IN PUBLIC ADMINISTRATION**
Advanced treatment, including opportunities for direct observation of governmental administration. Not open to freshmen, sophomores, or juniors. 4 credits.

Comparative Politics (Courses numbered 550-569; 660-669; 770-769)

- 551. COMPARATIVE POLITICS**
Introduces concepts, approaches, and problems of comparing political systems, using case studies from several modern foreign governments. This course deals not only with the varieties of contemporary comparative political analysis; but also with the wide varieties of political action and policy choice in the world today. Prerequisite for majors: Political Science 401 and 402 (or 531), and required of majors intending further study in comparative politics. Not open to freshmen except by permission of instructor. 4 credits.
- Intermediate and Advanced Courses in Comparative Politics.* Prerequisite for majors: Political Science 551. For non-majors: successful completion of a course in Political Science, or, with consent of the instructor, successful completion of another course in a related field or discipline. 600-level courses not open to freshmen; 700-level courses not open to freshmen and sophomores.
- *650. DEMOCRATIC SYSTEMS**
Major governments, including but not restricted to those in Western Europe, characterized by parliamentary and other forms of competitive politics. 4 credits.
- *651. DEVELOPED AND MODERN STATES**
Comparative political analysis of major "advanced" states characterized by industrialization and complex organization, with emphasis on but not restricted to such states as US, USSR, Japan, Germany, France. 4 credits.

652. DICTATORSHIP AND TOTALITARIANISM

Contemporary and other twentieth century governments characterized by executive dominance and other forms of non-competitive politics, with special emphasis on Nazi Germany and the Soviet Union under Stalin. 4 credits.

***653. DEVELOPING NATIONS**

Comparative analysis of politics in selected modernizing states in Africa, Latin America, Asia, Middle East. 4 credits.

Area and Functional Studies in Comparative Politics. Courses listed below, in two groups, are open (upon consent of the instructor) to seniors and juniors who have completed one or more courses in foreign-area studies in another department, and to seniors and juniors majoring in Political Science who have successfully completed Political Science 551. Majors are advised to select courses in approximately equal proportion from Group A and Group B.

A. AREA STUDIES

***750. POLITICS IN WEST EUROPE**

Examination of the politics of major continental powers. 4 credits.

***751. MAJOR COMMONWEALTH STATES: BRITAIN, CANADA, AUSTRALIA**

Comparison and analysis of major governments influenced by the British parliamentary system, but with special emphasis on the nature of federal systems, and ethnic diversity as illustrated, for example, with regard to French Canada, 4 credits.

752. POLITICS IN THE USSR AND EAST EUROPE

Comparative analysis of the background, structure, and underlying issues of the political systems of the Soviet Union and selected East European states. Includes examination of ideological bases and political history as well as contemporary trends. 4 credits.

753. MAJOR GOVERNMENTS OF EAST ASIA: CHINA AND JAPAN

Political development of China and Japan, with attention to the historical context and to related economic, social, and cultural variables. Where appropriate the two countries will be considered in comparative perspective, and their relations with each other and with the United States will be considered as factors in their internal affairs. 4 credits.

***755. GOVERNMENT AND POLITICS IN SOUTHEAST ASIA**

4 credits.

797, 798. SECTION 3: SEMINAR IN COMPARATIVE POLITICS OF NATIONS

Advanced treatment and individual research on the politics of one of the nations or regions of the world (e.g., France, China, Germany, USSR, Southeast Asia). Not open to freshmen, sophomores, or juniors. 4 credits.

B. PROBLEMS IN COMPARATIVE POLITICS AND DEVELOPMENT

***757. POLITICAL DEVELOPMENT AND POLITICAL DECAY**

Issues and concepts of political change. 4 credits.

***758. COMPARATIVE JUDICIAL PROCESSES**

Comparative court systems and their relationships to political life; political, social, and structural influences on judicial behavior; law and human behavior. 4 credits.

***759. COMPARATIVE LEGISLATIVE BEHAVIOR**

Role, organization, operation, and conduct of legislatures in various national political systems. 4 credits.

Political Science

*760. COMPARATIVE COMMUNIST SYSTEMS

Use of comparative methods in analysis of selected aspects of communist systems. Emphasis on interest groupings, elites, and decision-making. Attention to political behavior within communist international organizations and to intraparty distinctions between ruling and non-ruling communist parties. 4 credits.

*761. POLITICAL SOCIOLOGY

The impact of social structure and change upon political behavior, including elite/mass relationships, integration and instability. Attention to major empirical findings and theoretical contributions, from Marx and Weber to the present. 4 credits.

*797, 798. SECTION 4: SEMINAR IN COMPARATIVE POLITICS

Advanced treatment and individual research on theoretical problems and aspects of comparative politics, normally in the fields of administration, foreign policy, political parties, and governmental institutions. Not open to freshmen, sophomores or juniors. 4 credits.

RELATED COURSES

779. FOREIGN POLICIES IN EUROPE

(See International Politics.) 4 credits.

780. FOREIGN POLICIES OF THE USSR AND SOVIET BLOC

(See International Politics.) 4 credits.

781. INTERNATIONAL POLITICS OF EAST ASIA

(See International Politics.) 4 credits.

International Politics

571. INTRODUCTION TO INTERNATIONAL POLITICS

Key concepts associated with the causes of international conflict and efforts to prevent conflict and war. The development of a system of nations, behavior of nations, and issues that relate to that behavior in the contemporary world. Prerequisite for majors: Political Science 401 and 402 (or 531), and required of political science majors intending further study in international politics. Not open to freshmen except by permission of instructor. 4 credits.

Intermediate and Advanced Courses in International Politics. Prerequisite for majors: Political Science 571; for non-majors: a previous course in Political Science, or, with consent of the instructor, successful completion of a course in a related field. 600-level courses not open to freshmen; 700-level courses not open to freshmen and sophomores.

672. FOREIGN POLICIES OF MAJOR POWERS

The interaction of national policies, with emphasis on a comparison of major powers' national interest and objectives. Includes, among other techniques, the use of inter-nation simulation as a means to better comprehend national behavior and the international system. A moderate fee may be assessed in connection with the use of special materials connected with simulation exercises. 4 credits.

673. THE FOREIGN POLICY PROCESS OF THE UNITED STATES

The institutions and interests that shape and administer American foreign policy, including their historical development, with special attention to the President and his National Security Council; the Congress; and the major agencies involved both here and abroad. 4 credits. (Also fulfills AFROTC requirements.)

674. CONTEMPORARY ISSUES IN AMERICAN FOREIGN POLICY AND WORLD POLITICS

The problems, and the policies to meet them, in which the United States is involved with other major powers. 4 credits.

775. THEORIES OF INTERNATIONAL POLITICS AND INTEGRATION

Examination of general explanations for the behavior of nations and of the theory and practice of supra-national integration. The development of theories of international peace and security, with attention to the concept of linkage between domestic and international politics. Concepts and practices of arms limitation and conflict resolution and of integration and community-building at the international level. 4 credits.

***776. STRATEGY AND NATIONAL SECURITY POLICY**

Defense and deterrence considerations among the United States and other major powers, including consideration of the levels of armed violence affecting international politics, changes in the nature of war, including impact of modern weapons systems and corollary arms limitation problems. Attention also given to the development of defense policy and the role of armed force establishments in shaping defense policy in the US and elsewhere. 4 credits. (Also fulfills AFROTC requirements.)

***777. INTERNATIONAL LAW**

Formalized processes for regularizing state behavior, as reflected especially in the development of norms based on custom, precedent, and formal institutions, as in treaties and cases. Attention given to arms reduction and limitation arrangements; inspection; and other formal procedures designed to preserve peace. 4 credits.

***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 credits.

***779. FOREIGN POLICIES IN EUROPE**

The interaction of major European states, with attention to East-West relations, security alliances, forms of economic and political cooperation, and the impact of domestic change and superpower relationships on international politics in Europe. 4 credits.

780. FOREIGN POLICIES OF THE USSR AND THE SOVIET BLOC

The development of Soviet foreign policy and strategy in its national and European coalition context, with attention to Soviet-American and Sino-Soviet relations. 4 credits.

781. INTERNATIONAL POLITICS OF EAST ASIA

Foreign and defense policies of the major East Asian states, with emphasis on Japan, China, and selected Southeast Asian nations. Special attention to the issues and problems where the separate states' interests interact. 4 credits.

797, 798. SECTION 5: SEMINAR IN INTERNATIONAL POLITICS

Small-group discussion, including individual research, on problems in international politics, with emphasis on developments in theory. Not open to freshmen, sophomores, or juniors. 4 credits.

Portuguese

(See Spanish and Classics)

Psychology

Psychology (76)

Chairman: Gordon A. Haaland

PROFESSORS: Herbert A. Carroll, *emeritus*; George M. Haslerud, *emeritus*; Raymond L. Erickson, Eugene S. Mills, John A. Nevin, Ronald E. Shor, Robert I. Watson

ASSOCIATE PROFESSORS: Lance K. Canon, Robert G. Congdon, Rand B. Evans, Peter S. Fernald, G. Alfred Forsyth, Gordon A. Haaland, Earl C. Hagstrom

ADJUNCT ASSOCIATE PROFESSOR: Kirk E. Farnsworth

ASSISTANT PROFESSORS: Gregory J. Bertsch, James R. Davis, Leslie A. Fox, John E. Limber, David I. Schickedanz, Marty J. Schmidt, Stephen J. Weber, Daniel C. Williams

The listings below are general descriptions of the courses. The student is 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 prior to and during the pre-registration period. All courses offered each year unless otherwise noted. All general courses and basic major courses offered every semester.

General Courses

401 (401). INTRODUCTION TO PSYCHOLOGY

Psychology as a behavioral science with emphasis on both its theoretical and applied aspects. This is a prerequisite for all other courses in the department, except with permission of the department chairman. To actively experience the nature of the psychological research, the student is expected to serve as a subject. 4 credits.

511. INTRODUCTION TO PERCEPTION, LANGUAGE, AND THOUGHT

An introduction to human mental processes. Topics include visual and auditory perception, language and communication, thinking, problem solving, and creativity. The emphasis will be on the interrelationships among these areas of human psychology. Prerequisite: Psychology 401. 4 credits.

521. PRINCIPLES OF LEARNING AND THEIR APPLICATION

Designed for non-majors or for beginning majors in psychology. The basic principles that have been developed in the experimental study of human and animal learning, their theoretical integration, and their application to the understanding of human behavior. A critical appraisal of procedures for changing behavior in practical situations, as they relate to theories of learning. Prerequisite: Psychology 401. 4 credits.

531. PSYCHOBIOLOGY

The idea of man as a biological machine; the advantages and limits of such an approach for the study of behavior. Perception, language and thought, learning and memory, and emotions from the point of view of physiology. An attempt will be made to "explain" these behaviors by examining what is going on inside the organism. No previous biology course will be assumed. Prerequisite: Psychology 401. 4 credits.

561. CLINICAL APPROACHES TO HUMAN BEHAVIOR

The dynamics of normal and abnormal behavior from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. The emphasis is on human behavior and attention is given to clinical procedures of evaluating and modifying behavior. No training in the use of clinical techniques is given; emphasis is on familiarizing the student with the nature of the clinical approach. Prerequisite: Psychology 401. 4 credits.

581. THE STUDY OF CHILD BEHAVIOR

The developing child in the context of the society in which he lives. Specific influences on the process of development (conception through adolescence) and current problems in the area of development. Family and social environment, the learning process, media for children, personality development, exceptional children, and problems and issues of behavior (e.g., aggression, creativity, and discipline). Prerequisite: Psychology 401. 4 credits.

Major Courses

601. STATISTICS AND METHODOLOGY IN PSYCHOLOGY

Introduction to the uses of statistical analysis and experimental methodology in psychological research. The basic statistical and procedural considerations involved in answering questions in psychological research. Substantive problems are emphasized as illustrations of typical applications. Prerequisite: Psychology 401. Required of all undergraduate majors. 4 credits.

602. EXPERIMENTAL PSYCHOLOGY

The application of experimental methods to a variety of psychological phenomena with emphasis on the principles of experimental design and methods of data analysis. In addition to participating in and writing up a sequence of basic laboratory experiments, each student will be responsible for conceiving, conducting, and reporting an original experiment. Prerequisite: Psychology 601. 5 credits.

605. TESTS AND MEASUREMENT

Testing in the areas of intelligence, creativity, achievement, interests, and personality. Principles of test construction and evaluation and the relation of tests and measurements to psychological theory, research, and practice. Prerequisite: Psychology 601. 4 credits.

621. LEARNING AND MOTIVATION

The roles of learning and motivation in relation to contemporary theories of behavior and integrated with other areas of psychology. Theory, research methods, and applications. The major concepts and most recent research findings in the areas of learning and motivation are discussed. Prerequisite: Psychology 401. 4 credits.

651. PSYCHOLOGY OF PERSONALITY

Major theories of personality regarding questions of the acquisition, maintenance, and modification of individual behavior. Relevant research and the nature of theorizing. Prerequisite: Psychology 401. 4 credits.

652. SOCIAL PSYCHOLOGY

The behavior of individuals as it is affected by the behavior of other individuals, groups, and society. Attitude change and social influence, conformity, social interaction, and research. Other types of data are regularly introduced. Prerequisite: Psychology 401. 4 credits.

702. ADVANCED STATISTICS AND RESEARCH METHODOLOGY

Design, analysis, and interpretation of psychological experiments. Within the context of published or hypothetical research, topics such as repeated measures designs, trend analyses, nonparametric analyses, confounding, missing data, interpretation of interactions, and computer processing of data are examined. Intended primarily for Psychology majors planning to attend graduate school. Prerequisites: Psychology 601 and one 700-level psychology course. 4 credits.

704. RESEARCH METHODS IN SOCIAL PSYCHOLOGY

Major empirical procedures for investigating issues in social psychology. The primary features, assets and liabilities, and appropriate applications of a variety of research techniques, such as systematic observation, attitude measurement, survey methods, field and laboratory experiments, and nonreactive methods will be discussed.

Psychology

Philosophy of science, ethical responsibility, and artifact in research. Course participants will develop, conduct, and analyze original research projects on some significant problem in social psychology. Prerequisites: Psychology 601, 652. 4 credits.

711. SENSATION AND PERCEPTION

Sensory systems in processing information and experiencing objects and events in the world. Global theories of perception (e.g., Gibson, Helson, Brunswick) and specific perceptual processes are examined. Definition of the stimulus perceptual development, social perception, learning factors in perception, selective attention, pattern vision, color vision, auditory localization, scaling of sensory stimuli, brightness perception, psychophysical methods, signal detection theory, and sensory deprivation. Prerequisite: Psychology 601. 4 credits.

712. PSYCHOLOGY OF LANGUAGE

Modern theories of language structure, the functions of human language, various approaches to meaning, the relationship of language to other mental processes, language acquisition, indices of language development, speech perception, and reading. Prerequisite: Psychology 601 or permission of instructor. 4 credits.

713. COGNITION

An examination of complex mental activities. Consciousness and attention, concept formation, reasoning, problem solving, creative thinking, and the relationship between cognition and effective behavior. Prerequisite: Psychology 601. 4 credits.

722. HUMAN LEARNING

Experimental study of human learning and retention. Memory, transfer, verbal learning, perceptual learning, concept learning, and observational learning. Particular methodologies typical of research in each of these areas will be studied. Prerequisites: Psychology 601 and either 602 or 621. 4 credits.

723. APPLIED BEHAVIORAL ANALYSIS

The critical analysis of the literature on applications of learning theory to the solution of socially relevant problems. Appreciation of current research and theory in the field, rather than the development of skills in applied behavior analysis, constitute the goal of the course. Prerequisite: Psychology 602 or 621. 4 credits.

731. BRAIN AND BEHAVIOR

Relationships between the nervous system and behavior. The physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in man; the evolution of these functions in lower animals. Prerequisite: Psychology 601. 4 credits.

732. COMPARATIVE PSYCHOLOGY

Comparative methodologies in psychology; comparisons of the basic processes of sensation, motivations, learning, and social behavior in different species. Contemporary theories of behavior formulated by ethologists contrasted and compared with current theories in psychology. Prerequisite: Psychology 601. 4 credits.

754. ATTITUDES AND SOCIAL INFLUENCE

Theories of attitudes, the nature of attitudes, attitude measurement, and research and theory on conformity and leadership are examined as problems in interpersonal influence. Primary emphasis on recent psychological literature. Prerequisites: Psychology 601 and 652. 4 credits.

755. SOCIAL PSYCHOLOGY OF SOCIAL ISSUES

Important social problems such as prejudice, group conflict, overpopulation, war, and ecological problems. Specific social psychological processes are brought to bear to examine the nature of each problem and solutions that might be considered. Prerequisite: Psychology 601, 652. 4 credits.

756. ENVIRONMENTAL PSYCHOLOGY

The manner in which human behavior and experience is influenced and controlled by the physical environment. Three broad classes of environmental factors will be considered: the "built" environment (the impact of architectural constructions, planned communities, institutional design); the natural environment (landscape and wilderness use, orientation to outdoor recreational facilities); and the social environment (interpersonal nonverbal communication). Research and theory relevant to such topics as privacy, territoriality, crowding, urban stress, paralinguistics, person perception, and cultural differences in man's relationship to his environment. Prerequisites: Psychology 601, 652. 4 credits.

757. POLITICAL PSYCHOLOGY—VOTING BEHAVIOR

Psychological examination of voting behavior with particular emphasis on the New Hampshire preferential primary. Students shall be exposed to several contrasting analyses of voter decision-making with special focus on the relationship between public opinion and choice behavior. Students will participate in collecting and analyzing data from the primary. Development and practice of appropriate research skills. Prerequisites: Psychology 601, 652. 4 credits. (Offered spring 1976.)

761. ABNORMAL PSYCHOLOGY

Various kinds of disturbing behaviors in terms of: (1) historical developments; (2) viewpoints of etiology; (3) identifying and understanding disruptive behavior; and (4) diagnostic implications for treatment as a function of varying theoretical viewpoints. Prerequisite: Psychology 601. 4 credits.

762. COUNSELING

Consideration of some of the parameters of problems in daily living and analysis of a variety of individual, group, and institutional therapeutic interventions. In addition to therapeutic process and outcome, attention will be given to ethical considerations and professional and paraprofessional activities in a variety of work settings. Prerequisite: Psychology 601. 4 credits.

771. HISTORY OF PSYCHOLOGY

An opportunity for psychology majors to reassess, extend, and integrate knowledge of psychology within a historical perspective. Attention is given to antecedents in philosophy and the physical sciences and their relationship to the subsequent development of schools and systems of psychology. Contemporary thought and research. Prerequisite: Psychology 601. 4 credits.

781. DEVELOPMENTAL PSYCHOLOGY

Survey of current research and examination of major theories in the area of developmental psychology. Topics include: cognitive, personality, learning, and emotional development. Prerequisite: Psychology 601. 4 credits.

Special Courses

591. SPECIAL TOPICS

New or specialized courses are presented under this listing. Taught by different staff members each year. The instructor presents material in an area of psychology which is not normally covered in regular course offerings. Descriptions of course(s) to be taught under this listing will be on file in the Psychology offices during registration. Prerequisite: Psychology 401. 4 credits.

701. CONTEMPORARY TOPICS IN PSYCHOLOGY

A non-credit seminar focusing on topics of particular interest to students in psychology. Jointly organized by students and faculty to respond to requests of students. Prerequisite: Psychology 401. 0 credit.

Recreation and Parks

791. ADVANCED TOPICS

The instructor presents advanced material in an area in which he or she has developed specialized knowledge through research and study. Taught by different staff members each year. Students may repeat the course, but may not duplicate areas of specialization. Descriptions of courses to be taught under this listing will be on file in the Psychology offices during registration. Section 1 will be offered every semester as a seminar focusing on contemporary topics which signal new directions for psychology. An attempt will be made to broaden the scope of psychology by considering the limitations of the traditional questions asked by behavioral scientists and the methods they use and by exploring recent development in theory and method. Prerequisite: 16 credits of psychology or permission of instructor. 4 credits.

793. EXTERNSHIP

A supervised practicum experience in one of several cooperating mental health/rehabilitation facilities in New Hampshire. The purpose will be to gain meaningful work experience through applying knowledge learned in previous coursework and being a part of a working team in a way that is not possible in the classroom. Commitment includes a negotiated number of hours of work per week and participation in weekly on-site seminars. Supervision will be done by institutional personnel and by the instructor. Topics for the seminars will be determined by the work being done in the particular institution(s) involved. Prerequisite: Psychology 601, 762. 4 credits.

795. INDEPENDENT STUDY

Independent study with a faculty member. 1) Physiological, 2) Perception, 3) History and Theory, 4) Learning, 5) Social, 6) Cognition, 7) Statistics and Methods, 8) Experimental, 9) Personality, 10) Developmental, 11) Counseling, 12) Psychotherapy. Arrangements are to be made with a specific faculty member and enrollment is by permission only. 1-4 credits.

Recreation and Parks (41)

Chairman of Program: Gus C. Zaso

ASSOCIATE PROFESSOR: Gus C. Zaso

ASSISTANT PROFESSOR: Charles A. Lewis, Jr.

ADJUNCT ASSISTANT PROFESSOR: Wilbur F. LaPage

LECTURER: C. Michael O'Neil

VISITING LECTURER: Arthur H. Mittelstaedt, Jr.

400. THE IMPACT OF LEISURE IN CONTEMPORARY SOCIETY

An examination of major factors and trends which contribute to the emergence of a leisure-oriented society; significant problems which accompany the expansion of leisure opportunities; and relationships of leisure to the varieties of human activity. 4 credits.

454. ORGANIZED CAMPING

The organization and supervision of public, private, and commercial camps; program planning; selection of staff; and environmental-resources development. 4 credits.

455 (455). INTRODUCTION TO RECREATION AND PARK SERVICES

An integrated view of the leisure movement with a general introduction to the objectives and processes for portraying the role of recreation and parks in contemporary society. 4 credits.

Recreation and Parks

- 457. DYNAMICS OF LEADERSHIP AND PROGRAMMING**
A presentation and review of leadership theories and techniques and their relationship to principles of planning and evaluating leisure-oriented activities and programs. 4 credits.
- 560. INTRODUCTION TO COLLEGE UNION AND CAMPUS RECREATION SERVICES**
Management and operation of college unions and campus recreation resources as functions of service in higher education. Weekly laboratory experience is required as it relates to the administrative process. 4 credits.
- 564. FIELD WORK IN RECREATION AND PARK SERVICES**
To provide a learning experience in the practice of supervision, administration, and/or planning principles and techniques designed to test and to contribute to the theory of practice. Prerequisites: Recreation and Parks major and permission of instructor. 4-8 credits. Credit/Fail.
- 643. COMPARATIVE ENVIRONMENTAL EDUCATION**
A course that evaluates the interdependent relationships which exist between living things and the natural environments on a comparative basis. Resident laboratories will be held in natural learning areas such as the pond, salt marshes, the seashore, and the mountain forests. Emphasis will be placed on skills, techniques, and methods of ecosystem analysis with application to recreation and educational situations. 4 credits.
- 644. OUTDOOR EDUCATION**
The elements of organization, administration, and programming as they relate to the school curriculum and school camping. Concepts and processes will be illustrated and applied through outdoor laboratory experience. 4 credits.
- 661. RECREATION RESOURCES MANAGEMENT**
An examination of park practices as they relate to location, management, and maintenance. Special consideration will be given to small urban parks. 4 credits.
- 663. RECREATION AND PARK ADMINISTRATION**
A critical analysis of theoretical and practical methods utilized in attaining leisure-oriented public and private organizational goals. Prerequisite: permission of instructor. 4 credits.
- 667. RECREATION AND RESOURCE PLANNING**
An introduction to local, regional, and state planning concepts which relate to open space, parks, conservation, and preservation. 4 credits.
- 668. DESIGNING AND ENGINEERING FACILITIES AND AREAS FOR RECREATION**
The processes, principles, procedures, and practices involved in designing and engineering indoor and outdoor recreation facilities. 4 credits.
- 670 (670). INDEPENDENT STUDY IN LEISURE SERVICES**
Individual study and/or research relating to a broad range of leisure-oriented subjects. Prerequisites: senior classification and 2.5 cumulative grade point. 1-4 credits.
- 671. LEGAL AND FINANCIAL ASPECTS OF LEISURE SERVICES**
A review of the basic legal and financial aspects of leisure-oriented services with special attention directed toward establishing systems and departments, powers, operations, federal regulations, tort liabilities, and technical assistance programs. 4 credits.

Secretarial Studies

698. SEMINAR IN LEISURE PROBLEMS, TRENDS, AND RESEARCH

Preparation and presentation of position papers and research reviews which relate to problems, trends, and current practices. Prerequisite: senior classification or permission of instructor. 4 credits.

Reserve Officers Training Corps

(See Aerospace Studies and Military Science)

Resource Economics

(See Institute of Natural and Environmental Resources)

Russian

(See German and Russian)

Secretarial Studies (33)

ASSOCIATE PROFESSORS: Doris E. Tyrell, *emerita*; Myra L. Davis

401-402. SHORTHAND

Principles of Gregg shorthand with practice in transcribing from shorthand plates and class notes. Prerequisite: proficiency in typing or Secretarial 405 or 407 which must be taken in conjunction with this course. 4 credits.

405 (405). PERSONAL USE TYPEWRITING

Practice in acquiring correct typing techniques, arranging letters, outlines, notes, themes, bibliographies, and simple tabulations. Open to any student who does not know how to typewrite. 5 laboratories; 2 credits. Credit/Fail.

407-408. TYPEWRITING

Practice in acquiring correct typewriting techniques and in arranging letters, tabulations, and simple manuscripts. Prerequisite: permission of instructor. 5 laboratories; 2 credits. (See Secretarial 427.)

427. TYPEWRITING

Practice in acquiring correct typewriting techniques, and in arranging letters, tabulations, and simple manuscripts. This course is to be taken instead of Secretarial 407 by students who have had Secretarial 405 or the equivalent. Prerequisite: Secretarial 405 or equivalent and permission of instructor. 5 laboratories; 1 credit.

Social Science (81)

Courses coordinated by the Chairman of the Social Science Division,
College of Liberal Arts

681 (681). INTERNSHIPS

Field work in a department, agency, or institutional setting of the state or local government, or in a selected and approved private agency. The work will be under the supervision of the department or agency to which the student is appointed. The chairman of the department involved or his representative will be responsible for

Sociology and Anthropology

arranging the student's individual internship program. Prerequisite: internships for seniors only may be approved by the departments of History, Political Science, Psychology, or Sociology and Anthropology, or the Whittemore School of Business and Economics. Not more than 16 credits.

Sociology and Anthropology

Chairman: Richard E. Downs

PROFESSORS: Walter Buckley, Richard Dewey, Stuart Palmer, Solomon Poll, Murray A. Straus

ASSOCIATE PROFESSORS: Melvin T. Bobick, Thomas Burns, Peter Dodge, Richard E. Downs, Bud B. Khleif, Arnold S. Linsky, Melville Nielson, Frederick Samuels, Pauline Soukaris

ASSISTANT PROFESSORS: Loren Cobb, Michael E. Hayes, Stephen P. Reyna, Howard Shapiro

INSTRUCTORS: Charles E. Bolian, Rand B. Foster, Thomas J. Viccaro

Anthropology (85)

411. CULTURAL AND SOCIAL ANTHROPOLOGY

An introduction to Cultural and Social Anthropology, emphasizing their distinctive approaches to the study of human behavior and development as disciplines. Analysis of selected social institutions, forms of social structure, and language as they relate particularly to non-literate societies. A number of the latter will be studied in detail. 4 credits.

412. PHYSICAL ANTHROPOLOGY AND PREHISTORIC ARCHAEOLOGY

An introduction to man's physical evolution and his cultural prehistory as well as the techniques involved in both. 4 credits.

512. INTRODUCTION TO WORLD ETHNOGRAPHY

Primarily for anthropology majors and minors but also for those with a general interest in sociology or anthropology. Selected studies of peoples in the major ethnographic areas of the world. Particular attentions will be paid to historical and geographic factors involved in these areas, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Prerequisite: Anthropology 411 or equivalent, or permission of instructor. 4 credits.

514. METHOD AND THEORY IN ARCHAEOLOGY

Basic method and theory in archaeology; techniques used by the archaeologist in recovering and interpreting data; laboratory exercises to familiarize the student with ceramic and lithic analysis. Students learn to evaluate archaeological literature critically, using skills acquired in the course. Prerequisite for area courses in archaeology. Prerequisite: Anthropology 412 or permission of instructor. 1 2½-hour class per week. 4 credits.

614. ECONOMIC ANTHROPOLOGY

The economic organization of primitive and peasant societies, focusing on such problems as: social organization of production and distribution, economic surplus, concepts of property, markets, and development. Prerequisite: Anthropology 411 or permission of instructor. 4 credits.

Sociology and Anthropology

616. ANTHROPOLOGY OF RELIGION

Includes a survey of the major anthropological theories of religion, the analysis of religious beliefs as symbolic systems, and their interrelations with ritual and other social institutions. The religions of a number of societies will be examined in detail. Prerequisite: Anthropology 411 or consent of instructor. 4 credits.

618. POLITICAL ANTHROPOLOGY

A survey of decision-making processes with emphasis on the difference between systems of consensus as opposed to systems of centralized rule in pre-industrialized societies. Prerequisite: Anthropology 411 or permission of instructor. 4 credits.

620. ANTHROPOLOGICAL LINGUISTICS

An introduction to the nature of language and linguistic analysis. Topics covered will include: the analysis of speech events, the acquisition of language, expressive language, social structure and the speech community, language thought and world view, Anthropology 411 or permission of instructor. 4 credits.

731, 732. AREA STUDIES IN ARCHAEOLOGY

Courses in the archaeology of different areas of the world will be offered as staff is available and student needs dictate. (1) South America. An introduction to the archaeology of South America beginning with the earliest known remains and progressing up to the level of the various cultural groups which existed at the time of European contact. Particular emphasis will be placed on the changing relationship of culture and environment through time. Prerequisite: Anthropology 412 and 514 or permission of instructor.

747 (747). AREA STUDIES IN SOCIAL AND CULTURAL ANTHROPOLOGY

(1) South America, (2) Meso America, (3) North America, (4) Oceania, (5) Southeast Asia, (6) Africa, (7) Other. The societies and cultures of major world areas, offered as staff is available and student needs dictate. Ecological, historical, and socio-cultural factors which have influenced their development in each case are considered. Particular theoretical or methodological themes to be stressed will vary according to instructors. Prerequisite: Anthropology 411 or permission of instructor. 4 credits.

752. SOCIAL PROBLEMS IN MODERN AFRICA

Urban and rural adjustments (acculturation) of tribal systems in Africa (below the Sahara) to the twentieth century. This course is a follow-up of Anthropology 747 (6) although the latter is not a prerequisite. Prerequisite: Anthropology 411 or Sociology 400. A background in sociological theory and methods is desirable. 4 credits.

775. ANTHROPOLOGICAL THEORY

An examination of the major theoretical approaches in anthropology viewed in historical perspective. Prerequisite: Anthropology 411 or permission of instructor. 4 credits.

785. SENIOR THESIS

Independent work in the library or field; required of each major. Students should contact individual members of the Anthropology staff to obtain approval and arrange supervision for this work. Should be taken during the next-to-last semester before graduation. 4 credits.

795, 796. READING AND RESEARCH IN ANTHROPOLOGY

A student prepared by training and experience to do independent work under the guidance of an instructor may register for one or more of the following sections: (1) cultural/social anthropology, (2) anthropological linguistics, (3) prehistoric archaeology, (4) physical anthropology. Prerequisite: 12 hours of anthropology and permission of instructor. Variable credit.

Social Service (86)

522. INTRODUCTION TO SOCIAL WELFARE

A general overview of social welfare: a historical analysis; the study of contemporary social welfare services to include social insurance, public assistance, child welfare, and poverty programs. Correlated to course content will be observational experiences at nearby community agencies. Required for Social Service majors. It is recommended that majors take this course during their sophomore year. Prerequisite: permission of instructor for non-majors. 4 credits.

(622). SOCIAL WORK PRACTICE

Study of the methods approach to social work practice with emphasis given to basic concepts, principles, and techniques of social casework, social group work, and community organization. Required for Social Service majors. Prerequisite: Social Service 522 and permission of instructor for non-majors. 4 credits.

631. SOCIAL WELFARE FIELD EXPERIENCE

To give the student an understanding of social welfare through observation and participation. Social Service majors will be placed in a social welfare setting for a minimum of 30 full days. This field work may be done either during the summer following the junior year or during the first semester of the senior year; arrangements will be made on an individual basis between faculty adviser and student. Weekly seminar sessions constitute the classroom work of the course. Prerequisite: Social Service 522, 622 and permission of instructor. Does not count for major credit in Sociology. 4 or 8 credits.

632. CURRENT ISSUES IN SOCIAL WORK

Seminar for senior social service majors. Study of several current issues in social work. Weekly seminar sessions focused on a specific issue, such as national health insurance, public welfare reform, advocacy, child abuse and neglect, etc. constitute the classroom work of the course. Prerequisite: Social Service 631 or permission of the instructor. 4 credits.

795, 796. READING AND RESEARCH IN SOCIAL SERVICE

A student prepared by training and experience to do independent work under the guidance of an instructor may register for this course. Prerequisite: 12 hours of Social Service, sociology, or anthropology, and permission of instructor. Variable credit.

Sociology (82)

400. INTRODUCTORY SOCIOLOGY

Man's social and cultural relationships as revealed in his customs and institutions. Social theory, methods and techniques of research, and current research findings. A section using a laboratory-problem method of instruction is offered from time to time. Students interested in such a research experience should register for the section identified as "Laboratory" in the Time-Room Schedule. 4 credits.

500. SOCIAL PSYCHOLOGY

Individual actions, attitudes, ideas, and perceptions as influenced by socio-cultural environments. Individual-cultural relations in education, religion, economics, aesthetics, ethics, and deviant behavior. 4 credits.

520. THE FAMILY

An anthropological and institutional approach comparing customs and organizations in several societies. Not open to freshmen. A section using a laboratory-problem method of instruction is offered from time to time. Students interested in such a research experience should register for the section identified as "Laboratory" in the Time-Room Schedule. 4 credits.

Sociology and Anthropology

530. RACE AND ETHNIC RELATIONS

Majority-minority group relations. Special attention is given to the nature and results of Black-White and ethnic group relations in the United States. Not open to freshmen. Prerequisite: Sociology 400. 4 credits.

540. SOCIAL PROBLEMS

How culture in the form of customs and institutions is related to such human problems as crime and delinquency, alcoholism, physical and mental disease, sex pathologies, poverty, old age, broken families, and racial and religious prejudices. Especially for students who do not intend to major in sociology. Prerequisite: Sociology 400. 4 credits.

560. RURAL-URBAN SOCIOLOGY

Application of sociological principles to the study of customs and institutions in rural and urban settings. Differentiation between influences upon community organization of culture on the one hand and population size and density on the other. Prerequisite: Sociology 400. 4 credits.

600. SOCIAL INSTITUTIONS

Involves examining the nature of institutions as distinct from other societal forms, and the relationships among such institutions as education, religion, economy, government, paedotrophic and inter-sex practices, art, and recreation. A cross-cultural approach will be emphasized. Prerequisites: junior standing, six hours of sociology, declaration of sociology as major, or permission of instructor. 4 credits.

601. METHODS OF SOCIAL RESEARCH

Cross-sectional and longitudinal survey design; direct and indirect measurement techniques; design of field and laboratory experiments; special topics. Prerequisite: major in sociology or social service or permission of instructor. 4 credits.

602. STATISTICS

Elementary applied statistical techniques; descriptive statistics, cross-tabulation, correlation, probability, hypothesis testing, analysis of variance. 4 credits.

611. HISTORY OF SOCIAL THEORY

An examination of the background and early formulation of sociological theory. Consideration will be given to the writings of classical social thinkers, Descartes, Comte, and Max Weber, among others. 4 credits.

612. CONTEMPORARY SOCIOLOGICAL THEORY

An exposition of the major schools of contemporary sociological theory: functionalism, "verstehen" sociology, symbolic interactionism, reform sociology, neopositivism, and formal theory construction. 4 credits.

629. SMALL GROUPS

Interaction among individuals in small groups and between small groups is examined on the levels of perception, attitude, and behavior. Analytical techniques are applied. A prior course in social psychology is recommended. 4 credits.

695, 696. HONORS SEMINAR

Students work individually on a problem selected by the department member in charge of the seminar. A number of projects are assigned in which emphasis is placed upon the tools of academic research and upon oral and written reports. 4 credits.

703. CRIMINOLOGY

The scientific study and control of crime. The following are considered: indexes, rates, and theories of crime and delinquency, police, courts, probation, prison, and parole. 4 credits.

Sociology and Anthropology

720. CURRENT DEVELOPMENTS IN SOCIOLOGY OF THE FAMILY

The theoretical and empirical research on specific aspects of the family. A different topic will be selected each semester to reflect issues of current importance, for example: stratification and the family, intra-family communication, power structure of the family, kinship in modern societies. In addition to critical review of the literature, a class or individual research project will usually be carried out. Prerequisite: 6 credits of sociology, Sociology 520 recommended. 4 credits.

721. FAMILY INTERACTION

Relationships of family members to one another and the influence of family interaction on human behavior. The interactionist and role approach is used. Research which relates to scientific knowledge of family interaction is analyzed. Prerequisites: 8 credits in sociology and/or psychology; Sociology 500 recommended. 4 credits.

735. COMPLEX ORGANIZATIONS

Analysis of the structure and dynamics of complex, formal organizations (business, military, political and governmental, educational). Emphasis on the construction of theory to account for the findings of empirical studies, both historical and comparative. Special problems treated in the course: power and social control in formal systems; organizational processes, performances, and effectiveness; impact of complex, formal organizations on persons and societies. Prerequisite: permission of the instructor. 4 credits.

740. CULTURE CHANGE

Various types of society, leading to the development of a theory of culture change. Descriptive studies of institutional as well as theoretical materials selected from the writing of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. Prerequisite: Sociology 400. 4 credits.

741. SOCIAL CHANGE AND SOCIETAL DEVELOPMENT

Comparative, interdisciplinary approach to the study of social change. The course focuses on the interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prerequisite: permission of instructor, Sociology 740 recommended. 4 credits.

745. SOCIAL STRATIFICATION

Nature, functions, patterns, and effects of social stratification. Social mobility. The social class system in the United States. Prerequisite: Sociology 400. 4 credits.

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. Prerequisite: permission of instructor. 4 credits.

761. POPULATION DYNAMICS

Examination of 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. Emphasis is on the interrelationship of population and society. 4 credits.

770. CULTURE, PERSONALITY, AND SOCIETY

A cross-cultural view of the development of personality as emergent from the matrix of genetic, situational, and sociocultural determinants; and an analysis of the dynamic interplay of sociocultural and psychological behavior system. Prerequisite: permission of instructor. 4 credits.

Spanish and Classics

780. SOCIAL CONFLICT

The nature of social conflict, especially war. The setting and initiation of conflict, its dynamics, and the factors affecting its course and outcome. Prerequisite: permission of instructor. 4 credits.

785. THE STUDY OF WORK

This course is centered on the assumption that to understand society, one needs to understand the structure of work. Case studies of high-status and low-status occupations are used as clues to a larger perspective—an awareness of social processes and interrelationships in the social structure. The student is encouraged to study occupations in an ethnographic manner. Graduate students may enroll only with permission of instructor. 4 credits.

790. APPLIED SOCIOLOGY

The practical application of sociological research including: (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 of his choice and write a paper covering the above issues. Students will be involved in applied projects where possible. Prerequisite: Sociology 601. 4 credits.

795, 796. READING AND RESEARCH IN SOCIOLOGY

A student prepared by training and experience to do independent work under the guidance of an instructor may register for one or more of the following sections: (1) communications, (2) criminology, (3) culture change, (4) culture and personality, (5) deviant behavior, (6) family, (7) population, (8) rural urban, (9) social control, (10) social differentiation, (11) social movements, (12) social psychology, (13) social research, (14) social theory. Prerequisite: 12 hours of sociology and permission of instructor. Variable credit.

Soil and Water Science

(See Institute of Natural and Environmental Resources)

Spanish and Classics

Chairman: John C. Rouman

PROFESSORS: John S. Walsh, *emeritus*; R. Alberto Casas, Warren H. Held, Charles H. Leighton

ASSOCIATE PROFESSORS: Richard J. Callan, John C. Rouman

ASSISTANT PROFESSORS: Richard V. Desrosiers, F. William Forbes, Lois Grossman

LECTURER: Barbara Wing

ASSISTANT CHAIRMAN FOR SPANISH: F. William Forbes

Classics (78)

511-512. GREEK AND LATIN LITERATURE IN TRANSLATION

A survey of Greek and Latin literature through which the student will be made aware of the dimensions of the ancient Greco-Roman civilization from which so much of our contemporary culture derives. Primarily for the student unprepared to read works in the original Greek and Latin but desiring acquaintance with the subject matter. A background course for majors in such subjects as English, history, Latin,

Greek, and the modern languages and literatures. Open to freshmen. 3 recitations; 4 credits.

595, 596. TOPICS IN CLASSICS

The introduction and elementary study of the following fields either related to the linguistic study of Latin and Greek or relevant to Greco-Roman culture and history. Primarily designed for students unprepared to read Latin and Greek. 2 or 4 credits.

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|--|---|
| 1. Classical Mythology | 5. Hellenic Institutions |
| 2. Greek and Latin Origins of Medical Terms | 6. Roman Institutions |
| 3. Greek and Latin Origins of Legal Terms | 7. Classical Backgrounds of Modern Literature |
| 4. Greek and Latin Origins within the English Language | 8. Sanskrit |

605. INTRODUCTION TO LINGUISTICS

A survey of the entire field of linguistics for those interested in learning about the character of languages. Subjects to be included are comparative linguistics, a short history of linguistics, phonetics, phonemics, language families, types of grammars, methods of writing, etc. No prerequisite but some language training is desirable. 3 recitations; 4 credits.

621-622. MASTERPIECES OF GRECO-ROMAN CULTURE IN TRANSLATION

A more advanced study of the writings of the classical civilizations of Greece and Rome. Designed for students who have had some preparation in classical studies and are seeking a deeper acquaintance with the field. A background course for majors in such subjects as English, history, Latin, Greek, or the modern languages and literatures. Prerequisite: permission of instructor. Not open to freshmen. 3 recitations; 4 credits.

695-696. HONORS WORK IN CLASSICS

For seniors writing a research paper in the honors program in classics. Prerequisite: permission of instructor. 2 or 4 credits.

Greek (79)

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 the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY GREEK

Grammar, simple composition, and translation. (May not be taken for credit by students who had two or more years of Greek in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.) 5 recitations; 4 credits.

503-504. INTERMEDIATE GREEK

Selected readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prerequisite: Greek 402. 3 recitations; 4 credits.

601-602. GREEK PROSE COMPOSITION

A review of Attic Greek grammar; a study of Greek prose style; translation of English into Greek. Prerequisite: permission of instructor. 3 recitations; 4 credits.

751-752. HOMER AND THE ARCHAIC PERIOD

Selected readings from the "Iliad," the "Odyssey," the Homeric Hymns, Hesiod, Pindar, and the Lyric Poets. Prerequisite: permission of instructor. 3 recitations; 4 credits.

Spanish and Classics

753-754. ATHENIAN HISTORIANS

Selected readings from Herodotus, Thucydides, and Xenophon. Prerequisite: permission of instructor. 3 recitations; 4 credits.

755-756. ATHENIAN DRAMA

Selected readings from Aeschylus, Sophocles, Euripides, Aristophanes, and Menander. Prerequisite: permission of instructor. 3 recitations; 4 credits.

757-758. ATHENIAN PHILOSOPHY AND ORATORY

Selected readings from Plato, Aristotle, Lysias, Demosthenes, and Isocrates. Prerequisite: permission of instructor. 3 recitations; 4 credits.

795-796. SPECIAL STUDIES IN GREEK

Prerequisite: permission of instructor, 3 recitations; 4 credits. Examples of topics that may be selected by instructor and student in conference are:

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| 1. Pre-Socratic Philosophers | 12. Advanced Greek Composition |
| 2. Hellenistic Greek Authors | 13. Introduction to Classical Scholarship |
| 3. Theocritus | 14. Greek Epigraphy |
| 4. Polybius | 15. Greek Dialects |
| 5. Greek Authors of the Roman Empire | 16. Comparative Grammar of Greek and Latin |
| 6. Plutarch | 17. Homer: A Linguistic Analysis |
| 7. Septuagint | 18. Greek Institutions |
| 8. New Testament | 19. Palaeography and Textual Criticism |
| 9. Greek Church Fathers | |
| 10. Byzantine Authors | |
| 11. Spoken Greek | |

Latin (80)

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 the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY LATIN

Elements of grammar, reading of simple prose. This course cannot be counted for major credits. (May not be taken for credit by students who had two or more years of Latin in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.) 5 recitations; 4 credits.

501. INTERMEDIATE LATIN

Similar to Latin 503 (below), but for students continuing from Latin 402 and students whose preparation does not qualify them for Latin 503. Beginning with an intensive review of Latin grammar and vocabulary, to be followed by readings in prose and poetry, this course prepares students for Latin 504. Completion of Latin 501 will fulfill the foreign language requirement for the B.A. degree. 3 recitations; 4 credits.

503-504. INTERMEDIATE LATIN

Review. Selected readings from Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prerequisite: Latin 402 or equivalent. 3 recitations; 4 credits.

601-602. LATIN PROSE COMPOSITION

A review of Latin grammar; a study of Latin prose style; translation of English into Latin. Prerequisite: permission of instructor. 3 recitations; 4 credits.

751-752. CICERO AND THE ROMAN REPUBLIC

Prerequisite: permission of instructor. 3 recitations; 4 credits.

753-754. ROMAN HISTORIANS

Selected readings from Livy, Sallust, and Tacitus. Prerequisite: permission of instructor. 3 recitations; 4 credits.

755-756. VERGIL

Prerequisite: permission of instructor. 3 recitations; 4 credits.

757-758. HORACE

Prerequisite: permission of instructor. 3 recitations; 4 credits.

759-760. CATULLUS AND MARTIAL

Prerequisite: permission of instructor. 3 recitations; 4 credits.

761-762. OVID AND THE ELEGIAC POETS

Prerequisite: permission of instructor. 3 recitations; 4 credits.

763-764. PLINY AND STATIUS

Prerequisite: permission of instructor. 3 recitations; 4 credits.

791. METHODS OF FOREIGN LANGUAGE TEACHING

An interdepartmental course. A critical study of the objectives, methods, and techniques used in teaching Spanish, French, German, and Latin at all levels from elementary through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of the instructor. (Same as French 791, German 791, and Spanish 791). 4 credits.

795-796. SPECIAL STUDIES IN LATIN

Prerequisite: permission of instructor. 3 recitations; 4 credits. Examples of topics that may be selected by instructor and student in conference are:

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| 1. Minor Authors of the Republic | 13. Tacitus |
| 2. Plautus | 14. Suetonius |
| 3. Terence | 15. Latin Church Fathers |
| 4. Lucretius | 16. Medieval Latin |
| 5. Caesar | 17. Advanced Latin Composition |
| 6. Sallust | 18. Introduction to Classical Scholarship |
| 7. Minor Authors of the Empire | 19. Latin Epigraphy |
| 8. Ovid | 20. Italic Dialects |
| 9. Seneca | 21. Comparative Grammar of Greek and Latin |
| 10. Lucan | 22. Roman Law |
| 11. Quintilian | |
| 12. Persius and Juvenal | |

Spanish (77)

New students will be assigned to the proper course on the basis of their scores on the College Board of Achievement test. Transfer credit will not be given for elementary level college courses in foreign languages if the student had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY SPANISH*

For students without previous knowledge of Spanish. 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. No credit toward a major. (May not be taken for credit by students who had two or more years of Spanish in secondary school.)

Spanish and Classics

Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.) 5 recitations; 2 laboratories; 4 credits.

403-404. ELEMENTARY PORTUGUESE

For students without previous knowledge of Portuguese. 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. No credit toward a major. (May not be taken for credit by students who had two or more years of Portuguese in secondary school. Students whose academic career has been interrupted for a significant period of time are urged to consult the department chairman in this matter.) 5 recitations; 2 laboratories; 4 credits.

501. INTERMEDIATE SPANISH*

Similar to Spanish 503, but for students continuing from Spanish 402 and students whose preparation does not qualify them for Spanish 503. Aural-oral practice, review of the basic structure, reading, and writing to develop an active command of the language. No credit toward a major. Students with a final grade of B or better may register for Spanish 504, with permission of instructor. Completion of 501 will fulfill the foreign language requirement for the B.A. degree. 5 recitations; laboratory attendance as required; 4 credits.

503-504. INTERMEDIATE SPANISH*

Intensive and extensive reading of complete texts of intrinsic literary and intellectual worth, formal review of the structure of the language, training in oral and written expression of ideas. Classroom discussion and papers in Spanish. Open by placement examination, and to students who have passed Spanish 402 with a grade of C. Students making a grade of A in Spanish 504 may take courses numbered 750 and above with the permission of the department. No credit toward the major for 503. 4 recitations; 1 laboratory; 4 credits.

507-508. INTERMEDIATE PORTUGUESE

A conversation/composition approach based on readings in contemporary Portuguese and Brazilian literature, especially theater which is closest to conventional language. A traditional grammar text will supplement the reading selections. 4 recitations; 1 laboratory; 4 credits.

526. SPANISH CIVILIZATION AND CULTURE

The most important historical, geographical, and artistic expressions of Spanish civilization which have formed the character of contemporary Spanish culture. Readings supplemented by slides, films, tapes, and records. Conducted in English. Required of majors. 4 credits.

621. SPANISH AND PORTUGUESE LITERATURE IN TRANSLATION

Major works by principal Spanish and Portuguese authors such as Camoens, Cervantes, Lope de Vega, Caleron, Eca de Queiroz, Unamuno, Ortega y Gasset, Garcia, Lorca, Casona, etc. Readings discussion, papers in English. Does not count for Spanish major. 4 credits.

622. SPANISH AMERICAN AND BRAZILIAN LITERATURE IN TRANSLATION

Major works by principal Spanish American and Brazilian authors such as Inca Garcilaso, Diaz del Castillo, Machado de Assis, Borges, Asturias, Neruda, E. Verissimo, Fuentes, Lenero, Guimaraes Rosa, and Jorge Amado. Readings, discussion, papers in English. Does not count toward Spanish major. 4 credits.

*No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language.

631, 632. ADVANCED SPANISH CONVERSATION AND COMPOSITION*

For students who wish to perfect their command of written and spoken Spanish, maintain aural-oral fluency in Spanish through intensive work in and out of the classroom; individual conferences, and laboratory sessions. Prerequisite: Spanish 503 or 504 or equivalent. 4 lectures; 2½-hour laboratory; 4 credits.

651-652. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT

Reading and analysis of significant works in Spanish literature and thought. Outside readings on the historical and cultural background of the works read. Papers and discussion in Spanish. Concurrent enrollment in 631, 632 recommended. This course or its equivalent is prerequisite to all higher courses in Spanish. Open to students who have achieved a grade of C or better in Spanish 504, and by placement examination. Conducted in Spanish. 4 credits.

665, 666. SPANISH AMERICAN LITERATURE

The main themes of Spanish-American literature studied in the works of its most representative authors and against the historical, social, and geographical background of the New World. Conducted in Spanish. Prerequisite: Spanish 504 or equivalent. Concurrent enrollment in Spanish 631, 632 recommended. 4 credits.

685-686. JUNIOR YEAR ABROAD

A program of studies at a Spanish or Spanish-American university for juniors who have completed their sophomore year at the University of New Hampshire and have passed Spanish 503-504 or the equivalent with a grade of B or better. The students chosen for the program will be required to take non-credit orientation meetings during the semester prior to departure. Interested students should consult with the directors of the program. Variable credit up to 32 credits. Not offered for graduate credit.

691, 692. READINGS IN CURRENT PERIODICALS

Advanced Spanish language practice in reading, speaking, and writing, based on current events as presented in contemporary magazines and newspapers of the Spanish-speaking world. Prerequisite: Spanish 632 or equivalent; may be taken concurrently. May be repeated for credit. One two-hour session per week; 2 credits.

701, 702. CATALAN

An introduction to Catalan grammar and literature. Semester I: study of the linguistic elements of Catalan, especially in its contrasts with other Romance languages, and basic readings in Catalan. Semester II: a survey of Catalan literature from the Middle Ages to the present. Prerequisite: completion of an intermediate-level course in Latin or one of the Romance languages, or permission of the instructor. This course does not satisfy the language requirement in the College of Liberal Arts. 4 credits. (Not offered 1974-75.)

752. DRAMA AND POETRY OF THE SIGLO DE ORO

The social background of the Baroque period. Readings of representative plays of Lope de Vega, Tirso de Molina, Calderon, and the poetry of Lope, Gongora, and Quevedo. Development of the prose of the period. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

754. CERVANTES

The development of Cervantes' literary art. Reading and discussion of selections from all the major works of Cervantes. Comprehensive study of the Quijote, its originality and significance; its antecedents; its religious, philosophical, and sociological aspects; and its artistic structure. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

Spanish and Classics

755. LITERATURE OF THE NINETEENTH CENTURY

Readings and discussion of works by significant writers of the nineteenth century in Spain, such as Larra, Espronceda, Becquer, Perez Galdos, and Blasco Ibanez, within the artistic, philosophical, and social environment of the century. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

757. THEATER AND POETRY OF THE TWENTIETH CENTURY

Critical analysis, reports, and discussion of the major developments in poetry and the drama of the twentieth century, beginning with the Generation of '98. Major writers to be studied will include Benavente, Machado, J. R. Jimenez, Garcia Lorca, Casona, Sastre, Buero Vallejo, Damaso Alonso, and Miguel Hernandez. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

758. SPANISH PROSE OF THE TWENTIETH CENTURY

Readings and discussion of the novels, short stories, and essays of such major writers of the twentieth century as Unamuno, Baroja, Menendez Pidal, Ortega y Gasset, Julian Marias, Aranguren, Perez de Ayala, Gironella, and Cela, as well as a survey of contemporary prose. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

760. UNAMUNO AND ORTEGA Y GASSET

Critical examination of the philosophical ideology and literary content of the major contributions of Miguel de Unamuno and Jose Ortega y Gasset. Prerequisite: Spanish 652 or 666 or equivalent, or permission of instructor. 4 credits. (Offered alternate years.)

771. SPANISH-AMERICAN DRAMA

From pre-Hispanic origins to the present, with emphasis on the modern playwrights of Mexico and Puerto Rico. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

772. SPANISH-AMERICAN NOVEL

Development of the genre from Romanticism to present-day writers, with special emphasis on contemporary trends and techniques. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

773. SPANISH-AMERICAN SHORT STORY

Development of the genre through study of representative authors, with stress on the twentieth century. Principles of interpretation. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

774. SPANISH-AMERICAN POETRY

Discussion of major poets from *modernismo* to the post-Vanguard movements: Dario, Huidobro, Mistral, Vallejo, Octavio Paz. Conducted in Spanish. Prerequisite: Spanish 652 or 666 or equivalent. 4 credits. (Offered alternate years.)

791. METHODS OF FOREIGN LANGUAGE TEACHING

An interdepartmental course. A critical study of the objectives, methods, and techniques used in teaching Spanish, French, German, and Latin at all levels from elementary through college. Discussion, demonstration, preparation of instructional materials, micro-teaching of the language skills. Prerequisite: permission of the instructor. (Same as French 791, German 791, and Latin 791.) 4 credits.

795, 796. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE

Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics that may be selected by instructor and student in conference are: (1) The history of the Spanish language, (2) Medieval

Spanish literature, (3) Spanish literature of the Renaissance, (4) Spanish literature of the Golden Age, (5) Spanish literature of the eighteenth and nineteenth centuries, (6) Spanish literature of the twentieth century (1898-1936), (7) Contemporary Spanish literature, (8) Spanish American literature of the sixteenth and seventeenth centuries, (9) Spanish American literature of the eighteenth and nineteenth centuries, (10) Spanish American literature of the twentieth century, (11) Contemporary Spanish American literature, (12) Structural and applied linguistics, (13) Spanish Literary Criticism, (14) Spanish-American Drama, (15) Latin America, (16) Linguistic Problems of Disabled Children, (17) Major Spanish-American Authors, (18) Spanish Poetry, (19) Galdos, (20) Archetype Latin American Literature, (21) Special Teaching Problems, (22) Spanish Civilization and Culture, (23) Latin-American Civilization and Culture, (24) Borges, (25) Spanish Theater. Prerequisite: permission of major supervisor. 2 or 4 credits.

Speech and Drama (83)

Chairman: David J. Magidson

PROFESSORS: Edmund A. Cortez, *emeritus*; Joseph D. Batcheller

ASSOCIATE PROFESSORS: John C. Edwards, David J. Magidson

ASSISTANT PROFESSORS: Raymond J. Bernier, Carol Lucha Burns, Gilbert B. Davenport, Richard D. Halley, Philip J. Sabatelli, Wilburn Sims

LECTURERS: Patricia Fleming, Susan Goldin, Sister M. Josselia Colbert

Communications

402 (402). COMMUNICATIONS I

An analysis of interpersonal and intrapersonal communications. Perspectives from the communications arts and sciences provide a broad theoretical approach. A major goal of the course is the student's awareness of himself and his role in the process of communication. Two lecture sessions and a 1½ hour laboratory-discussion section. Team taught; guest lecturers. Open to freshmen and sophomores. 4 credits.

403 (403). PUBLIC SPEAKING

A course in public speaking designed to sensitize speakers and listeners to the process of communication, including understanding and adapting to receivers, idea selection and development, message organization, and delivery. Some examination of nonverbal and other aspects of communication. 4 credits.

405 (405). DEBATE WORKSHOP

Basic principles of rational decision-making through argumentation. Students apply principles of argumentation in various debate formats. (May be repeated for credit.) 2 credits.

421. PROBLEMS IN HUMAN LISTENING BEHAVIOR

An analysis of listening processes, evaluation of means by which accuracy in listening can be improved, and the pitfalls which inhibit that accuracy. Practice in various theoretically different listening situations with experimental techniques, where applicable. (Offered in alternate years with Speech and Drama 630.) 4 credits.

Speech and Drama

501. ARGUMENTATION

The study of argument and advocacy as action on minds by means of discourse. Includes such concepts as presumptions, hierarchies, loci, presentation of data and the form of the discourse, ethical and logical duties of the advocate. Students examine arguments by politicians, lawyers, or others who advance propositions of fact, value, or policy. (Alternate years with Speech and Drama 656.) Prerequisite: Speech and Drama 405 or permission. 4 credits.

503. INTRODUCTION TO GROUP PROCESSES

An examination of communications behavior in small groups. Analysis of problem solving procedures, leadership, behavioral patterns, communications interaction patterns, and other variables related to improved effectiveness in small group participation. Prerequisite: Speech and Drama 402 or 403, or permission. 4 credits.

506. PERSUASION

An advanced public speaking course which focuses on the problems associated with influencing human behavior. Assignments are devised to encourage students to utilize principles acquired in the course; for example, persuasive messages on relevant issues, advertising materials and campaign content. Prerequisite: Speech and Drama 403 or permission. 4 credits.

555. INTRODUCTION TO MASS COMMUNICATIONS

The nature, development, and effects of mass communications on our society. Particular emphasis on television, both its effects and techniques of basic television productions. Students will have limited opportunities for studio work. Permission required. 4 credits.

572. GENERAL SEMANTICS

The study of the human symbol-using capacity and the effects of language on behavior. Ways in which symbols help create individual realities, reflect levels of personal judgement and adjustment, facilitate or hinder interpersonal communication. Application of course principles to verbal and nonverbal communication, contemporary social issues, etc. 4 credits.

608. ADVANCED SPEECH COMPOSITION

The development and application of rhetorical strategies in preparation and presentation of messages variously designed for oral delivery. The course operates as a writing and speaking workshop. Recommended: Speech and Drama 403. (Offered in alternate years with Speech and Drama 671.) 4 credits.

630. PSYCHOLOGY OF COMMUNICATION

Psychological principles of communication, such as concept-reference, vocal, visual, and verbal cues, as well as attention. (Offered in alternate years with Speech and Drama 421.) 4 credits.

656. PRINCIPLES OF RHETORICAL CRITICISM

A seminar designed to explore the roles and methods of rhetorical critics. Includes historical background to rhetorical-critical structures and processes including neo-Aristotelian criticism, Burkeian criticism, and other contemporary approaches. Provides a broad exposure to critical principles and practices in the area. (Offered alternate years with Speech and Drama 501.) Prerequisite: Speech and Drama 403 or permission. 4 credits.

671. CRITICISM OF CONTEMPORARY RHETORIC

Examines the broad range of contemporary rhetorical activities and applies rhetorical-critical systems and principles to the study of those activities. Examples can include: campaign rhetoric, agitative rhetoric, the rhetoric of religion, the rhetoric of militarism, the rhetoric of diplomacy, and the rhetoric of social movements. Course content variable. (Offered in alternate years with Speech and Drama 608.) Prerequisite: Speech and Drama 656 or permission. 4 credits.

673 (673). EXPERIMENTAL AND DESCRIPTIVE STUDIES IN ORAL COMMUNICATION

An examination of experimental and descriptive studies in the field of speech, with emphasis upon the theoretical contributions which have evolved from such investigations. 4 credits.

681. THEORIES OF LANGUAGE

A course which examines the nature, uses, and roles of language from varying perspectives and disciplines. Representative theorists include Carroll, Piaget, Sapir, Whorf, Vetter, Vygotsky, Wiener, Chomsky, Labov, Stewart, Ogden and Richards, Ruesch, and Sullivan. (Offered in alternate years with Speech and Drama 673.) Prerequisite: permission of the instructor or Speech and Drama 572 and 673. 4 credits.

695 (695). SPECIAL TOPICS IN COMMUNICATIONS

Individual or group projects to enrich or expand theoretical or applied experiences, primarily in the Communication option of the Department. By permission and arrangement with appropriate faculty. Variable credits of 2, 4, 6, or 8. (May be repeated to a maximum of 8 credits.)

750. WRITING FOR PERFORMANCE

See description in Theater offerings. 4 credits.

Theater

435. THEATER AND ITS DRAMA I (INTRODUCTION TO THEATER)

Introduction to basic drama and theater theory with emphasis upon modern theater. Survey of theater areas, personnel, and methods. Attendance at University Theater and Allied Arts productions. Minimal participation in laboratory and major productions. 4 credits.

436. THEATER AND ITS DRAMA II (HISTORY OF THEATER)

Theater and drama-history and theory in its social framework from the beginnings to 1800. 4 credits. (Alternate years.)

438. THEATER AND ITS DRAMA III (HISTORY OF THEATER)

A continuation of Speech and Drama 436 from 1800 to the present. 4 credits. (Alternate years.)

441. VOICE AND DICTION I

Voice and articulation development with relation to the communication needs of the individual with particular reference to the theater, television, radio, etc. Individual and group practice sessions in addition to regular class meetings. Permission of instructor required. 2 credits.

442. VOICE AND DICTION II

Continuation of 441 with more emphasis upon basic skills for oral interpretation, theater, etc., including analysis and development of dialects. Prerequisite: Speech and Drama 441. 2 credits.

Speech and Drama

- 457. ORAL INTERPRETATION**
The analysis of literature as a basis for performance; demonstration and experimentation with methods of performance which will enhance particular pieces of literature; the development of a critical standard for evaluation of performance and, consequently, of literature. 2 lectures; 2 laboratories; 4 credits.
- 459 (459). SCENIC ARTS I (STAGECRAFT)**
Technical aspects of theatrical production. Stage and television scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theater production. 4 credits.
- 475 (475). STAGE MAKE-UP**
Fundamentals of juvenile, old age, character and special stage make-up techniques. Permission of instructor required. Laboratory fee: \$10. 2 credits.
- 481. SUMMER REPERTORY THEATER WORKSHOP**
An intensive workshop which includes the following: 1) Classes in voice, movement, make-up, and improvisation taught by the directors and professional actors of the resident company. 2) Experience in technical aspects of theater—scenery, costumes, lighting, publicity. 3) Performance in Summer Theater production with experienced resident actors. Admission to workshop by audition only. Enrollment by permission. Offered in the eight-week summer session. Classes, rehearsals, and performances to be arranged. 8 credits.
- 541. THEATER PUBLICITY**
Public relations and publicity with relation to developing an audience for theatrical productions. Practical application to University Theater and other assigned productions. Suggested background: Speech and Drama 435. Permission of instructor. 2 credits.
- 542. BOX OFFICE AND HOUSE MANAGEMENT**
The business of Theater; box office procedure, house management, and ancillary problems. Practical application to University Theater and other assigned productions. Suggested background: Speech and Drama 435, permission of instructor. 2 credits.
- 547 (547). SCENIC ARTS II (STAGE COSTUME DESIGN AND EXECUTION)**
A course covering costume history, styles, design theory, pattern-making, and construction. Permission of instructor. 4 credits.
- 549 (549). SCENIC ARTS III (STAGE LIGHT DESIGN AND PRACTICE)**
A course covering elementary electricity, design theory, instrumentation, control, and practice. 4 credits.
- 551. REHEARSAL AND PERFORMANCE I (IMPROVISATION)**
Development of fundamental vocal and physical stage techniques for actors and directors through exercises, improvisations, and theater games. Should be taken concurrently with Speech and Drama 441. 2 credits.
- 552. REHEARSAL AND PERFORMANCE II (CHARACTERIZATION)**
Application of prior training in Speech and Drama 551 (prerequisite) to building characterizations in scenes and short plays. Should be taken concurrently with Speech and Drama 442. 2 credits.
- 565. MUSICAL COMEDY WORKSHOP**
An introduction to musical comedy styles with an emphasis on improving audition and performance techniques. Students must be prepared with a song and sheet music on the first day of class. 4 credits.

Speech and Drama

- 575. SCENIC ARTS IV (FUNDAMENTALS OF SCENE DESIGN)**
Stage drafting, modules, materials, design theory, and styles. Individualized exercises and final project. Required for all theater majors. Prerequisite: Speech and Drama 459. Recommended: Speech and Drama 547, Speech and Drama 549. 4 credits.
- 620 (620). EDUCATION THROUGH DRAMATIZATION**
The exploration of the possibilities of learning through the use of puppetry, story-telling, involvement theater, creative dramatics, and theater for children and the application to the classroom, playground, recreation center, library hospital ward, etc. 4 credits.
- 621. CREATIVE DRAMATICS**
A study of creative dramatics as a teaching device with an emphasis on developing the student's confidence in the art of pantomime, improvisation, and story telling. Students are expected to work with the Durham Drama for Youth program. Prerequisite: Speech and Drama 620. 4 credits.
- 623. THEATER FOR CHILDREN—PUPPETRY**
A course based on all materials necessary for a successful children's production with an added emphasis on puppetry. (Alternate years with Speech and Drama 621). 4 credits.
- 624. THEATER AND MUSICAL PRODUCTION FOR CHILDREN**
A production oriented course emphasizing children's musical performances and Story Theater techniques. (Alternate years with Speech and Drama 623.) 4 credits.
- 629. COMMUNITY ORIENTED CHILDREN'S DRAMA PROGRAMS**
The student will work in a community developing new drama programs geared toward a child audience. 4 credits.
- 641. PLAY ANALYSIS FOR PRODUCTION**
Analysis and discussion of a number of play scripts toward the end of developing coherent and meaningful production concepts for actors, technicians, directors, designers, teachers, etc. Prerequisites: Speech and Drama 435, 436 or 438 and either 459, or 551 and 552. (Alternate years with Speech and Drama 693.) 4 credits.
- 652. SCENIC ARTS V (PRODUCTION DESIGN)**
Advanced exercises in all scenic arts toward full production plans, detail drawings, schedules, etc., for a hypothetical theater of the student's own design. Prerequisite: Speech and Drama 459, 547, and 549. 4 credits.
- 654 (654). PERFORMANCE PROJECT**
Application of acting and directing theory to specific assigned responsibilities in a University Theater production or to an individual performance project. Prerequisites: Speech and Drama 551, 552. To be taken in conjunction with Speech and Drama 655, but not concurrently. 2 credits. (May be repeated to 4 credits.)
- 655 (655). SCENIC ART PROJECT**
Application of experience in design and technical aspects of theater to specific assigned responsibilities in a University Theater production or to an individual project or presentation. Prerequisites: Speech and Drama 459, 652. To be taken in conjunction with Speech and Drama 654, but not concurrently. 2 credits. (May be repeated to 4 credits.)
- 657. REHEARSAL AND PERFORMANCE III (DIRECTING)**
Continuation of Speech and Drama 552 (prerequisite). The director and performer develop interaction of character. Ensemble playing. Full directing responsibility for a one-act play. 4 credits.

Speech and Drama

658. REHEARSAL AND PERFORMANCE IV (STYLES)

Continuation of Speech and Drama 657 and of the sequence begun in Speech and Drama 551 and 552. Styles of drama for the actor and director: Greek, Shakespearean, eighteenth-century comedy, and nineteenth-century realism. Prerequisites: Speech and Drama 551 and 552, 657, or the equivalent. 4 credits.

668. GROUP INTERPRETATION

Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. Prerequisite: Speech and Drama 457. 4 credits. (Alternate years.)

693. THEATER MANAGEMENT

Theater organization, public relations, business, and box-office management with projects associate with University Theater activities. Special topics may be explored by the individual. Prerequisite: four courses in theater. 4 credits. (Alternate years.)

750. WRITING FOR PERFORMANCE

The study and application of principles of writing primarily for performance. Work done will include playwriting, writing for radio and television, writing for film. Emphasis will vary depending on the semester. Focus on original work with possible performances in other classes. May be taken three times for credit. Prerequisite: permission of instructor. 4 credits.

781. THEATER WORKSHOP FOR TEACHERS

This is an intensive seminar-workshop for teachers in rehearsal techniques, theater production, and stage direction, including work in laboratory and in summer repertory theater production as applicable to secondary-school theater. Offered in the summer session. To be arranged (classes, rehearsals, and performances.) 4 credits.

782. THEATER WORKSHOP FOR TEACHERS

The second half of Speech and Drama 781. Speech and Drama 781 is not a prerequisite for 782. Offered in the summer session. Classes, rehearsals, and performances to be arranged. 4 credits.

General

691 (691). LABORATORY OR FIELD EXPERIENCE

Emphasis to be selected. Taken in the senior year. 4 credits.

697 (697). SENIOR SEMINAR I

Divisional and overall meetings as specifically planned each semester. Preparation for specific senior project combined with an overview of recent developments and trends in the oral-communication arts and sciences. Prerequisite: senior standing. 2 credits.

698 (698). SENIOR SEMINAR II

The further development and completion of the senior project. Prerequisite: senior standing. 2 credits.

795, 796, (795), (796). INDEPENDENT STUDY

Application of the theory of specific speech communication areas in individual or group projects. May be repeated and taken for variable credits of 2, 4, 6, or 8. Could be combined with the senior experience (for majors) for a total of 12 credits in the same semester if the student wishes to be free to study off-campus. Project is to be developed with supervising instructor.

Technology (45)Dean: Richard S. Davis

Technology courses, not readily identified with any one discipline and elective for students both within and out of the College of Technology, are listed here.

455. HOW ELECTRICAL THINGS WORK

An elective survey course designed for the completely uninitiated student. The qualitative understanding of the electrical, magnetic, and mechanical principles of commonly encountered technology in the household and automobile, to the level of elementary diagnosis and repair. At the end of the course each student will be able to diagnose and repair simple household electrical problems in wiring and small appliances, and simple automotive electrical problems in the ignition system (tune-up), the generation system, and the starting system. The course will consist of laboratory-discussions in which the principles of typical equipment will be explained, measured while in operation, and disassembled to show the principles of design, diagnosis, and repair. Student interest will influence the topics considered. Open for credit to non-College of Technology students only. 2 two-hour lecture-demonstrations; laboratory-demonstrations; 4 credits.

501. LIGHT: SOURCES AND USES

History of lighting from Edison's first lamp to the laser; production, transmission, and utilization of light; color, the spectrum, and the human eye; sources of light; controlling light; the four factors of seeing; designing a lighting installation. Applications of lighting in schools, offices, factories, stores, the home; for sports and recreation, agriculture, and medicine; in the ocean; and in public buildings. Open for credit to non-engineering students only. No math prerequisite, other than high school mathematics. 1 two-hour lecture; 1 two-hour group discussion; 4 credits.

601. STATISTICAL METHODS IN ENGINEERING AND PHYSICAL SCIENCE

Methods of organizing data and statistical techniques for data analysis as applied to problems in engineering and physical science. Elementary probability theory, probability distributions, tests of significance, correlation, and regression analysis. Design of experiments; completely randomized blocks; factorials, fractional factorials; process optimization. Introduction to quality control; construction and analysis of control charts for variables and attributes; statistical aspects of tolerance. 4 credits.

610. INTRODUCTION TO OCEAN ENGINEERING

This course will be conducted on a seminar basis. It will deal with engineering problems arising in various fields of current oceanographic interest. Typical areas will be marine biology, saturation diving systems, and physical oceanography. In addition to the engineering faculty directing this course, other experts in the fields of ocean science and engineering will be invited to participate. Prerequisite: permission of instructor. 4 credits.

683. TECHNOLOGY: ITS ROLE AND FUNCTION IN SOCIETY

A study of the impact of Technology on social systems, with examination of both current and historical examples. Consideration of interrelations between social customs, psychological responses, physical needs, and technological developments. Examination of the decision-making process involved with technological change and the interrelationship between technology and public policy. Instruction is given by lectures, group discussions, interviews with key people, and through extensive reading assignments. Prerequisite: junior and senior standing and permission of instructor. 2 2-hour lecture or discussion periods per week; 4 credits.

Thompson School of Applied Science

Thompson School of Applied Science (14)

Director: Lewis Roberts, Jr.

The following selected courses, numbered at the 400 level, may be elected by students in four-year degree programs for credit toward graduation. Permission of the instructor is required.

Applied Plant Science (03)

452. PLANT PROPAGATION AND DEVELOPMENT

Principles and practices of propagation and development of plants. Laboratory work includes various types of plant propagation and handling of many types of young plants. Prerequisite: permission of instructor. 4 credits.

453. NURSERY CULTURE AND OPERATIONS

Various phases of the nursery business, starting with seedlings or rooted cuttings and carrying through to the handling of the finished product. Since it is essential to have clean nursery stock, such items as pest control, nursery inspection, and plant quarantines will be covered in detail. Prerequisite: permission of instructor. 3 credits.

457. GREENHOUSE MANAGEMENT

Growing plants in glass and plastic structures. Principles of greenhouse management including soils, soil mixes, water, heat, and light. Behavior of plants in artificial environments. Pest control. Prerequisite: permission of instructor. 4 credits.

458. COMMERCIAL FLORICULTURE

A continuation of 457 (Greenhouse Management). An intensive study of leading cut flowers, potted plants, bulbous crops, certain vegetables, and some minor crops and annuals as box plants. Prerequisite: permission of instructor. 4 credits.

Communications (07)

411. READING AND EXPOSITORY WRITING

Study and practice in exposition; reading for thought and appreciation. 3 credits.

412. ADVANCED EXPOSITORY WRITING AND READING

Writing reports and other communication media; reading major types of literature. 3 credits.

Wildlife Management

(See Institute of Natural and Environmental Resources)

Zoology (84)

Chairman: Philip J. Sawyer

PROFESSORS: Edythe T. Richardson, *emerita*; Arthur C. Borrer, Wilbur L. Bullock, Lorus J. Milne, Philip J. Sawyer, Emery F. Swan, Paul A. Wright

ASSOCIATE PROFESSORS: Paul E. Schaefer, *emeritus*; Robert A. Croker, John E. Foret, Frank K. Hoornbeek, Marcel E. Lavoie, John J. Sasner, Edward K. Tillinghast

ADJUNCT ASSOCIATE PROFESSOR: Clarence Porter

ASSISTANT PROFESSORS: Edward N. Francq, James F. Haney, Larry G. Harris, E. H. Wheeler, Jr.

(412) 412. PRINCIPLES OF ZOOLOGY

Concepts of animal biology, including an introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. *Intended principally for majors in the biological sciences.* 4 credits.

507-508. HUMAN ANATOMY AND PHYSIOLOGY

An integrated presentation, by systems, of structure and function in the human body. Lectures are strongly oriented toward physiology. Weekly laboratories alternate between dissection of a preserved small mammal and physiological exercises, involving observations on living tissues. 4 credits.

(518). VERTEBRATE MORPHOLOGY

A study of the basic morphological features of the vertebrates. The structure of the major systems will be studied at both the macroscopic and microscopic levels. Prerequisite: Zoology 412. 4 credits.

527 (527). VERTEBRATE PHYSIOLOGY

Designed to complement Zoology 518 in comparing the functioning of vertebrate organ systems. Prerequisite: Zoology 412, 518. 4 credits.

(542) 542. ORNITHOLOGY

Birds, their identification, migration, life histories, and economic importance, with special reference to those of eastern North America. Prerequisite: one semester of biology. 4 credits.

604. PRINCIPLES OF GENETICS

An introduction to the chemical and physical basis of inheritance; genes and chromosomes as units of mutation, structure, and function; organization of the genetic material; genes in populations. *Students desiring formal laboratory experience should register in Zoology 706.* Prerequisite: Zoology 412 or equivalent and junior standing. 4 credits.

618. INTRODUCTORY INVERTEBRATE ZOOLOGY

A lecture and laboratory survey of the invertebrate phyla with emphasis on their systematics, morphology, phylogeny, and natural history. Prerequisite: Zoology 412 or equivalent. 4 credits.

704. COMPARATIVE ENDOCRINOLOGY

The various endocrine organs are considered in their relationship to control of the internal environment, growth, development, and adaptation to the external environment. Prerequisite: vertebrate anatomy and physiology; organic chemistry. 4 credits.

706. GENETICS LABORATORY

Experiments and demonstrations in classical, developmental, and population genetics and cytogenetics, utilizing a wide range of organisms and techniques. Prerequisite or concurrent: Zoology 604 or equivalent and permission of instructor. 2 credits.

707. HUMAN GENETICS

Inheritance patterns, gene and chromosome mutation rates and effects, linkage and gene frequency. Prerequisite: Zoology 604 or equivalent or permission of the instructor. 4 credits.

711. NATURAL HISTORY OF COLD-BLOODED VERTEBRATES

The various classes of poikilothermic vertebrates—their habits, habitats, and life histories—with special reference to those occurring in eastern North America. Prerequisite: general zoology and Zoology 518. 4 credits.

Zoology

(712). MAMMALOLOGY

The origin and diversification of mammals, their reproductions, ecology, behavior, and economic importance. Laboratories will emphasize techniques of the mammalogist and identification of local forms. Prerequisite: general zoology and Zoology 518. 4 credits.

(713). ANIMAL BEHAVIOR

Individual and group behavior of animals, including the role of anatomy, physiology, and prior experience, and the ecological significance of these behavioral mechanisms. Techniques and the practical application of the study of animal behavior. Prerequisite: one year of zoology. 4 credits.

715. NATURAL HISTORY OF MARINE INVERTEBRATES

A field and laboratory course designed to acquaint the student with the inshore marine invertebrate metazoan animals of northern New England. Emphasis will be on identification, classification, habitat preferences, and behavior of these animals. Field work (collection and observation) will constitute a major part of the course and the student must be prepared to assume some travel expense. Prerequisite: general zoology. Summer only. 4 credits.

717. GENERAL LIMNOLOGY

An introduction to the special relationships of freshwater organisms to the chemical, physical and biological aspects of the aquatic environment. Emphasis on factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prerequisites: Biology 541 or equivalent. 4 credits.

719. FIELD LIMNOLOGY

Principles of freshwater ecology are examined through laboratory exercises dealing with a variety of freshwater habitats. Stress placed on the methods used to study freshwater lakes and interpretation of data. Includes a seminar series and occasional Saturday field trips. Prerequisites: present or prior enrollment in Botany 717, Zoology 717, or equivalent and permission of instructor. 3 credits.

721. PARASITOLOGY

An introductory course on some of the more important parasites causing disease in man and animals. Living materials will be used as far as possible. Prerequisite: one year of zoology. 4 credits.

723. CELL PHYSIOLOGY

Application of the principles of chemistry and physics to the understanding of cell structure and function. Metabolic reactions and their control are considered in relation to cell organization. Treatment is also given to the genesis and function of specialized cells. Prerequisite: organic chemistry. 4 credits.

724. MARINE PARASITOLOGY

A study of the diseases and parasites of marine fishes and shellfish with particular reference to the local estuarine environment. Prerequisites: Zoology 508 or 518 or equivalent and a course in invertebrate zoology. 4 credits.

726. GENERAL PHYSIOLOGY

A study of some of the physical and chemical phenomena common to all biological systems. Special emphasis is placed on membranes, permeability, excitability, conductivity, contractility, and bioenergetics. Prerequisites: organic chemistry, physics, and one year of zoology. 4 credits.

729. VERTEBRATE EMBRYOLOGY

The fundamental principles of vertebrate growth and development, including metamorphosis, regeneration and aging, as well as embryonic development. Prerequisites: Zoology 518, 527 and 604 or equivalent. 4 credits.

730. HISTOLOGY AND MICROTECHNIC

The microscopic anatomy of tissues and organs of vertebrates and an introduction to routine techniques used in such studies. Prerequisite: Zoology 508 or 518 or equivalent. 1-hour lecture; 6-hours laboratory; 4 credits.

772. FISHERIES BIOLOGY

Designed to introduce the student to some of the information and techniques used by the freshwater fisheries biologist. Emphasis on freshwater fisheries, but many of the techniques and some of the readings pertain as well to salt water fisheries. Prerequisite: Zoology 711 or equivalent, and permission of instructor. 4 credits.

774. INTRODUCTION TO MARINE SCIENCE

Daily lectures, laboratory and field work. Offered at the Isles of Shoals in cooperation with Cornell and the State University of New York. Summers only. Prerequisite: at least a full year of college biology. 5 credits.

795, 796. SPECIAL PROBLEMS IN ZOOLOGY

Election of one or more sections of this course provides opportunity for advanced study. Work may involve reading, laboratory work organized seminars, and/or conferences. Section numbers and subject-matter fields are: (1) Biological Oceanography, (2) Ecology, (3) Endocrinology, (4) Evolution, (5) Developmental Biology, (6) Genetics, (7) Histology, (8) History of Zoology, (9) Invertebrate Zoology, (10) Physiology, (11) Vertebrate Zoology, (12) Zoogeography, (13) Zoological Techniques, (14) Parasitology, (15) Histochemistry, (16) Protozoology, (17) Systematics, (18) Animal Behavior, (19) Teaching Practices. Prerequisite: permission of staff concerned. 2 or 4 credits. (Limit of 12 credits from the sections of this course.)

Rules Governing Tuition Rates

I. Basic Rule

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.

II. Determination of Tuition Rates

A. *In-State*: The Board of Trustees shall fix the in-state tuition rate annually on the basis of their projected budget including as part of said budget the applicable funds made available by the Legislature in its biennial budget.

B. *Out-of-State*: In accordance with the policy established by the Legislative Budget Act, the out-of-state tuition rate shall be set annually by the Board of Trustees at a figure which reflects actual cost of per capita operating costs, including instructional expenses, overhead, and bond retirement (excluding self-liquidating bonds), as determined by the costs in the fiscal year just preceding the first of January for the fiscal year in which tuition is to be charged, all in accordance with the established accounting practices of the University.

III. Determination of Student Status

A student shall be classified as in-state or out-of-state for tuition purposes at the time of his first admission to the University. The decision shall be made by the Director of Admissions of the appropriate division in the first instance based upon information furnished by the student's application and other relevant information available to the Director.

IV. Review of Student Status

Any student who is aggrieved by the decision of the Director of Admissions classifying him as an out-of-state student for tuition purposes may appeal to the Appeals Committee of the appropriate division on forms and in accordance with procedures which shall be made available to the students in the office of the Director of Admissions. The student shall have the right to present to the Appeals Committee such additional evidence as he may deem appropriate in processing his appeal, and shall have the right to appear in person and be heard.

The decision of the Appeals Committee shall be final unless the Board of Trustees in its discretion elects to review the record before the Committee. No evidence may be adduced or presented before the full Board of Trustees, but review shall be of the record only.

V. Change in Status

Any student who has, on his first admission to the University, been classified as out-of-state for tuition purposes, may apply to the Director of Admissions for a change of status on or before September 1 of any year for the fall semester, and on or before January 1 of any year for the spring semester. Applications shall be considered in the chronological

Rules Governing Tuition Rates

order in which they are presented. No changes approved during a semester shall be effective until the beginning of the next following semester. Provided, however, that where a change of status from out-of-state to in-state has been denied by the Director of Admissions prior to the commencement of a semester, and his decision is reversed by the Appeals Committee or the Board of Trustees during the semester, the student's status shall be effective as of the commencement of the semester.

In the event the Director of Admissions possesses facts or information indicating that a student's status should be changed from in-state to out-of-state, the student shall be informed in writing of the change of status. The student may appeal the decision of the Director as hereinabove set forth. No such change made by the Director after the commencement of any semester shall be effective until the beginning of the next semester. Change of out-of-state status made by the Director prior to the commencement of any semester, but reversed during the semester by the Board of Appeals, shall be effective as of the commencement of the semester.

VI. Application Forms

Each applicant for in-state status for tuition purposes shall submit an application on forms to be prescribed by the Director of Admissions which shall include a sworn statement certifying that the applicant is legally domiciled within the State of New Hampshire. The application shall also include such additional information as the Director may require in support of the affidavit of domicile. In his discretion, the Director may require resubmission of an application form from any in-state student prior to the commencement of each semester the student plans to attend the University.

VII. Substantive Rules

In all cases of application for in-state status for tuition purposes, the burden of proof shall be on the applicant. At the applicant's request, the Director of Admissions shall state the reason or reasons for his decision in writing.

For the purposes of determining tuition status, the following definitions and rules shall prevail:

A. The term "parent" shall mean a person's father; or if he has no father, his mother; or if one parent has custody of an unemancipated person, the parent having custody; or if there is a guardian or legal custodian, provided that there are no circumstances indicating that such guardianship or custodianship was created primarily for the purpose of conferring the status of an in-state student on such unemancipated person.

B. No person shall be eligible for in-state tuition status unless he shall have been domiciled within the state continuously for a period of at least six months immediately prior to registration for the term for which in-state status is claimed.

C. No unemancipated person shall be eligible for in-state tuition status unless his parent shall have established domicile in this state.

D. No person shall be eligible for in-state tuition status unless he establishes that his residence in New Hampshire is for some purpose other than the temporary or primary one of obtaining an education.

E. "Domicile" denotes a person's true, fixed, and permanent home and place of habitation. It is the place where he intends to remain and to which he expects to return when he leaves without intending to establish a new domicile elsewhere.

All evidence relevant to determining domicile may be considered, but the following indicia shall, in any case, be relevant, without limiting in any way such other information as the applicant may wish to submit or the Director may wish to require:

- i. Payment or non-payment of any tax levied by the State or any political subdivision on persons resident or domiciled thereon.
- ii. Residence reported on any federal or state tax return.
- iii. Registration of one's automobile.
- iv. State issuing one's driver's license.

Rules Governing Tuition Rates

- v. Receipt of support in whole or in part from parents who are resident or domiciled outside the State of New Hampshire.
- vi. Voting residence.
- vii. Claim by any non-resident parent that the applicant is a dependent for tax or any other financial purpose.
- viii. Regular departure by an applicant from the State of New Hampshire during recesses or vacations from the University.
- ix. The filing of any claim for benefits under any policy of insurance or any federal, state, or local benefit legislation based on residence or domicile outside the State of New Hampshire.
- x. Status in some other state which would qualify a person for in-state tuition in that state.

F. Unless the contrary appears to the satisfaction of the Director of Admissions in individual cases, the following presumptions shall prevail:

- i. The domicile of an unemancipated person is that of his parents, or if his parents are separated or divorced, that of the parent who has custody of him.
- ii. The domicile of an unemancipated person who has no parents is that of his guardian or other legal custodian, unless it appears that such guardianship or custodianship was created for the purpose of establishing an in-state status.
- iii. The domicile of any person who first enters the University from the domicile of his parent, as defined in subparagraph A above, is that of his parent until he abandons such domicile, and, for purposes other than that of his education, acquires a new domicile.
- iv. The domicile of any person who first enters the University from a domicile other than New Hampshire is such a domicile until he abandons such domicile and, for purposes other than that of his education, acquires a new domicile.
- v. Attendance at the University or at any other educational institution in this state in-itself shall not be evidence of intention to establish or establishment of a domicile in this state.

G. No person shall be deemed to be emancipated unless his parent, as defined in subparagraph A above, has entirely surrendered the right to the care, custody, and earnings of such person and unless his parent is no longer under any legal obligation to support or maintain such person or, having supported and maintained such person even though under no legal obligation to do so, has ceased to support or maintain such person. Emancipation shall not be found unless all such tests are met. The following shall be indicia of emancipation, but shall not be exclusive, and other evidence may be submitted by an applicant and demanded by the Director of Admissions:

- i. Lack of financial support of the person by the parent.
- ii. Lack of contribution to the parent of any earnings or other income received by the person.
- iii. Failure of the parent to claim the person as a dependent on his income or other tax returns.
- iv. Establishment by the person of a domicile separate and apart from that of the parent.
- v. Failure of the person to return to the home of the parent during vacations and other recesses from school.

VIII. Waiver

Nothing contained in these rules shall preclude the Director from waiving any requirement hereof under special circumstances in individual cases.

Faculty & Cooperative Extension

Faculty Emeriti

Abbot, Helen D.

Associate Professor Emeritus, Library

A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939. (1943 to 1972)

Babcock, Donald C.

Professor Emeritus of Philosophy

B.A., University of Minnesota, 1907; M.A., *ibid.*, 1908; S.T.B., Boston University, 1912; D.H.L. (Hon.), University of New Hampshire, 1960. (1918 to 1956)

Barraclough, Kenneth E.

Professor Emeritus of Forestry,

Extension Forester Emeritus

B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940. (1926 to 1963)

Bartley, Irving D.

Associate Professor Emeritus of Music and University Carillonneur

B.M., Syracuse University, 1935; M.M., *ibid.*, 1938. (1945 to 1968)

Barton, Philip S.

Director Emeritus, Thompson School of Applied Science, and Professor Emeritus of Applied Animal Science

B.S., University of New Hampshire, 1928; M.Ed., *ibid.*, 1938. (1939 to 1969)

Bingham, Sylvester H.

Professor Emeritus of English

A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; Ph.D., Yale University, 1937. (1936 to 1970)

Bowles, Ella S.

Publications Editor Emeritus

Plymouth Normal School, 1905. (1943 to 1951)

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 University, 1962. (1945 to 1972)

Brackett, Thelma

University Librarian Emeritus

A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962. (1942 to 1962)

Bratton, Karl H.

Professor Emeritus of Music

B.M., University of Kansas, 1931; M.A., Teachers College, Columbia University, 1945. (1945 to 1971)

Campbell, Willis C.

Research Associate Emeritus, Engineering Experiment Station

B.S., New Hampshire College, 1906. (1938 to 1954)

Carroll, Herbert A.

Professor Emeritus of Psychology

A.B., Bates College, 1923; A.M., Brown University, 1928; Ph.D., Columbia University, 1930. (1941 to 1962)

Colby, Halstead N.

Associate Professor Emeritus of Soil and Water Science, Extension Agricultural Engineer Emeritus

B.S., University of New Hampshire, 1930. (1932 to 1936, 1946 to 1968)

Colovos, Nicholas F.

Professor Emeritus of Animal Science

B.S., University of New Hampshire, 1927; M.S., *ibid.*, 1931. (1928 to 1971)

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)

Cortez, Edmund A.

Professor Emeritus of Speech

B.A., Taylor University, 1923; B.O., Asbury College, 1924; B.D., Asbury Theological Seminary, 1924; M.A., Columbia University, 1926; Ed.M., Harvard University, 1927. (1927 to 1965)

Danoff, Alexander P.

Assistant Professor Emeritus of German

A.B., New York University, 1928; A.M., *ibid.*, 1929. (1948 to 1969)

- Degler, Carroll M.**
Professor Emeritus of Business Administration and Economics
A.B., University of Kansas, 1925; M.B.A., New York University, 1927. (1928 to 1973)
- DeQuoy, Ruth W.**
Associate State 4-H Leader Emeritus
B.A., New Hampshire College, 1921; M.Ed., University of Maryland, 1953. (1929 to 1965)
- Duncan, Lillian R.**
Associate Professor Emeritus Public Service Librarian
B.A., University of Oklahoma, 1933. (1934 to 1973)
- Dunn, Stuart**
Professor Emeritus of Botany
B.S., University of Minnesota, 1923; M.S., Iowa State College, 1925; Ph.D., University of Minnesota, 1931. (1926 to 1970)
- Eggert, Russell**
Professor Emeritus of Horticulture
B.S., Michigan State College, 1929; M.S., *ibid.*, 1939. (1942 to 1946, 1948 to 1970)
- Ellis, Elizabeth E.**
Extension Associate Professor Emeritus of Home Economics
B.S., Teachers College, Columbia University, 1927; M.A., *ibid.*, 1929. (1929 to 1960)
- Hall, Harry H.**
Professor Emeritus of Physics
B.S., Union College, 1926; Ph.D., Harvard University, 1934. (1940 to 1969)
- Haslerud, George M.**
Professor Emeritus of Psychology
B.A., University of Minnesota, 1930; Ph.D., *ibid.*, 1934. (1945 to 1972)
- Hennessey, William G.**
Professor Emeritus of English
A.B., Boston University, 1916; A.M., *ibid.*, 1924; D.F.A. (Hon.), Transylvania College, 1966; Litt.D. (Hon), University of New Hampshire, 1967. (1923 to 1961)
- Hitchcock, Leon W.**
Professor Emeritus of Electrical Engineering
B.S., Worcester Polytechnic Institute, 1908. (1910 to 1956)
- Hoitt, Samuel W.**
Director Emeritus of the Cooperative Extension Service and Professor of Agricultural Education
B.S., University of New Hampshire, 1928; M.S., *ibid.*, 1931. (1929 to 1970)
- 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)
- Huddleston, Eric T.**
Professor Emeritus of Architecture
B.Arch., Cornell University, 1910. (1914 to 1957)
- Iddles, Harold A.**
Professor Emeritus of Chemistry
B.S., Michigan State College, 1918; M.S., University of Iowa, 1921; Ph.D., Columbia University, 1925; D.Sc. (Hon.), University of New Hampshire, 1966. (1929 to 1965)
- Johnson, Arthur W.**
Professor Emeritus of Business and Economics
B.B.A., College of Business Administration, Boston University, 1922; M.B.A., *ibid.*, 1929; C.P.A., (1920 to 1963)
- Johnson, G. Reid**
Associate Professor Emeritus of History
A.B., Muskingum College, 1916; M.A., Princeton University, 1920; Ph.D., University of Edinburgh, 1922. (1932 to 1963)
- Lavine, Irvin**
Professor Emeritus of Chemical Engineering
B.S., University of Minnesota, 1924; Ph.D., *ibid.*, 1930. (1948 to 1949, 1951 to 1965)
- Marshall, Thomas O.**
Professor Emeritus of Education
A.B., Colgate University, 1929; Ed.M., University of Buffalo, 1933; Ed.D., Harvard University, 1941. (1947 to 1973)
- Maynard, Max S.**
Professor Emeritus of English
B.A., University of British Columbia, 1937. (1946 to 1972)
- Meyers, T. Ralph**
Professor Emeritus of Geology
B.A., Ohio State University, 1926; M.A., *ibid.*, 1929. (1927 to 1972)

Mills, Marian E.

Assistant Professor Emeritus of Botany
B.S., Teachers College, Columbia University, 1917; M.A., *ibid.*, 1920. (1927 to 1957)

Moore, Herbert C.

Associate Professor Emeritus of Dairy Science
B.S., Purdue University, 1923; M.S., University of Minnesota, 1925. (1928 to 1970)

Morrow, Kenneth S.

Professor Emeritus of Dairy Science
B.S., University of Minnesota, 1918; M.S., *ibid.*, 1925. (1934 to 1966)

Nast, Charlotte G.

Professor Emeritus of Botany
B.A., University of Wisconsin, 1927; M.A., *ibid.*, 1929; Ph.D., University of California, 1938. (1948 to 1970)

Partridge, Allan B.

Associate Professor Emeritus of History
A.B., Clark University, 1922; A.M., *ibid.*, 1923. (1925 to 1971)

Perry, Errol C.

Thompson School Assistant Professor Emeritus of Farm Management
B.S., Massachusetts State College, 1920. (1929 to 1942, 1946 to 1962)

Phillips, Thomas G.

Professor Emeritus of Agricultural and Biological Chemistry
B.S., Ohio State University, 1912; M.S., *ibid.*, 1913; Ph.D., University of Chicago, 1918. (1925 to 1957)

Prince, Ford S.

Professor Emeritus of Agronomy
B.S., University of Illinois, 1913. (1925 to 1957)

Rand, M. Elizabeth

Associate Professor Emeritus of Home Economics
A.B., Wheaton College, 1930; M.Ed., Boston University, 1946. (1948 to 1973)

Richardson, Edythe T.

Professor Emeritus of Zoology
B.S., New Hampshire College, 1922; M.S., University of New Hampshire, 1924. (1922 to 1966)

Sackett, Everett B.

Dean Emeritus of the College of Liberal Arts and Professor Emeritus of Education
B.A., Hamline University, 1923; M.A., University of Minnesota, 1926; Ph.D., Columbia University, 1931. (1938 to 1967)

Schaefer, Paul E.

Associate Professor Emeritus of Zoology
A.B., Bethany College, 1926; M.S., Ohio State University, 1931; Ph.D., *ibid.*, 1936. (1941 to 1971)

Seiberlich, Joseph

Research Professor Emeritus, Engineering Experiment Station
Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, *ibid.*, 1928. (1941 to 1962)

Shimer, Stanley R.

Professor Emeritus of Biochemistry
B.S., Muhlenberg College, 1918; M.S., Pennsylvania State College, 1923. (1924 to 1966)

Skelton, Russell R.

Professor Emeritus of Civil Engineering
B.S., Purdue University, 1924; C.E., *ibid.*, 1934; S.M., Harvard University, 1939. (1928 to 1966)

Stevens, Henry B.

Director Emeritus of University Extension Service
A.B., Dartmouth College, 1912. (1918 to 1956)

Stolworthy, E. Howard

Professor Emeritus of Mechanical Engineering
B.S., Tufts College, 1922. (1922 to 1968)

Swasey, Henry C.

Associate Professor Emeritus of Intercollegiate Athletics
B.S., Amherst College, 1915; M.S., Indiana University, 1941. (1921 to 1962)

Sweet, Paul C.

Coach of Track and Cross Country and Professor Emeritus of Physical Education
B.S., University of Illinois, 1923; M.S., University of Southern California, 1941. (1924 to 1970)

Thames, Sarah

Associate Professor Emeritus of Home Economics
B.S., Simmons College, 1930; M.S., Teachers College, Columbia University 1942. (1945 to 1961)

Tirrell, Loring V.

Professor Emeritus of Animal Science
B.S., Massachusetts Agricultural College, 1920; M.S., Massachusetts State College, 1941. (1921 to 1925, 1930 to 1966)

Tyrrell, Doris E.

Associate Professor Emeritus of Secretarial Studies
B.S., University of Minnesota, 1926; M.A., *ibid.*, 1932. (1938 to 1966)

Walsh, John S.

Professor Emeritus of Languages
A.B., Harvard University, 1915; A.M., Boston University, 1928; D.H.L. (Hon), University of New Hampshire, 1965. (1922 to 1962)

Warren, Richard

Professor Emeritus of Poultry Science, Extension Poultryman Emeritus
B.S., Cornell University, 1934; M.S., *ibid.*, 1935. (1937 to 1970)

Webster, Robert G.

Professor Emeritus of English
B.A., University of New Hampshire, 1926; M.A., *ibid.*, 1930. (1927 to 1970)

Woodruff, Ruth J.

Professor Emeritus of Economics
B.A., Bryn Mawr, 1919; A.M., *ibid.*, 1920; Ph.D., Radcliffe College, 1931. (1931 to 1967)

Wooster, Caroline S.

Associate Professor Emeritus of Physical Education
Cert., Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934. (1944 to 1970)

Yale, William

Professor Emeritus of History
Ph.D., Sheffield Scientific School, Yale University, 1910; M.A., University of New Hampshire, 1928. (1928 to 1957)

Zimmerman, Oswald T.

Professor Emeritus of Chemical Engineering
B.S.E., University of Michigan, 1929; M.S.E., *ibid.*, 1931; Ph.D., *ibid.*, 1934. (1938 to 1970)

Faculty

Abeles, Carolyn M.

Adjunct Instructor in the Arts
B.A., Connecticut College, New London, 1964. Appointed 1972.

Abeles, Sigmund M.

Associate Professor of The Arts
A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957. Appointed 1970.

Abromson, Morton C.

Instructor in The Arts
A.B., Boston University, 1963; M.A., *ibid.*, 1964. Appointed 1972.

Ackerman, Margaret D.

Assistant Professor of Education
B.S., University of Arizona, 1961; M.A., *ibid.*, 1967; Ph.D., University of Pennsylvania, 1971. Appointed 1971.

Adamovich, Frank W.

Assistant Professor, Documents Librarian
B.S., Fitchburg State Teachers College, 1960; M.S., Simmons College, 1968. Appointed 1968.

Adams, Robert L. A.

Assistant Professor of Geography
B.A., Williams College, 1961; M.A., Clark University, 1966; Ph.D., *ibid.*, 1971. Appointed 1967.

Albers, Carl H.

Adjunct Professor of the Whittemore School
B.A., Valley City State Teachers College, 1943; M.B.A., University of Denver, 1947. Appointed 1968.

* Indicates time devoted to Cooperative Extension Service

† Indicates time devoted to Agricultural Experiment Station

Aldrich, Terry Lee
Head Ski Coach and Lecturer in Physical Education
B.S., St. Lawrence University, 1968.
Appointed 1972.

†**Allen, Fred E.**
Professor of Animal Science and Veterinarian
B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936. Appointed 1940.

Allmendinger, E. Eugene
Associate Professor of Naval Architecture
B.S., University of Michigan, 1941; M.S., University of New Hampshire, 1950. Appointed 1958.

Alonzo, Roy S.
Thompson School Associate Professor of Food Services Management
A.S., Becker Junior College, 1951; B.S., Boston University, 1953; M.B.A., Western New England College, 1961. Appointed 1969.

Amell, Alexander R.
Professor of Chemistry
B.S., University of Massachusetts, 1947; Ph.D., University of Wisconsin, 1950. Appointed 1955.

Amsden, Katherine
Associate Professor of Physical Education
A.B., Sweet Briar College, 1953; M.S., Smith College, 1956; Ph.D., University of Southern California, 1967.
Appointed 1967.

Andersen, Kenneth K.
Professor of Chemistry
B.S., Rutgers University, 1955; Ph.D., University of Minnesota, 1959.
Appointed 1960.

Anderson, Charlotte K.
Professor, Assistant Librarian
B.A., University of Michigan, 1935; A.B.L.S., *ibid.*, 1936; A.M.L.S., *ibid.*, 1951.
Appointed 1943.

Anderson, Franz E.
Associate Professor of Geology
B.A., Ohio Wesleyan University, 1960; M.A., Northwestern University, 1962; Ph.D., University of Washington, 1967. Appointed 1967.

Andrew, Michael D.
Associate Professor of Education and Coordinator for Teacher Education
B.S., Cornell University, 1960; A.M.T., Harvard University, 1961; Ed.D., *ibid.*, 1969. Appointed 1966.

†**Andrews, Richard A.**
Professor of Resource Economics
B.S., University of Maine, 1949; M.S., Pennsylvania State University, 1951; Ph.D., University of Minnesota, 1959. Appointed 1959.

Annis, William H.
Professor of Occupational Education
B.S., University of Maine, 1951; M.Agr.Ed., University of New Hampshire, 1959; Ed.D., Cornell University, 1961. Appointed 1962.

Antosiewicz, Rose T.
Assistant Professor of Italian
A.B., Brown University, 1954; Ph.D., University of California at Los Angeles, 1971.
Appointed 1970.

Arndt, Karl S.
Visiting Assistant Professor of German
A.B., Brown University, 1960; M.A., University of Connecticut, 1963; Ph.D., *ibid.*, 1966. Appointed 1973.

Arnoldy, Roger L.
Associate Professor of Physics
B.S., St. Mary's College, 1956; M.S., University of Minnesota, 1959; Ph.D., *ibid.*, 1962. Appointed 1967.

Ashley, Charles H.
Associate Professor of Education
A.B., Dartmouth College, 1957; M.Ed., University of New Hampshire 1960; Ed.D., Boston University, 1969. Appointed 1969.

Aultman, Dwight E., III
Trainer, Physical Therapist; Assistant Professor of Physical Education
B.S., Medical College of Virginia, 1956.
Appointed 1966.

Azzi, Victor D.
Professor of Mechanics
B.S., University of New Hampshire, 1955; D.Eng., Yale University, 1961. Appointed 1965.

Baker, Alan L.
Assistant Professor of Botany
B.A., Harpur College, S.U.N.Y., 1965; Ph.D., University of Minnesota, 1973. Appointed 1972.

Balderacchi, Arthur E.

Associate Professor of The Arts
A.B., Duke University, 1960; M.F.A., University of Georgia, 1965. Appointed 1965.

Ballentine, Roy

Lecturer in the Whittemore School
B.S., Yale College, 1972; M.A., Yale University, 1973. Appointed 1973.

Balling, L. C.

Associate Professor of Physics
B.A., Oberlin College, 1960; M.A., Harvard University, 1961; Ph.D., *ibid.*, 1965. Appointed 1967.

Balomenos, Richard H.

Professor of Mathematics Education
B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; Ed.D., Harvard University, 1961. Appointed 1961.

Bangs, Judith M.

Lecturer in Philosophy
A.B., Boston University, 1964; M.A., *ibid.*, 1966. Appointed 1970.

Banks, Russell E.

Lecturer in English
B.A., University of North Carolina, 1967. Appointed 1972.

Bardwell, John D.

Associate Professor, Library; Director, Department of Media Services
A.A., Boston University, 1950; B.S., Gorham State Teachers College, 1952; M.Ed., University of New Hampshire, 1955. Appointed 1960.

Barlow, Robert F.

Professor of Economics and Administration
B.A., Colby College, 1950; M.A., Fletcher School of Law and Diplomacy, Tufts University, 1951; Ph.D., *ibid.*, 1960. Appointed 1962.

Barney, Dwight E.

Assistant Extension Livestock Specialist, Lecturer in Animal Science, and Farm Coordinator
B.S., University of New Hampshire, 1967; M.S., *ibid.*, 1972. Appointed 1971.

***Barrett, James P.**

Professor of Forest Biometrics
B.S., North Carolina State University, 1953; M.F., Duke University, 1957; Ph.D., *ibid.*, 1962. Appointed 1962.

Barstow, Thomas R.

Assistant Professor of Physical Education
B.S., St. Lawrence University, 1961; M.Ed., *ibid.*, 1965. Appointed 1965.

Batchelder, Gerald M.

Thompson School Associate Professor of Civil Technology and Adjunct Associate Professor of Civil Engineering
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952. Appointed 1953.

Batcheller, Joseph D.

Professor of Speech and Drama
A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; Ph.D., *ibid.*, 1942. Appointed 1944.

Batho, Edward H.

Professor of Mathematics
B.S., Fordham University, 1950; M.S., University of Wisconsin, 1952; Ph.D., *ibid.*, 1955. Appointed 1960.

Beasley, Wayne M.

Associate Professor of Materials Science
S.B., Harvard College, 1946; S.M., Massachusetts Institute of Technology, 1965. Appointed 1957.

Bechtell, Homer F., Jr.,

Associate Professor of Mathematics
B.S., Grove City College, 1951; M.A., University of Wisconsin, 1956; Ph.D., *ibid.*, 1963. Appointed 1966.

Beckett, John A.

Forbes Professor of Management
B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946. C.P.A. Appointed 1962.

Beckwith, Marion C.

Professor of Physical Education
A.B., Oberlin College, 1935; M.Ed., University of New Hampshire, 1937. Appointed 1935.

Bell, R. Virginia

Associate Professor of Occupational Therapy
B.S., University of Michigan, 1953; Certificate O.T.R., Boston School of Occupational Therapy, 1955. Appointed 1958.

Bennett, Albert B.

Associate Professor of Mathematics
B.S., Maine Maritime Academy, 1954; B.S.,
University of Maine, 1958; M.A., *ibid.*,
1959; Ed.D., University of Michigan, 1966.
Appointed 1967.

Bereit, Virginia F.

Assistant Professor of Education
B.S., Baldwin-Wallace College, 1953; M.E.,
Kent State University, 1958; Ed.D., Col-
umbia University, 1971. Appointed 1973.

Bernard, Roger P.

*Dean of Academic Affairs, Merrimack
Valley Branch*
B.S., Fordham College, 1960; M.A., Ford-
ham University, 1963. Appointed 1973.

Bernier, Raymond J.

*Assistant Professor and Technical Director
of Speech and Drama*
B.S., Southeastern Massachusetts University,
1958; M.Ed., Bridgewater State College,
1960; M.A., Smith College, 1967. Ap-
pointed 1967.

Bertsch, Gregory J.

Assistant Professor of Psychology
B.A., Boston College, 1966; M.A., Uni-
versity of Vermont, 1968; Ph.D., *ibid.*,
1970. Appointed 1970.

Betz, George W.

*Associate Professor Economic
Development*
A.B., University of Kansas, 1952; Ph.D.,
University of Wisconsin, 1966. Appointed
1970.

Bianco, David P.

Director, Residential Life
B.A., Eastern Michigan University, 1966;
Ed.M., Boston University, 1969. Appointed
1972.

Bigelow, Nancy Charity

Adjunct Lecturer in Medical Technology
B.S., University of Vermont, 1966; M.T.
(ASCP) 1966. Appointed 1972.

Bigglestone, Gail A.

Assistant Professor of Physical Education
B.S., University of New Hampshire, 1960;
M.S., University of Massachusetts, 1966.
Appointed 1970.

Biggs, May K.

Assistant Professor of Botany
B.S., Southern University, 1959; M.S., Yale
University, 1960; Ph.D., The Catholic Uni-
versity of America, 1971. Appointed 1969.

Birch, Francis S.

Assistant Professor of Earth Sciences
A.B., Harvard University, 1958; M.S., Uni-
versity of Wisconsin, 1964; Ph.D., Princeton
University, 1969. Appointed 1972.

Birmingham, Frank P.

Assistant Professor of Philosophy
B.A., University of Kansas, 1963; M.A.,
University of Michigan, 1966; Ph.D., Uni-
versity of Michigan, 1972. Appointed 1968.

Bishop, Paul L.

Assistant Professor of Civil Engineering
B.S.C.E., Northeastern University, 1968;
M.S.C.E., Purdue University, 1970; Ph.D.,
ibid., 1972. Appointed 1971.

Blanchard, Fletcher A., Jr.

Professor of Electrical Engineering
B.S., Union College, 1948; M.S., Lehigh
University, 1950. Appointed 1950.

†**Blanchard, Robert O.**

Assistant Professor of Plant Pathology
B.S., University of Maine (Gorham), 1964;
M.Ed., University of Georgia, 1969; Ph.D.,
ibid., 1971. Appointed 1972.

†**Blickle, Robert L.**

Professor of Entomology
B.S., Ohio State University, 1937; M.S.,
University of New Hampshire, 1939; Ph.D.,
Ohio State University, 1942. Appointed
1938-1941, 1946.

Bobick, Melvin T.

Associate Professor of Sociology
A.B., University of Illinois, 1949; A.M.,
ibid., 1952; Ph.D., *ibid.*, 1958. Appointed
1958.

†**Bogle, Alfred Linn**

Assistant Professor of Botany
B.S., University of Washington, 1958; M.S.,
ibid., 1961; Ph.D., University of Minnesota,
1968. Appointed 1970.

Bolian, Charles

Instructor in Anthropology
B.A., Mississippi State University, 1965.
Appointed 1971.

Bonner, Thomas N.

President of the University and Professor of History

B.A., University of Rochester, 1947; M.A., *ibid.*, 1948; Ph.D., Northwestern University, 1952. Appointed 1971.

Bonnice, William E.

Associate Professor of Mathematics

B.A.E., Syracuse University, 1951; M.S., University of Washington, 1960; Ph.D., *ibid.*, 1962. Appointed 1962.

Borror, Arthur C.

Professor of Zoology

B.S., Ohio State University, 1956; M.S., *ibid.*, 1958; Ph.D., Florida State University, 1961. Appointed 1961.

Bothner, Wallace A.

Associate Professor of Geology

B.A., Harpur College, 1963; Ph.D., University of Wyoming, 1967. Appointed 1967.

Bovino, J. Patrick

Instructor in Business Administration

A.B., Seton Hall University, 1965; M.B.A., Rutgers University, 1967. Appointed 1970.

Bowen, Diane V.

Adjunct Lecturer in Medical Technology

B.S., Westbrock College, 1968; M.T. (ASCP) 1968. Appointed 1972.

Bowers, Dolores J.

Assistant Professor of Nursing

Diploma, Reading Hospital School of Nursing, 1954; B.S., Teachers College, Columbia University, 1964; Ed.M., *ibid.*, 1970. Appointed 1972.

Bowes, M. William

Head Football Coach and Lecturer in Physical Education

B.S., Pennsylvania State University, 1965. Appointed 1966-67, 1972.

Bowman, James S.

Assistant Professor Entomology and

Extension Entomologist

B.Sc., Ohio State University, 1951; M.Sc., *ibid.*, 1954; Ph.D., University of Wisconsin, 1958. Appointed 1971.

†**Bowring, James R.**

Professor of Resource Economics

B.S.A., University of Manitoba, 1936; M.A., University of Alberta, 1941; Ph.D., Iowa State University, 1944. Appointed 1948.

Boy, Angelo V.

Professor of Education

A.B., University of Notre Dame, 1953; Ed.M., Boston University, 1955; Ed.D., *ibid.*, 1960. Appointed 1965.

Boynton, Jason E.

Associate Professor of Education

B.Ed., Plymouth Teacher's College, 1949; M.Ed., University of New Hampshire, 1952. Appointed 1966.

Bozak, John C., Jr.,

Thompson School Associate Professor of Forest Technology

B.S., University of Connecticut, 1962; M.F., Yale School of Forestry, 1963. Appointed 1967.

Braff, Allan J.

Associate Professor of Economics and Business Administration

A.B., University of Rochester, 1951; M.B.A., Columbia University, 1953; Ph.D., University of Wisconsin, 1959. Appointed 1965.

Bravo, Donald

Lecturer in Music

B.M., New England Conservatory of Music, 1956; M.M., Boston Conservatory of Music, 1964. Appointed 1967.

Breeding, Charles H. J.

Thompson School Associate Professor of Applied Soil Sciences

B.S., University of New Hampshire, 1949; M.S., *ibid.*, 1966. Appointed 1963.

Briden, Earl F.

Assistant Professor of English

Ed.B., Rhode Island College, 1963; M.A., Brown University, 1966; Ph.D., *ibid.*, 1970. Appointed 1970.

Briggs, Janet C.

Lecturer in Animal Science

B.S., University of Massachusetts, 1962. Appointed 1963.

Brinsfield, Shirley D.

Adjunct Professor of the Whittemore School

B.A., University of Washington, 1949; LL.B., Columbia University, 1952. Appointed 1968.

Brockelman, Paul T.

Associate Professor of Philosophy

A.B., Dartmouth College, 1957; M.A., Northwestern University, 1963; Ph.D., *ibid.*, 1968. Appointed 1963.

Brown, Warren R.

Instructor in Political Science

B.A., Willamette University, 1966; M.A., Claremont Graduate School, 1972. Appointed 1972.

Browne, Evelyn

Professor of Physical Education

A.B., University of California, 1943; M.A., Teachers College, Columbia University, 1943; M.A., University of New Hampshire, 1962. Appointed 1943.

†**Bruns, Paul E.**

Professor of Forest Resources

A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D., University of Washington, 1956. Appointed 1958.

Bucci, Frank A.

Assistant Professor of Hotel

Administration

B.S., University of New Hampshire, 1949; M.B.A., Boston College, 1969. Appointed 1970.

Buckley, Walter F.

Professor of Sociology

B.A., Brown University, 1952; Ph.D., University of Wisconsin, 1958. Appointed 1971.

Bullock, Wilbur L.

Professor of Zoology

B.S., Queens College, 1942; M.S., University of Illinois, 1947; Ph.D., *ibid.*, 1948. Appointed 1948.

Bunker, Laurel G.

Lecturer and Supervisor, Clinical Affiliation Program

B.S., Tufts College, 1951; M.A., California State College at Los Angeles, 1967. Appointed 1968.

Burns, Carol L.

Assistant Professor in Speech and Drama

B.S., Syracuse University, 1963; Diploma, American Musical and Drama Academy, 1965; M.F.A., University of Utah, 1969. Appointed 1969.

Burns, Thomas R.

Associate Professor of Sociology

B.S., Stanford University, 1959; M.A., *ibid.*, 1963; Ph.D., *ibid.*, 1969. Appointed 1968.

Burton, David M.

Associate Professor of Mathematics

B.A., Clark University, 1954; A.M., University of Rochester, 1956; Ph.D., *ibid.*, 1961. Appointed 1959.

Bush, David W.

Thompson School Instructor in Civil Technology

A.S., State University of New York at Canton, 1969; B.S., Clarkson College of Technology, 1971. Appointed 1972.

†**Byers, Gordon L.**

Professor of Soil and Water Science

B.S., McGill University, 1948; M.S.A., Ontario Agricultural College, 1950. Appointed 1956.

Byrnes, Michael T. (Captain, U S Army)

Lecturer in Military Science

B.A., Providence College, 1967; Appointed 1973.

Cahill, Vincent S., Jr. (Colonel, USAF)

Professor, Aerospace Studies

B.A., Sacramento State College, 1954; B.S., Oklahoma State University, 1961; M.S., Air Force Institute of Technology, 1965. Appointed 1972.

Caldwell, S. Anthony

Assistant Professor of English

A.B., Columbia College, 1952; M.A., Columbia University, 1953; Ph.D., Harvard University, 1968. Appointed 1957.

Callan, Richard J.

Associate Professor of Spanish

A.B., Iona College, 1957; M.A., Fordham University, 1959; Ph.D., St. Louis University, 1965. Appointed 1969.

Canavan, Patrick

Lecturer in Organizational Development

B.B.A., Iona College, 1966; M.Phil., Yale University, 1969. Appointed 1972.

Canon, Lance K.

Associate Professor of Psychology

B.A., Yale University, 1961; M.A., Stanford University, 1963; Ph.D., *ibid.*, 1965. Appointed 1973.

Carbonneau, Lionel J.

Coach of Lacrosse and Assistant

Professor of Physical Education

B.A., University of New Hampshire, 1952. Appointed 1965.

Cargill, Mary C.

Assistant Professor, Serials Cataloger
B.A., Agnes Scott College, 1946; B.S.L.S.,
Drexel Institute of Technology, 1947; M.A.,
University of North Carolina, 1961. Ap-
pointed 1972.

Carney, John J.

Assistant Professor of Education
B.A., Seton Hall University, 1963; M.A.,
ibid., 1965; Ph.D., Syracuse University,
1973. Appointed 1973.

Carnicelli, Thomas A.

Associate Professor of English
A.B., Princeton University, 1958; M.A.,
Harvard University, 1960; Ph.D., *ibid.*,
1966. Appointed 1967.

Carter, Gavin H.

Associate Professor of Physical Education
B.S., Springfield College, 1952; M.S., *ibid.*,
1953; Ph.D., University of Oregon, 1958.
Appointed 1965.

Casas, R. Alberto

Professor of Spanish
B.En.L., Universidad de Barcelona, 1936;
A.M., Columbia University, 1947; Ph.D.,
ibid., 1954. Appointed 1952.

Cavalucci, Ralph J.

*Assistant Football Coach and Lecturer in
Physical Education*
B.S., Utah State University, 1954; M.A.,
Columbia University, 1960. Appointed
1972.

Cavanaugh, Barbara D.

Instructor in Nursing
Diploma, Grace-New Haven School of Nurs-
ing, 1961; B.S., Duke University, 1962; B.S.,
in Nursing Education, Columbia University,
1964. Appointed 1972.

Cavanaugh, John R.

*Assistant Professor of Education and
Assistant Dean, School of Continuing Studies*
B.Ed., Plymouth State College, 1961; M.A.,
Teachers College, Columbia University,
1962; Ed.D., *ibid.*, 1965. Appointed 1969.

Celikkol, Barbaros

*Assistant Professor of Mechanical
Engineering*
B.A., Elon College, 1964; M.S., Stevens
Institute of Technology, 1967; Ph.D., Uni-
versity of New Hampshire, 1972. Appointed
1969.

Cerny, James W.

Lecturer in Geography
B.A., University of New Hampshire, 1968;
M.S., Pennsylvania State University, 1970.
Appointed 1972.

Chaltas, John G.

Associate Professor of Education
B.S., Southern Connecticut State Uni-
versity, 1951; M.A., Columbia University,
1953; Ed.D., *ibid.*, 1957. Appointed 1967.

Chapman, Donald H.

Professor of Geology
B.A., University of Michigan, 1927; M.A.,
ibid., 1928; Ph.D., *ibid.*, 1931. Appointed
1931.

Chasteen, N. Dennis

Assistant Professor of Chemistry
A.S., Flint Junior College, 1962; A.B.,
University of Michigan, 1965; M.S., Uni-
versity of Illinois, 1966; Ph.D., *ibid.*, 1969.
Appointed 1972.

Chen, Jiann-Jer

*Thompson School Assistant Professor of
Applied Science*
B.S., Taiwan Normal University, 1962; M.S.,
University of New Hampshire, 1968; Ph.D.,
ibid., 1972. Appointed 1972.

Chesbro, William R.

Professor of Microbiology
B.S., Illinois Institute of Technology, 1951;
M.S., *ibid.*, 1955; Ph.D., *ibid.*, 1959. Ap-
pointed 1959.

Chupp, Edward L.

Professor of Physics
A.B., University of California, 1950; Ph.D.,
ibid., 1954. Appointed 1962.

Cimboric, Peter

*Director of Counseling and Health Services
and Adjunct Assistant Professor of
Education*

A.B., Montclair State College, 1965; M.A.,
Columbia University, 1967; Ph.D., Uni-
versity of Missouri, 1970. Appointed 1970.

Civitico, Bruno

Assistant Professor of The Arts
B.F.A., Pratt Institute, 1966; M.F.A., In-
diana University, 1968; Appointed 1973.

Clark, Charles E.

Associate Professor of History
A.B., Bates College, 1951; M.S., Columbia
University, 1952; Ph.D., Brown University,
1966. Appointed 1967.

Clark, David G.

Associate Professor of Physics

B.A., Park College, 1938; M.S., Texas Agricultural and Mechanical College, 1940; Ph.D., Pennsylvania State College, 1947. Appointed 1947.

Clark, Ronald R.

Associate Professor of Electrical Engineering

B.S., University of New Hampshire, 1956; M.E., Yale University, 1957; Ph.D., Syracuse University, 1963. Appointed 1957.

Clark, William E.

Assistant Professor of Mechanical Engineering

B.S., University of New Hampshire, 1931. Appointed 1946.

Clee, Jan E.

Dean of the Whittemore School of Business and Economics and Professor of Organizational Development

B.A., Social Academy, 1953; M.S., Case Institute, 1963; Ph.D., *ibid.*, 1967. Appointed 1967.

Cobb, Loren

Assistant Professor of Sociology

B.A., Cornell University, 1970; M.A., *ibid.*, 1971; Ph.D., *ibid.*, 1973. Appointed 1972.

Cohen, Allan R.

Associate Professor of Business Administration

A.B., Amherst College, 1959; M.B.A., Harvard Graduate School of Business Administration, 1961; D.B.A., *ibid.*, 1967. Appointed 1966.

Cole, Gordon B.

Lecturer in Music

Appointed 1973.

Cole, Lawrence P.

Assistant Professor of Economics and Associate Dean of the Whittemore School of Business and Economics

B.Ed., Keene Teachers College, 1959; M.S., Purdue University, 1964; Ph.D., *ibid.*, 1969. Appointed 1966.

†**Collins, Walter M.**

Professor of Animal Science

B.S., University of Connecticut, 1940; M.S., *ibid.*, 1949; Ph.D., Iowa State University, 1960. Appointed 1951.

Congdon, Robert G.

Psychologist, Counseling and Testing Center and Adjunct Associate Professor of Psychology

A.B., University of California, 1947; Ed.D., Harvard University, 1961. Appointed 1952.

Conner, Theodore W.

Coach of Baseball and Assistant Professor of Physical Education

B.S., Springfield College, 1955; M.S., University of Illinois, 1958. Appointed 1962.

Coolidge, Clyde R.

Lecturer in Business Administration

B.A., University of New Hampshire, 1960; LL.B., Boston College Law School, 1963. Appointed 1966.

Copeland, Arthur H., Jr.,

Professor of Mathematics

B.S., University of Michigan, 1949; M.A., *ibid.*, 1950; Ph.D., Massachusetts Institute of Technology, 1954. Appointed 1968.

Copeland, John A.

Head Track Coach, Lecturer in Physical Education

B.A., University of Connecticut, 1968; Teaching Certificate, *ibid.*, 1972. Appointed 1973.

Copeland, Lynda P.

Lecturer in Music

B.M., University of Michigan, 1947; M.M., New England Conservatory of Music, 1952. Appointed 1968.

Coppock, Bruce H.

Lecturer in Music

B.M., New England Conservatory of Music, 1973. Appointed 1973.

Coppola, Joseph P.

Assistant Football Coach and Lecturer in Physical Education

B.S., Boston College, 1971. Appointed 1972.

†**Corbett, Alan C.**

Associate Professor of Animal Science

B.S., University of Maine, 1936; M.S., *ibid.*, 1937; D.V.M., Michigan State College, 1940. Appointed 1941.

Corcoran, Ellen P.

Assistant Professor of Education

B.A., Bryn Mawr College, 1962; M.A.T., New York University, 1968; Ph.D., *ibid.*, 1972. Appointed 1972.

Corell, Robert W.

Professor of Mechanical Engineering
B.S.M.E., Case Institute of Technology, 1956; M.S.M.E., Massachusetts Institute of Technology, 1959; Ph.D., Case Institute of Technology, 1964. Appointed 1957-60, 1964.

Corsack, Howard

Professor in Administration
B.S., Rutgers University, 1950; B.A., *ibid.*, 1950; M.B.A., *ibid.*, 1953. Appointed 1972.

Costa, Juanita M.

Instructor in Home Economics
B.S., University of Wisconsin, 1971; M.S., University of Nebraska, 1973. Appointed 1973.

Courser, Carol M.

Instructor in Home Economics
B.S., University of New Hampshire, 1969; M.Ed., Tufts University, 1971. Appointed 1972.

Craig, Robert E.

Assistant Professor of Political Science
B.A., Adelphi University, 1960; Ph.D., University of North Carolina, 1971. Appointed 1966.

Cramer, Eva B.

Adjunct Visiting Lecturer in Animal Science
B.S., Cornell University, 1965; M.S., Jefferson Medical School, 1967; Ph.D., *ibid.*, 1969. Appointed 1972.

Croker, Robert A.

Associate Professor of Zoology
A.B., Adelphi College, 1958; M.S., University of Miami, 1960; Ph.D., Emory University, 1966. Appointed 1966.

Crowson, Lydia L.

Assistant Professor of French
B.A., Birmingham-Southern College, 1968; M.A., University of Wisconsin, 1969; Ph.D., *ibid.*, 1972. Appointed 1972.

Culver, Robin S.

Lecturer in Animal Science
B.A., University of New Hampshire, 1970. Appointed 1971.

Curcio, Ronald P.

Assistant Professor of Education
B.A., Boston College, 1960; M.A., Fordham University, 1962; Ed.D., Rutgers University, 1969. Appointed 1968.

Daggett, Albert F.

Professor of Chemistry
B.S., University of New Hampshire, 1928; M.S., *ibid.*, 1930; Ph.D., Columbia University, 1934. Appointed 1928-31, 1935.

Darlington, Sidney

Adjunct Professor of Electrical Engineering
B.S., Harvard University, 1928; B.S., Massachusetts Institute of Technology, 1929; Ph.D., Columbia University, 1940. Appointed 1971.

Datilio, Louis J.

Gymnastics Coach and Lecturer in Physical Education
B.S., Temple University, 1961; M.A., Trenton State College, 1967. Appointed 1967.

Dauphinais, Edward J.

Associate Professor, Technology Branch Librarian
B.A., Hillyer College, 1956; M.S.L.S., Simmons College, 1960. Appointed 1968.

Davenport, Gilbert B.

Assistant Professor of Speech and Drama
B.A., Western Reserve University, 1956; Certification, Naval Intelligence School, 1958; M.A., University of Denver, 1961. Appointed 1962.

†**Davis, Henry A.**

Associate Professor of Analytical Services
B.S., University of New Hampshire, 1932; M.S., *ibid.*, 1934. Appointed 1932.

Davis, James R.

Assistant Professor of Psychology
B.A., Northern Illinois University, 1965; M.A., *ibid.*, 1966; Ph.D., University of Wisconsin, 1969. Appointed 1970.

Davis, Myra L.

Associate Professor of Secretarial Studies
B.S., Central Missouri State Teachers College, 1939; M.A., State University of Iowa, 1945. Appointed 1945.

Davis, Richard S.

Dean of the College of Technology and Professor of Materials Science
Ba.Sc., University of Toronto, 1951; Ma.Sc., *ibid.*, 1952; Ph.D., *ibid.*, 1972. Appointed 1968.

Davis, Robert M.

Assistant Professor of French

B.A., Carleton College, 1957; M.A., University of Wisconsin, 1962; Ph.D., *ibid.*, 1972. Appointed 1969.

Dawson, Carl

Associate Professor of English

A.B., Occidental College, Los Angeles, 1959; M.A., Columbia University, 1960; Ph.D., *ibid.*, 1966. Appointed 1970.

Dawson, Charles O.

Professor of Civil Engineering

B.C.E., Ohio State University, 1930; M.S., *ibid.*, 1940. Appointed 1930.

Dawson, John F.

Assistant Professor of Physics

B.S., Antioch College, 1958; Ph.D., Stanford University, 1963. Appointed 1968.

Dawson, Judith A.

Instructor of Home Economics

B.S., Arizona State University, 1968; M.S., Pennsylvania State University, 1970. Appointed 1971.

Deane, Nancy H.

Assistant Dean of the College of Liberal Arts and Lecturer in English

B.A., Albion College, 1962; M.A., University of Wisconsin, 1964. Appointed 1966.

Deichert, Lillian C.

Associate Professor, Loan Librarian

A.B., Hunter College, 1933; M.L.S., Pratt Institute, 1960. Appointed 1964.

Deporte, Michael V.

Associate Professor of English

B.A., University of Minnesota, 1960; M.A., Stanford University, 1964; Ph.D., *ibid.*, 1966. Appointed 1972.

Desrosiers, Richard V.

Assistant Professor of Classics

A.B., Boston College, 1960; A.M., University of Wisconsin, 1961; Ph.D., University of North Carolina, 1969. Appointed 1965.

DeVille, Phillippe

Assistant Professor of Economics

B.A., University of Louvain (Belgium), 1967; M.A., *ibid.*, 1967; Ph.D., Stanford University, 1973. Appointed 1973.

DeVoto, Mark B.

Assistant Professor of Music

A.B., Harvard College, 1961; M.F.A., Princeton University, 1963; Ph.D., *ibid.*, 1967. Appointed 1968.

Dewey, Richard S.

Professor of Sociology

A.A., Pasadena Junior College, 1934; A.B., College of Wooster, 1936; M.A., Oberlin College, 1939; Ph.D., University of Wisconsin, 1941. Appointed 1958.

Diamonti, Michael C.

Instructor in Education

B.A., Seton Hall University, 1967; M.Ed., Rutgers University, 1970. Appointed 1973.

Dickman, C. Meigs

Assistant Professor of Nursing

Diploma, Greenwich Hospital School of Nursing, 1965; B.S.N., University of Cincinnati, 1967; M.S.N., Boston University, 1971. Appointed 1972.

Diller, Ann L.

Assistant Professor of Education

B.A., Maryville College, 1960; M.A., Tulsa University, 1962; Ed.D., Harvard, 1971. Appointed 1973.

Diller, Karl C.

Associate Professor of English

B.A., University of Pittsburgh, 1961; Ed.M., Harvard University, 1964; Ph.D., *ibid.*, 1967. Appointed 1972.

Dishman, Robert B.

Professor of Political Science

A.B., University of Missouri, 1939; A.M., *ibid.*, 1940; Ph.D., Princeton University, 1948. Appointed 1951.

Dodds, John A.

Thompson School Associate Professor of Applied Animal Science

B.S., University of Vermont, 1936; M.Agr.Ed., University of New Hampshire, 1960. Appointed 1953.

Dodge, Peter

Associate Professor of Sociology

B.A., Swarthmore College, 1948; A.M., Harvard University, 1950; Ph.D., *ibid.*, 1961. Appointed 1964.

Dodrill, Isabel

Associate Professor of Home Economics and State Leader, Extension Home Economist
A.B., Fort Hays State College, 1937; B.S., Kansas State University, 1941; M.A., Teachers College, Columbia University, 1957. Appointed 1965.

Doherty, Edward J.

Director of Career Planning and Placement
B.S., University of New Hampshire, 1960. Appointed 1962.

Dolcino, Luigi N.

Adjunct-Lecturer in Occupational Therapy
Liceo Ginnasio Andre, Doria Genoa, Italy, Maturita Classica, 1940; University of Genoa, Italy, M.D., 1946. Appointed 1969.

Dotchin, L. William, Jr.

Instructor in Physics
B.S., Bates College, 1962; M.S., University of New Hampshire, 1965. Appointed 1965.

Dotton, Frederick C.

Lecturer in Music
B.M., University of Arizona, 1961; M.M., *ibid.*, 1964; Ph.D., University of Michigan, 1973. Appointed 1973.

Downs, Richard E.

Associate Professor of Anthropology
S.B., Harvard University, 1942; Cert. of Ethn., University of Paris, 1949; Ph.D., University of Leiden, 1956. Appointed 1962.

Draves, David D.

Associate Professor of Education
B.A., University of Wisconsin, 1948; M.A., *ibid.*, 1949; Ph.D., *ibid.*, 1957. Appointed 1964.

Drew, William H.

Acting Dean of the Graduate School, Coordinator of Research, and Professor of Resource Economics
B.S., Pennsylvania State College, 1947; M.S., Rutgers University, 1949; Ph.D., Vanderbilt University, 1961. Appointed 1956.

†Dunlop, William R.

Professor of Animal Science and Extension Poultry Pathologist
D.V.M., V.S., Ontario Veterinary College, 1938. Appointed 1950.

†Dunn, Gerald M.

Professor of Plant Science
B.S., West Virginia University, 1948; M.S., Purdue University, 1950; Ph.D., *ibid.*, 1951. Appointed 1951.

Durgin, Owen B.

Associate Professor of Resource Economics
B.S., Gorham State Teachers College, 1946; M.A., University of New Hampshire, 1951. Appointed 1950.

Durnall, Edward J.

Director of the Division of Continuing Education and Associate Professor of Education
B.S., Hofstra University, 1947; M.A., Colorado College, 1948; Ed.M., Harvard University, 1952; Ed.D., Oregon State University, 1953. Appointed 1966.

Durrell, Donald D.

Adjunct Professor of Education
A.B., University of Iowa, 1926; M.Ed., Harvard University, 1929; Ed.D., *ibid.*, 1930; L.H.D., (Hon.) Boston University, 1969. Appointed 1973.

Dusek, R. Valentine

Assistant Professor of Philosophy
B.A., Yale University, 1963; Ph.D., University of Texas, 1972. Appointed 1966.

Dussault, Marjorie B.

Assistant Professor of Occupational Therapy
B.S., University of Toledo, 1961; B.S., Ohio State University, 1965; M.Ed., Ohio University, 1970. Appointed 1971.

Dykens, James W.

Adjunct Professor of Social Psychiatry
B.S., University of Vermont, 1943; M.D., University of Vermont, 1945. Appointed 1972.

Eder, Sidney C.

Assistant Professor of Education
B.A., University of California at Los Angeles, 1957; M.Ed., University of Arizona, 1961; Ph.D., Arizona State University, 1971. Appointed 1971.

Edwards, John C.

Director of Theater and Associate Professor of Speech and Drama
B.S., Northwestern University, 1950; M.A., *ibid.*, 1952; Ph.D., *ibid.*, 1963. Appointed 1961.

Edwards, Ruth S.

Assistant Professor of Music
B.M., Northwestern University, 1949; M.M.,
ibid., 1950. Appointed 1966.

Ellis, David W.

Vice Provost for Academic Affairs and
Associate Professor of Chemistry
A.B., Haverford College, 1958; Ph.D.,
Massachusetts Institute of Technology,
1962. Appointed 1962.

Emery, Harvard B.

Assistant Professor of Graphics
Cert. in M.E., Lowell Institute, 1938. Ap-
pointed 1954.

Engalichev, Nicolas

Associate Professor of Resource
Economics and Extension Economist,
Marketing (Forest Products)
B.S., S.U.N.Y., College of Forestry, Syra-
cuse University, 1957; M.S., *ibid.*, 1960.
Appointed 1963.

Erickson, Raymond L.

Professor of Psychology
B.A., University of Buffalo, 1951; M.A.,
University of California at Los Angeles,
1954; Ph.D., *ibid.*, 1962. Appointed 1963.

†**Estes, George O.**

Associate Professor of Plant Science
B.S., University of Maine, 1958; M.S., *ibid.*,
1960; Ph.D., Oregon State University, 1969.
Appointed 1969.

Evans, Rand B.

Associate Professor of Psychology
B.A., University of Texas (Austin), 1963;
M.A., *ibid.*, 1964; Ph.D., *ibid.*, 1967. Ap-
pointed 1972.

Faiman, Robert N.

Vice Provost for Research and
Special Program Administration,
Professor of Electrical Engineering
B.S.E.E., North Dakota State College, 1947;
M.S.E.E., University of Washington, 1948;
Ph.D., Purdue University, 1956. Appointed
1959.

Fairchild, Thomas P.

Associate Professor of Animal Science
and Extension Dairyman
B.S., University of New Hampshire, 1959;
M.S., University of Wisconsin, 1961; Ph.D.,
ibid., 1964. Appointed 1969.

Fan, Stephen S.T.

Associate Professor of Chemical
Engineering
B.S., Stanford University, 1957; M.S., *ibid.*,
1960; Ph.D., *ibid.*, 1962. Appointed 1962.

Farnsworth, Kirk E.

Psychologist, Assistant Director, Counseling
and Testing Center, and Adjunct Associate
Professor of Psychology
B.S., Iowa State University, 1962; M.S.,
ibid., 1966; Ph.D., *ibid.*, 1968. Appointed
1968.

Federer, C. Anthony

Adjunct Associate Professor of
Micrometeorology
B.S., University of Massachusetts, 1959;
M.S., University of Wisconsin, 1962; Ph.D.,
ibid., 1964. Appointed 1970.

Fernald, Mary Louise

Associate Professor of Nursing
B.S., University of New Hampshire, 1931;
Diploma, Children's Hospital School of
Nursing, 1935; M.A., Teachers College,
Columbia University, 1947. Appointed
1964.

Fernald, Peter S.

Associate Professor of Psychology
A.B., Amherst College, 1958; M.S., Spring-
field College, 1959; Ph.D., Purdue Univer-
sity, 1963. Appointed 1966.

Fink, Stephen L.

Professor of Organizational Development
and Psychologist, Counseling and Testing
Center
B.S., Union College, 1954; Ph.D., Western
Reserve University, 1959. Appointed 1969.

Fisher, Lester A.

Instructor in English
B.A., University of Maine, 1966; M.A.,
University of New Hampshire, 1970. Ap-
pointed 1968.

†**Fisher, G. Thomas**

Associate Professor Entomology and
Extension Entomologist
B.S., Iowa State University, 1950; M.S.,
Rutgers University, 1952; Ph.D., *ibid.*,
1954. Appointed 1969.

Fitzpatrick, Evelyn P.

Instructor in Nursing
Diploma, New England Deaconess Hospital,
1950; B.S., Boston University, 1954. Ap-
pointed 1973.

Fleming, Patricia

Lecturer in Speech and Drama
B.S., Southern Illinois University, 1971;
M.S., *ibid.*, 1972. Appointed 1973.

Fogg, Marguerite F.

Associate Professor of Nursing
Diploma, Pillsbury Hospital School, 1940;
Certificate, Hague Hospital, 1945; B.S.,
Boston College, 1957; M.S., *ibid.*, 1960.
Appointed 1967.

Fogg, Miriam Kay

Adjunct Lecturer in Medical Technology
B.S., University of Vermont, 1967; M.T.,
(ASCP), 1967. Appointed 1972.

Forbes, F. William

Assistant Professor of Spanish
A.B., Stanford University, 1965; M.A., Uni-
versity of Arizona, 1967; Ph.D., *ibid.*, 1971.
Appointed 1970.

Ford, Joseph P.

Assistant Professor of Political Science
B.A., University of New Hampshire, 1956;
M.P.A., Harvard University, 1957. Ap-
pointed 1959-61, 1962.

Foret, John E.

Associate Professor of Zoology
A.B., University of New Hampshire, 1962;
M.S., *ibid.*, 1963; A.M., Princeton Uni-
versity, 1965; Ph.D., *ibid.*, 1966. Appointed
1967.

Forsyth, G. Alfred

Associate Professor of Psychology
B.A., Dickinson College, 1961; M.S., North
Carolina State University, 1963; Ph.D., Pur-
due University, 1967. Appointed 1967.

Forsyth, Peggy D.

Lecturer in Psychology
B.S., Madison College, 1961; M.S., North
Carolina State University, 1963; M.S. Pur-
due University, 1965. Appointed 1973.

Fort, Marron C.

Associate Professor of German
A.B., Princeton University, 1961; Ph.D.,
University of Pennsylvania, 1965. Appoin-
ted 1969.

Foss, Stephen D.

Instructor in Chemical Engineering
B.S., University of New Hampshire, 1964;
M.S., *ibid.*, 1965. Appointed 1966.

†Foster, Bennett B.

Associate Professor of Forest Resources
B.S.F., Colorado State University, 1952;
M.F., Oregon State University, 1957; Ph.D.,
Duke University, 1966. Appointed 1964.

Foster, Rand B.

Instructor in Anthropology
B.A., University of Minnesota, 1966; M.A.,
University of Arizona, 1969. Appointed
1973.

Fox, Leslie A.

Assistant Professor of Psychology
B.S., University of Washington, 1963; Ph.D.,
ibid., 1968. Appointed 1968.

Francq, Edward N.

Assistant Professor of Zoology
B.S., University of Maryland, 1956; M.S.,
University of Idaho, 1962; Ph.D., Pennsylv-
ania State University, 1967. Appointed
1965.

French, E. Elizabeth

*Adjunct Assistant Professor of Medical
Technology*
A.B., Skidmore College, 1943; M.T.
(ASCP), Mary Hitchcock Memorial Hospital
School of Med. Tech., 1944; M.D.C.M.,
McGill University Faculty of Medicine,
1950. Appointed 1972.

Frick, George E.

*Adjunct Professor of Resource
Economics*
B.S., University of Connecticut, 1943; M.S.,
ibid., 1947. Appointed 1957.

Friel, Gerald J.

*Head Basketball Coach and Lecturer
in Physical Education*
B.S., State University College, New York,
1966. Appointed 1969.

Frost, Albert D.

Professor of Electrical Engineering
B.S., Tufts College, 1944; A.M., Harvard
University, 1947; Sc.D., Massachusetts Insti-
tute of Technology, 1952. Appointed 1957.

Fujimaki, Yasuyo

Lecturer in Japanese
B.A., Tarkio College, 1968. Appointed 1974.

Gadon, Herman

Professor of Business Administration
A.B., Dartmouth College, 1947; Ph.D.,
Massachusetts Institute of Technology
1953. Appointed 1964.

Gallagher, Patricia E.
Lecturer in Speech and Drama
B.A., University of New Hampshire, 1971.
Appointed 1973.

Garrett, Peter W.
Adjunct Assistant Professor of Forest Genetics
B.S., Michigan State University, 1958; M.S., University of Michigan, 1962; Ph.D., *ibid.*, 1969. Appointed 1970.

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Associate Professor of Geology
B.A., University of New Hampshire, 1959; M.S., University of Illinois, 1962; Ph.D., *ibid.*, 1963. Appointed 1965.

Geeslin, William E.
Assistant Professor of Mathematics
B.A., University of Texas at Austin, 1967; M.S., Stanford University, 1970; Ph.D., *ibid.*, 1972. Appointed 1972.

Gerhard, Glen C.
Associate Professor of Electrical Engineering
B.E.E., Syracuse University, 1956; M.Sc., Ohio State University, 1958; Ph.D., *ibid.*, 1963. Appointed 1967.

Giles, Anthony S.
Assistant Professor of Communication Disorders
B.A., Colby College, 1966; M.A., Syracuse University, 1968; Ph.D., *ibid.*, 1970. Appointed 1970.

Gilman, Paul A.
Thompson School Professor of Civil Technology
B.S., University of Vermont, 1938; M.S., Pennsylvania State University, 1951. Appointed 1945.

Gilmore, Henry C. Jr. (Major, U S Army)
Lecturer in Military Science
B.S., University of Scranton, 1960; M.B.A., University of Utah, 1973. Appointed 1973.

Gilmore, Robert C.
Associate Professor of History
A.B., University of Vermont, 1944; M.A., McGill University, 1947; M.A., Yale University, 1951; Ph.D., *ibid.*, 1954. Appointed 1952.

Ginsburg, Philip E.
Instructor in Political Science
B.A., Cornell University, 1961; M.S., Columbia University, 1965. Appointed 1973.

Glanz, Filson H.
Associate Professor of Electrical Engineering
B.S., Stanford University, 1956; M.S., *ibid.*, 1957; Ph.D., *ibid.*, 1965. Appointed 1965.

Glynn, Peter N.
Lecturer in Speech and Drama
B.A., University of New Hampshire, 1971; M.F.A., Smith College, 1973. Appointed 1974.

Goff, Robert C. (Major, U S Army)
Lecturer in Military Science
B.A., University of Maine, 1960. Appointed 1970.

Goffe, Lewis C.
Associate Professor of English
B.S., University of New Hampshire, 1935; M.A., *ibid.*, 1946; Ph.D., Boston University, 1961. Appointed 1946.

Goldin, Susan E.
Lecturer and Coordinator of Theatre Resources for Youth, Speech and Drama Department
B.A., Syracuse University, 1966; M.S., State University of N.Y. at Albany, 1968. Appointed 1973.

Gordon, Bernard K.
Professor of Political Science
B.A., New York University, 1953; A.M., *ibid.*, 1955; Ph.D., University of Chicago, 1959. Appointed 1971.

Granger, Ralph H.
Thompson School Associate Professor of Applied Business Management and Assistant to the Director of the Thompson School
B.S., Massachusetts State College, 1935; M.S., *ibid.*, 1939. Appointed 1946.

Grant, Clarence L.
Professor of Chemistry; Associate Director, Center for Industrial and Institutional Development
B.S., University of New Hampshire, 1951; M.S., *ibid.*, 1956; Ph.D., Rutgers University, 1960. Appointed 1952-58, 1961.

Grant, W. Arthur
Assistant to the President
B.A., University of New Hampshire, 1951. Appointed 1963.

Graves, Donald H.

Assistant Professor of Education
B.A., Bates College, 1952; M.Ed., Bridge-
water State College, 1959; Ph.D., State
University of Buffalo, 1973. Appointed
1973.

Gray, Carol J.

Professor of Nursing
Diploma, Abington Memorial Hospital,
Pennsylvania, 1955; B.S., Teachers College,
Columbia University, 1962; M.N., Univer-
sity of Washington, 1964; M.Ed., Teachers
College, Columbia University, 1969; Ed.D.,
ibid., 1971. Appointed 1972.

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Professor of Biochemistry
A.B., Oberlin College, 1954; Ph.D., Univer-
sity of Rochester, 1958. Appointed 1967.

Greenleaf, William

Professor of History
B.S.S., City College, New York, 1942; M.A.,
Columbia University, 1948; Ph.D., *ibid.*,
1955. Appointed 1958.

Grishman, Alan

Associate Professor of Music
B.S., Mannes College of Music, 1965; M.A.,
New York University, 1967. Appointed
1967.

Grossman, Lois S.

Assistant Professor of Spanish
A.B., Temple University, 1965; M.A., *ibid.*,
1967; Ph.D., Rutgers University, 1972. Ap-
pointed 1972.

Haaland, Gordon A.

Associate Professor of Psychology
A.B., Wheaton College, 1962; Ph.D., State
University of New York at Buffalo, 1966.
Appointed 1965.

Haendler, Helmut M.

Professor of Chemistry
B.S., Northeastern University, 1935; Ph.D.,
University of Washington, 1940. Appointed
1945.

Hageman, Elizabeth

Assistant Professor of English
B.S., Simmons College, 1963; M.A., Colum-
bia University, 1964; Ph.D., University of
North Carolina, 1971. Appointed 1971.

Hagstrom, Earl C.

Associate Professor of Psychology
B.S., Tufts University, 1952; Sc.M., Brown
University, 1954; Ph.D., *ibid.*, 1957. Ap-
pointed 1965.

Hall, Francis R.

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B.S., Stanford University, 1949; M.A., Uni-
versity of California at Los Angeles, 1953;
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ted 1964.

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Lecturer in Home Economics
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Professor of Forest Resources
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nesota, 1954. Appointed 1968.

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Handy, Allan W.

Adjunct Lecturer in Pathology
B.S., Tufts College, 1934; M.D., Tufts Medi-
cal School, 1938. Appointed 1965.

Haney, Irene K.

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B.A., Miami University, 1966; M.A., Univer-
sity of Toronto, 1968. Appointed 1972.

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Assistant Professor of Zoology
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Appointed 1972.

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1965.

Harris, F. Conley

Assistant Professor of The Arts

B.F.A., University of Kansas, 1965; M.F.A., University of Wisconsin, 1968. Appointed 1970.

Harris, Larry G.

Assistant Professor of Zoology

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Hart, Reina P.

Assistant Professor Reference Librarian

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Assistant Professor of Soil Chemistry

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Professor of The Arts

Diploma, Massachusetts School of Art, 1941; B.F.A., Yale University School of the Fine Arts, 1948; M.F.A., *ibid.*, 1949. Appointed 1949.

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Assistant Professor of Social Work

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Hebert, David J.

Associate Professor of Education

B.S., University of Maine, 1962; M.Ed., Duquesne University, 1964; Ph.D., Kent State University, 1967. Appointed 1967.

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Coach of Westling and Assistant

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B.S., State College, Pennsylvania, 1950; M.S., University of Massachusetts, 1966. Appointed 1966.

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Professor of Wood Science and Technology
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Associate Professor of Home Economics
Teaching Diploma, Nova Scotia Provincial Normal College, 1935; B.S., Mount Allison University, 1939; M.S., Michigan State University, 1949. Appointed 1967.

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Associate Professor of Animal Science
B.S., Pennsylvania State University, 1956; M.S., University of Maryland, 1958; Ph.D., Pennsylvania State University, 1962. Appointed 1963.

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Associate Professor of Zoology
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Horrigan, James O.

Associate Professor of Business Administration
B.S.C., University of Notre Dame, 1952; M.B.A., University of Chicago, 1956; Ph.D., *ibid.*, 1967. Appointed 1966.

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Associate Professor of Economics
B.A., University of California at Santa Barbara, 1964; Ph.D., *ibid.*, 1967. Appointed 1967.

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Professor of Physics
B.S., Michigan State University, 1949; M.S., *ibid.*, 1951; Ph.D., Pennsylvania State University, 1957. Appointed 1957.

Howard, Cleveland L.

Associate Professor of Music
B.M., Boston University, 1953; M.M., *ibid.*, 1954; D.M.A., *ibid.*, 1969. Appointed 1969.

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Medical Director of the University Health Service
B.S., Bates College, 1943; M.D., Tufts Medical School, 1946. Appointed 1955.

Hoyle, Elizabeth L.

Thompson School Lecturer in Food Services Management
B.S., Carnegie-Mellon University, 1956; Diploma, Massachusetts General Hospital, 1957; Diploma, Human Engineering Laboratory, 1970. Appointed 1972.

Hoyle, Merrill C.

Adjunct Assistant Professor of Plant Science

B.S., University of Massachusetts, 1957; M.S., *ibid.*, 1961; Ph.D., University of New Hampshire, 1971. Appointed 1972.

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Dean, Office of Institutional Research and Planning, and Professor of Electrical Engineering

B.S., University of New Hampshire, 1948; M.Eng., Yale University, 1949; Ph.D., University of Illinois, 1955. Appointed 1949.

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Associate Professor of Chemistry

B.S., University of Sheffield, 1961; Ph.D., *ibid.*, 1964. Appointed 1967.

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Associate Professor of French

B.A., Bryn Mawr College, 1942; Ph.D., Yale University, 1955. Appointed 1961.

Hudon, Louis J.

Professor of French

A.B., Bowdoin College, 1938; M.A., Yale University, 1942; Ph.D., *ibid.*, 1943. Appointed 1961.

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Assistant Professor, Assistant Order Librarian

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Assistant Professor of Economics

B.A., Florida State University, 1968; Ph.D., Vanderbilt University, 1972. Appointed 1973.

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Professor of Biochemistry

B.S., California Institute of Technology, 1941; M.S., University of Wisconsin, 1944; Ph.D., *ibid.*, 1948. Appointed 1963.

Irwin, Manley R.

Professor of Economics

A.B., Michigan State College, 1950; M.A., University of Michigan, 1954; Ph.D., Michigan State University, 1963. Appointed 1963.

Jacoby, Robb

Professor of Mathematics

S.B., University of Chicago, 1941; S.M., *ibid.*, 1942; Ph.D., *ibid.*, 1946. Appointed 1961.

James, Jesse

State Leader, Extension 4-H Youth Development, and Associate Professor of Occupational Education

B.S., University of Georgia, 1937; M.S., *ibid.*, 1951. Appointed 1957.

James, Marion E.

Associate Professor of History

B.A., University of New Hampshire, 1940; M.A., Radcliffe College, 1949; Ph.D., *ibid.*, 1955. Appointed 1955.

Jameson, James J. (Major USA)

Lecturer in Military Science

B.S., United States Military Academy, 1957; M.S., University of Southern California, 1971. Appointed 1971.

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Associate Professor of Resource Economics

B.S., University of Illinois, 1960; M.S., North Carolina State University, 1964; Ph.D., *ibid.*, 1966. Appointed 1969.

Jefferson, Brian T.

Assistant Professor of The Arts

B.S., Massachusetts College of Art, 1964; M.S., Pennsylvania State University, 1967; Ed.D., *ibid.*, 1971. Appointed 1969.

Jellison, Charles A., Jr.

Professor of History

A.B., Stanford University, 1947; M.A., *ibid.*, 1948; Ph.D., University of Virginia, 1956. Appointed 1956.

Jenkins, Melvin E., Jr.

Thompson School Associate Professor of Forest Technology

B.S.F., University of Massachusetts, 1959; M.S.F., University of New Hampshire, 1961. Appointed 1961.

Jenkins, Patricia S.
Thompson School Instructor in Applied Plant Science
B.S., University of Massachusetts, 1958. Appointed 1968.

Jenks, R. Stephen
Associate Professor of Organizational Behavior
B.A., College of Wooster, 1961; M.S., Case Institute, 1963; Ph.D., *ibid.*, 1966. Appointed 1967.

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Adjunct Professor of Education
B.A., University of New Hampshire, 1948; M.A., *ibid.*, 1949; Ph.D., Columbia University, 1958. Appointed 1952.

Johnson, Richard E.
Professor of Mathematics
B.A., Intermountain Union College, 1934; M.A., University of Washington, 1939; Ph.D., University of Wisconsin, 1941. Appointed 1966.

Jones, Daniel W.
Assistant Professor of Physical Education
B.A., Fairmont State College, 1967; M.A., Case Western Reserve University, 1970; Ph.D., University of Toledo, 1973. Appointed 1974.

Jones, Galen E.
Professor of Microbiology
B.A., Dartmouth College, 1950; M.A., Williams College, 1952; Ph.D., Rutgers University, 1956. Appointed 1966.

Jones, Paul R.
Professor of Chemistry
B.A., Albion College, 1952; Ph.D., University of Illinois, 1956. Appointed 1956.

Jones, William R.
Professor of History
A.B., Harvard University, 1951; M.A., *ibid.*, 1952; Ph.D., *ibid.*, 1958. Appointed 1962.

Kaen, Fred R.
Assistant Professor of Finance
B.S., Lehigh University, 1963; M.B.A., University of Michigan, 1968; Ph.D., *ibid.*, 1972. Appointed 1973.

Kaplan, Barry D.
Adjunct Assistant Professor in Hotel Administration
B.S., University of New Hampshire, 1963; M.B.A., Michigan State University, 1964. Appointed 1967.

Kaufmann, Richard L.
Professor of Physics
B.S., California Institute of Technology, 1957; M.S., Yale University, 1958; Ph.D., *ibid.*, 1960. Appointed 1963.

Kauppinen, Tenho S.
Assistant Dean of the College of Technology and Associate Professor of Mechanical Engineering
B.S., University of New Hampshire, 1939; M.S., *ibid.*, 1947. Appointed 1939.

Kayser, John R.
Associate Professor of Political Science
B.A., University of New Hampshire, 1962; M.A., Ohio State University, 1964; Ph.D., Claremont Graduate School and University Center, 1969. Appointed 1969.

***Keener, Harry A.**
Dean of the College of Life Sciences and Agriculture, Director of the Agricultural Experiment Station, and Professor of Animal Science
B.S., Pennsylvania State College, 1936; M.S., West Virginia University, 1938; Ph.D., Pennsylvania State College, 1941. Appointed 1941.

Keeseey, C. Robert
Ombudsman
B.A., Oberlin College, 1948. Appointed 1960.

Kelley, B. Ann
Associate Professor of Nursing
Diploma, Peter Bent Brigham Hospital, 1955; B.S., Boston University, 1959; M.S., *ibid.*, 1966. Appointed 1965.

Kelley, Barbara R.
Assistant Professor of Nursing
B.S.Ed., Burbank Hospital/Fitchburg State College, 1961; M.S.N., Boston College Graduate School. Appointed 1973.

- Kemnitz, Thomas M.**
Assistant Professor of History
A.B., University of Michigan, 1964; Ph.D., University of Sussex, 1969. Appointed 1969.
- Kennedy, Robert C.**
Thompson School Professor of Applied Plant Science
B.V.A., Massachusetts State College, 1940; M.S., University of New Hampshire, 1961. Appointed 1941.
- Kertzer, Robert**
Associate Professor of Physical Education
B.S., Brooklyn College, 1960; M.S., University of Illinois, 1961; Ph.D., Michigan State University, 1965. Appointed 1965.
- Khleif, Bud B.**
Associate Professor of Sociology and Education
Certificate, British Government Arab College, Jerusalem, 1948; B.A., Hebrew University, 1952; M.A., University of Michigan, 1954; Ph.D., Johns Hopkins University, 1957. Appointed 1967.
- †**Kiang, Yun Tzu**
Assistant Professor of Plant Science and Genetics
B.S., Taiwan Normal University, 1957; M.A., Ohio State University, 1962; Ph.D., University of California, 1970. Appointed 1970.
- Kidder, William**
Associate Dean of Students
B.A., University of New Hampshire, 1967. Appointed 1973.
- Kimball, Robert O.**
Associate Professor of Mathematics
B.S., University of New Hampshire, 1941; M.A., *ibid.*, 1952. Appointed 1946.
- Kimball, Roland B.**
Professor of Education
B.S., University of New Hampshire, 1942; M.Ed., *ibid.*, 1949; Ed.D., Harvard School of Education, 1958. Appointed 1963.
- Kinerson, Russell S.**
Assistant Professor of Botany
B.S., University of Maine, 1965; M.S., University of Vermont, 1967; Ph.D., University of Washington, 1971. Appointed 1973.
- †**Klippenstein, Gerald L.**
Associate Professor of Biochemistry
B.S., Wheaton College, 1962; Ph.D., Northwestern University, 1967. Appointed 1967.
- Klotz, Louis H.**
Associate Professor of Civil Engineering
B.S.C.E., Pennsylvania State University, 1951; M.C.E., New York University, 1952; Ph.D., Rutgers University, 1967. Appointed 1965.
- Knight, Lewis E.**
Visiting Assistant Professor of Education
B.A., Amherst College, 1957; M.A.T., Harvard University, 1961; Ed.D., Stanford University, 1971. Appointed 1973.
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Assistant Professor of Physical Education
B.A., Syracuse University, 1959; M.S., University of Wisconsin, 1967. Appointed 1963.
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Assistant Professor of Plant Science
B.S., Kansas State University, 1964; M.S., *ibid.*, 1966; Ph.D., Colorado State University, 1971. Appointed 1971.
- Kole, Michael A.**
Assistant Professor of Administration
B.Mgt.Eng., Rensselaer Polytechnic Institute, 1960. Appointed 1972.
- Korbel, John**
Professor of Economics and Business Administration
S.B., Harvard College, 1939; M.B.A., Harvard Business School, 1941; Ph.D., Harvard University, 1959. Appointed 1966.
- Krieg, Fred J.**
Assistant Professor of Education
B.A., Boston University, 1967; M.A., University of Massachusetts, 1968; M.S., Ohio State University, 1971; O.D., *ibid.*, 1972; Ph.D., *ibid.*, 1973. Appointed 1973.
- Kuo, Shan S.**
Professor of Applied Mathematics
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- Ladd, Dwight R.**
Professor of Business Administration
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Lambert, Helen H.

Lecturer in Zoology

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Lambert, Robert H.

Professor of Physics

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Lange, Kenneth L.

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Associate Professor of Political Science

A.B., Dartmouth College, 1952; A.M., Fletcher School, Tufts University, 1957; M.A.L.D., *ibid.*, 1958; Ph.D., *ibid.*, 1963. Appointed 1965.

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Professor of The Arts

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Linsky, Arnold S.

Associate Professor of Sociology
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Littlefield, Frederick

Lecturer in Speech and Drama
Certificate, Massachusetts School of Radio and Electronics, 1965; B.A., University of New Hampshire, 1968. Appointed 1973.

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B.A., University of New Hampshire, 1963; M.S., Simmons College, 1965; M.S., University of New Hampshire, 1971. Appointed 1964.

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Assistant Professor of Wildlife Ecology
B.A., Long Beach State College, 1963; M.S., Humboldt State College, 1966; Ph.D., Colorado State College, 1969. Appointed 1973.

Long, David F.

Professor of History
A.B., Dartmouth College, 1939; A.M., Columbia University, 1948; Ph.D., *ibid.*, 1950. Appointed 1948.

†**Loy, James B.**

Associate Professor of Plant Science
B.S., Oklahoma State University, 1963; M.S., Colorado State University, 1965; Ph.D., *ibid.*, 1967. Appointed 1967.

Lyle, Gloria G.

Associate Professor of Chemistry
B.A., Vanderbilt University, 1944; M.S., Emory University, 1946; Ph.D., University of New Hampshire, 1958. Appointed 1951.

Lyle, Robert E., Jr.

Professor of Chemistry
B.A., Emory University, 1945; M.S., *ibid.*, 1946; Ph.D., University of Wisconsin, 1949. Appointed 1951.

Lynch, Darrel D. (Major, USAF)

Lecturer, Aerospace Studies
B.S., University of New Hampshire, 1969; M.S., *ibid.*, 1970. Appointed 1971.

MacHardy, William E.

Assistant Professor of Plant Pathology and Extension Plant Pathologist
B.S., University of Maine, 1958; M.Ed., *ibid.*, 1965; M.S., University of Nebraska, Omaha, 1966; Ph.D., University of Rhode Island, 1970. Appointed 1972.

***Macklin, Jerry M.**

Associate Professor of Entomology and Assistant Director, Cooperative Extension Service
B.S., Purdue University, 1952; M.S., *ibid.*, 1956; Ph.D., *ibid.*, 1971. Appointed 1972.

Magidson, David J.

Associate Professor of Speech and Drama
B.S., University of Wisconsin, 1963; M.S., *ibid.*, 1965; Ph.D., University of Utah, 1969. Appointed 1972.

Mai, Robert P.

Lecturer in Education
B.A., Columbia University, 1964; M.A.,
University of Rochester, 1968. Appointed
1973.

Marquay, Gertrude Martha

Adjunct Lecturer in Medical Technology
B.A., University of New Hampshire, 1953;
M.T. (ASCP), 1953. Appointed 1972.

Marschner, Donald C.

Professor of Business Administration
B.A., Brown University, 1929; Ph.D., Col-
umbia University, 1964. Appointed 1964.

Marshall, Grover E.

Assistant Professor of French and Italian
A.B., Bowdoin College, 1951; M.A., Prince-
ton University, 1954; Ph.D., *ibid.*, 1971.
Appointed 1965.

Mathieson, Arthur C.

*Associate Professor of Botany and Director
of the Jackson Estuarine Laboratory*
B.A., University of California, 1960; M.A.,
ibid., 1961; Ph.D., University of British
Columbia, 1965. Appointed 1965.

†**Mautz, William W.**

Assistant Professor of Wildlife Ecology
B.S., Wisconsin State University, 1965;
M.S., Michigan State University, 1967;
Ph.D., *ibid.*, 1969. Appointed 1969.

McCann, Francis D., Jr.

Associate Professor of History
A.B., Niagara University, 1960; M.A., Kent
State University, 1962; Ph.D., Indiana Uni-
versity, 1967. Appointed 1971.

McFate, James

*Adjunct Assistant Professor of Hotel
Administration*
Stetson University. Appointed 1972.

Meagher, Judith A.

Assistant Professor of Education
B.S.Ed., Salem Teachers College, 1960;
M.Ed., Boston University, 1962; Ed.D.,
ibid., 1968. Appointed 1968.

Meeker, Loren David

Associate Professor of Mathematics
B.A., Oregon State University, 1959; B.S.,
ibid., 1959; M.S., Stanford University,
1962; Ph.D., *ibid.*, 1965; M.Sc., University
of Aston, England, 1969. Appointed 1970.

Melvin, Donald W.

Associate Professor of Electrical Engineering
B.S., University of New Hampshire, 1955;
M.E., Yale University, 1957; Ph.D., Syra-
cuse University, 1970. Appointed 1957.

Menge, Carleton P.

Professor of Education
B.S., Springfield College, 1939; M.A., Uni-
versity of Chicago, 1940; Ph.D., *ibid.*, 1948.
Appointed 1948.

Mennel, Robert M.

Associate Professor of History
B.A., Denison University, 1960; M.A., Ohio
State University, 1965; Ph.D., *ibid.*, 1969.
Appointed 1969.

Merritt, Richard D.

Associate Professor of The Arts
Certificate, Rochester Institute of Tech-
nology, 1948. Appointed 1948.

Merton, Andrew H.

Instructor in English
B.A., University of New Hampshire, 1967.
Appointed 1972.

Messier, Victor R.

Instructor in Home Economics
B.P.E., University of Alberta, 1962; M.S.,
ibid., 1965; Ph.D., Pennsylvania State Uni-
versity, 1973. Appointed 1970.

Metcalfe, Theodore G.

Professor of Microbiology
B.S., Massachusetts College of Pharmacy,
1940; Ph.D., University of Kansas, 1950.
Appointed 1956.

Miaoulis, George

*Assistant Professor of Business
Administration*
B.S., New York University, 1965; M.B.A.,
ibid., 1969; Ph.D., *ibid.*, 1973. Appointed
1973.

Michael, Joseph E., Jr.

Lecturer in Law, Whittemore School
A.B., Dartmouth College, 1948; LL.B.,
Boston University School of Law, 1950.
Appointed 1960.

Miller, Edmund G.

Professor of English
A.B., Dartmouth College, 1943; M.A., Col-
umbia University, 1947; Ph.D., *ibid.*, 1955.
Appointed 1951.

Miller, Elsilyn B.

*Instructor of Occupational Therapy
(Pre-clinical)*

B.S., McGill University, 1963. Appointed 1973.

Mills, Betty J.

Assistant Professor of Physical Education

B.S., Georgia State College for Women, 1949; M.S., University of Tennessee, 1958. Appointed 1967.

Mills, Eugene S.

Provost and Professor of Psychology

A.B., Earlham College, 1948; M.A., Claremont Graduate, 1949; Ph.D., *ibid.*, 1952. Appointed 1962.

Mills, Richard L.

Associate Professor of Economics and Business Administration

B.S., Rose Polytechnic Institute, 1962; M.A., Indiana University, 1964; Ph.D., *ibid.*, 1967. Appointed 1967.

Milne, Lorus J.

Professor of Zoology

B.A., University of Toronto, 1933; M.A., Harvard University, 1934; Ph.D., *ibid.*, 1936. Appointed 1948.

Mitchell, James R.

Associate Professor of Plant Science and Extension Agronomist, Forage Crops

B.S., University of New Hampshire, 1957; M.S., Pennsylvania State University, 1960; Ph.D., *ibid.*, 1969. Appointed 1963.

Mittelstaedt, Arthur H.

Visiting Lecturer in Recreation and Parks

B.S., New York State College of Forestry, Syracuse University, 1958; M.A., New York University Graduate School of Public Administration, 1963. Appointed 1971.

Mooradian, Andrew T.

Director, Department of Intercollegiate Athletics, and Associate Professor of Physical Education

B.S., University of New Hampshire, 1948; M.S., Boston University, 1958. Appointed 1950.

Moore, Asher

Donald C. Babcock Professor of Philosophy
A.B., Wesleyan University, 1940; M.A., Harvard University, 1942; Ph.D., *ibid.*, 1948. Appointed 1961.

Moore, Berrien, III

Assistant Professor of Mathematics

B.S., University of North Carolina, 1963; Ph.D., University of Virginia, 1969. Appointed 1969.

Moore, Donald A.

Adjunct Professor Whittemore School; Director, Center for Industrial and Institutional Development

B.S., Wayne State University, 1952. Appointed 1969.

Morgan, Joyce V.

Lecturer in Russian

B.A., Manhattanville College, 1961; M.A., Yale University, 1965. Appointed 1973.

Morin, Robert R.

Assistant Professor, Coordinator Cooperative Library Service

B.A., University of New Hampshire, 1963; M.S., Simmons College, 1965. Appointed 1965.

†**Morris, Douglas E.**

Assistant Professor of Resource Economics

B.S., Oklahoma State University, 1968; M.S., *ibid.*, 1969; Ph.D., *ibid.*, 1973. Appointed 1972.

Morrison, James D.

Professor of Chemistry

B.S., Franklin and Marshall College, 1958; Ph.D., Northwestern University, 1963. Appointed 1965.

Morrison, Jean M.

Assistant Professor of Physical Education

B.A., University of Kentucky, 1956; M.A., Mills College, 1962. Appointed 1965.

Mosberg, William

Associate Professor of Mechanical Engineering

B.S.M.E., Columbia University, 1956; M.Eng., Yale University, 1960. Appointed 1958.

Mott, Basil J. F.

Dean, School of Health Studies, and Professor of Health Services Administration and Planning

A.B., Amherst College, 1949; M.P.A., John F. Kennedy School of Government, Harvard University, 1953; Ph.D., Harvard University, 1967. Appointed 1973.

Mower, Lyman

Professor of Physics

B.S., University of California, 1949; Ph.D., Massachusetts Institute of Technology, 1953. Appointed 1957.

Mulhern, John E., Jr.

Professor of Physics

B.S., Oklahoma Agricultural and Mechanical College, 1948; M.A., Boston University, 1949; Ph.D., *ibid.*, 1954. Appointed 1954.

Munroe, M. Evans

Professor of Mathematics

B.A., University of Texas, 1940; Sc.M., Brown University, 1941; Ph.D., *ibid.*, 1945. Appointed 1959.

Murdoch, Joseph B.

Professor of Electrical Engineering

B.S., Case Institute of Technology, 1950; M.S., University of New Hampshire, 1955; Ph.D., Case Institute of Technology, 1962. Appointed 1952.

Murray, Donald M.

Professor of English

B.A., University of New Hampshire, 1948. Appointed 1963.

Murray, Frederick P.

Associate Professor of Communication Disorders

B.A., Stanford University, 1948; M.A., University of Southern California, 1950; Ph.D., Denver University, 1966. Appointed 1966.

Myers, Norman W.

Vice President-Treasurer

B.S., University of New Hampshire, 1950. Appointed 1953.

Neff, John C.

Lecturer in Medical Technology

B.S., St. Joseph College, 1959; M.D., St. Louis University, 1963. Appointed 1972.

Nevin, John A.

Professor of Psychology

B.E., Yale University, 1954; M.A., Columbia University, 1961; Ph.D., *ibid.*, 1963. Appointed 1972.

Newman, Jane E.

Dean of Students

B.A., Saint Joseph's College, 1967; M.Ed., Pennsylvania State University, 1969. Appointed 1969.

Nicholls, Diane

Lecturer and Coach in Physical Education
B.S., University of New Hampshire, 1973. Appointed 1973.

Nicoloff, Philip L.

Professor of English

B.A., University of California at Los Angeles, 1949; M.A., Columbia University, 1952; Ph.D., *ibid.*, 1959. Appointed 1954.

Nielsen, John P.

Associate Professor of Civil Engineering

B.S., San Jose State College, 1957; M.S.C.E., University of Wyoming, 1958; Ph.D., Colorado State University, 1961. Appointed 1969.

Nielson, Melville

Associate Dean of the College of Liberal Arts and Associate Professor of Sociology
B.S., Bowling Green State University, 1942; M.A., Ohio State University, 1947; Ph.D., *ibid.*, 1955. Appointed 1950.

Nordell, Lawrence P.

Visiting Associate Professor in Economics

A.B., University of California at Berkeley, 1963; Ph.D., *ibid.*, 1967. Appointed 1972.

Nordgren, Eric A.

Associate Professor of Mathematics

B.Ch.E., Polytechnic Institute of Brooklyn, 1956; Ph.D., University of Michigan, 1964. Appointed 1964.

Norton, Robert C.

Assistant Coach and Lecturer in Physical Education

B.A., Rutgers University, 1965. Appointed 1970.

O'Connell, Lawrence W.

Associate Professor of Political Science

B.A., University of New Hampshire, 1956; Ph.D., Syracuse University, 1968. Appointed 1966.

O'Connor, J. David

Assistant Football Coach and Lecturer in Physical Education

B.A., University of New Hampshire, 1967; M.Ed., Boston State College, 1971. Appointed 1972.

O'Connor, James T., Jr.

Lecturer in Animal Science and Extension Animal Scientist

D.V.M., University of Pennsylvania, 1941. Appointed 1969.

O'Donnell, Dorothy C.

Associate Professor of Home Economics and Extension Interior Design Specialist
B.S., Cornell University, 1946; M.S., University of Wisconsin, 1952; M.S., *ibid.*, 1955. Appointed 1961.

Olsen, James H.

Associate Professor, Assistant to the Librarian
B.A., George Washington University, 1962; M.L.S., University of Maryland, 1966. Appointed 1970.

***Olson, David P.**

Associate Professor of Wildlife Ecology, Extension Wildlife Specialist
B.S., University of Minnesota, 1954; M.S., University of Maine, 1958; Ph.D., University of Minnesota, 1964. Appointed 1964.

O'Neil, C. Michael

Director, Recreation and Student Activities, and Lecturer in Recreation and Parks
B.S., Keene State College, 1966. Appointed 1971.

Orkin, Eric B.

Instructor in Hotel Administration
B.S., Cornell University, 1968; M.B.A., University of Pennsylvania, 1970. Appointed 1973.

Owens, Charles W.

Associate Professor of Chemistry
B.S., Colorado College, 1957; Ph.D., University of Kansas, 1963. Appointed 1963.

Palmer, Stuart H.

Professor of Sociology
B.A., Yale College, 1949; M.A., Yale University, 1951; Ph.D., *ibid.*, 1955. Appointed 1955.

Paul, Nicholas L.

Assistant Professor of Occupational Education
B.S., North Carolina State University, 1961; M.Ed., *ibid.*, 1968; Ed.D., *ibid.*, 1973. Appointed 1973.

Peck, Rhoda M.

Assistant Professor of Home Economics and 4-H Program Specialist
B.S., New York University College for Teachers, 1955; M.S., University of Maryland, 1968. Appointed 1968.

***†Peirce, Lincoln C.**

Professor of Plant Science
B.S., Cornell University, 1952; Ph.D., University of Minnesota, 1958. Appointed 1964.

Perkins, Jane E.

Adjunct Lecturer in Medical Technology
A.A., Green Mt. Jr. College, 1953; B.S., University of New Hampshire, 1969; M.T. (ASCP), 1954. Appointed 1972.

Perkins, Marjorie E.

Lecturer in Zoology
B.A., Bates College, 1941; M.Ed., University of New Hampshire, 1968. Appointed 1973.

Peters, Dwight R.

Intercollegiate Athletics Assistant Coach and Lecturer in Physical Education
B.S., University of New Hampshire, 1972. Appointed 1972.

Peters, Joan A.

Assistant Professor of Home Economics and Program Leader, Consumer Education and Information
B.Sc., Acadia University, 1953; M.S., Pennsylvania State University, 1955. Appointed 1960.

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Associate Professor of Soil and Water Science
B.S., Kansas State College, 1948; M.S., Purdue University, 1950; Ph.D., Rutgers University, 1957. Appointed 1957.

Petillo, Juliette D.

Assistant Professor of Nursing
B.S.N., St. Anselm's College School of Nursing, 1961; M.S.N., Boston University, 1973. Appointed 1973.

Petroski, Joseph J.

Associate Professor of Education
B.A., University of New Hampshire, 1947; M.Ed., *ibid.*, 1952; Ed.D., Harvard University, 1960. Appointed 1964.

Pfanner, Helmut F.

Associate Professor of German
Teaching Credential, Teachers Training College, Austria, 1952; M.A., Stanford University, 1961; Ph.D., *ibid.*, 1965. Appointed 1969.

Pierce, Robert S.

Adjunct Associate Professor of Forest Resources and Soil and Water Science
B.S., University of Michigan, 1949; M.S., University of Wisconsin, 1952; Ph.D., *ibid.*, 1957. Appointed 1967.

Pilar, Frank L.

Professor of Chemistry
B.S., University of Nebraska, 1951; M.S., *ibid.*, 1953; Ph.D., University of Cincinnati, 1957. Appointed 1957.

Pine, Gerald J.

Professor of Education
A.B., Boston College, 1955; M.Ed., *ibid.*, 1957; Ed.D., Boston University, 1963. Appointed 1966.

Piotrowski, Thaddeus M.

Assistant Professor Sociology, Merrimack Valley Branch
B.A., St. Francis College, 1963; M.A., University of Pennsylvania, 1972; Ph.D., *ibid.*, 1973. Appointed 1973.

Pistole, Thomas

Assistant Professor of Microbiology
Ph.B., Wayne State University, 1964; M.S., *ibid.*, 1966; Ph.D., University of Utah, 1969. Appointed 1971.

Pokoski, John L.

Associate Professor of Electrical Engineering
B.S., St. Louis University, 1959; M.S., Arizona State University, 1965; Ph.D., Montana State University, 1967. Appointed 1967.

Polk, Keith

Associate Professor of Music
B.A., San Diego State College, 1956; M.M., University of Wisconsin, 1958; Ph.D., University of California at Berkeley, 1968. Appointed 1964.

Poll, Solomon

Professor of Sociology
B.S., Temple University, 1955; M.A., University of Pennsylvania, 1957; Ph.D., *ibid.*, 1960. Appointed 1964.

†Pollard, James E.

Assistant Professor of Plant Science
A.B., Duke University, 1965; Ph.D., University of Florida, 1969. Appointed 1970.

Porter, Clarence A.

Assistant Vice Provost for Academic Affairs and Adjunct Associate Professor of Zoology
B.S., Portland State University, 1962; M.S., Oregon State University, 1964; Ph.D., Oregon State University, 1966. Appointed 1972.

Post, Donald E.

Thompson School Lecturer in Applied Plant Science
B.S., University of New Hampshire, 1972. Appointed 1973.

Potter, Hugh M., III

Assistant Professor of English
A.B., Union College, 1954; M.A., University of North Carolina, 1957; Ph.D., University of Minnesota, 1965. Appointed 1962.

Powell, Stephen Alonzo

Assistant Professor and Special Collections Librarian
B.A., Hamilton College, 1955; M.S.L.S., Rutgers University, 1961. Appointed 1974.

Prince, Allan B.

Vice Provost for Budget and Administration and Professor of Soil and Water Science
B.S., Rutgers University, 1947; Ph.D., *ibid.*, 1950. Appointed 1954.

Pritchard, Hugh C.

Professor, Reference Librarian
B.A., University of Washington, 1939; M.A., University of North Carolina, 1942; M.S., Columbia University, 1950. Appointed 1954.

Puth, Robert C.

Assistant Professor of Economics
B.A., Carleton College, 1958; M.A., Northwestern University, 1965; Ph.D., *ibid.*, 1967. Appointed 1967.

Radow, James

Professor of Applied Mathematics
B.A., City College, New York, 1943; Sc.M., Brown University, 1945; Ph.D., New York University, 1957. Appointed 1965.

Ragonese, Carmen D.

Director of Alumni Affairs
B.A., University of New Hampshire, 1949; M.S., Air Force Institute of Technology, 1965. Appointed 1973.

Rasmussen, Mary H.

Associate Professor of Music

B.A., University of New Hampshire, 1952; M.M., University of Illinois, 1953; M.L.S., *ibid.*, 1956. Appointed 1968.

Reed, Robert C.

Associate Professor, Order Librarian

B.A., Hartwick College, 1953; M.A.L.S., University of Michigan, 1960. Appointed 1960.

†**Reeves, Roger Marcel**

Associate Professor of Entomology and Forest Resources

B.S., S.U.N.Y., College of Forestry, Syracuse University, 1957; M.S., Cornell University, 1961; Ph.D., S.U.N.Y., College of Forestry, Syracuse University, 1964. Appointed 1964.

Rehder, Robert M.

Assistant Professor of English

B.A., Princeton University, 1957; M.A., *ibid.*, 1962; Ph.D., *ibid.*, 1970. Appointed 1974.

Reid, Samuel R.

Professor of Business Administration and Economics

B.S., St. Louis University, 1950; M.S., *ibid.*, 1959; Ph.D., *ibid.*, 1962. Appointed 1969.

†**Repka, Frank J.**

Assistant Professor of Animal Science

B.S., University of Toledo, 1967; Ph.D., Cornell University, 1972. Appointed 1972.

Resch, John P.

Assistant Professor of History, Merrimack Valley Branch

B.A., Denison University, 1962; M.A., Ohio State University, 1965; Ph.D., Ohio State University, 1969. Appointed 1972.

Reyna, Stephen P.

Assistant Professor of Anthropology

A.B., Columbia College, 1965; Ph.D., Columbia University, 1972. Appointed 1973.

Rich, Avery E.

Professor of Plant Pathology and Associate Dean, College of Life Sciences and Agriculture

B.S., University of Maine, 1937; M.S., *ibid.*, 1939; Ph.D., State College of Washington, 1950. Appointed 1941-43, 1951.

Richardson, John C.

Professor of English

A.B., Dartmouth College, 1941; M.A., Columbia University, 1942; Ph.D., Boston University, 1959. Appointed 1946.

Rilling, Jean M.

Lecturer and Coach in Physical Education

Degree, University of Liverpool, 1955. Appointed 1967.

Ringrose, Richard C.

Professor of Animal Science

B.S., Cornell University, 1932; Ph.D., *ibid.*, 1936. Appointed 1942.

Roberts, Lewis, Jr.

Thompson School Associate Professor of Applied Science and Director of Thompson School of Applied Science

B.A., Brown University, 1959; M.Ed., Auburn University, 1970; Ed.D., *ibid.*, 1972. Appointed 1972.

Robinson, Frederick J.

Associate Director, Merrimack Valley Branch and Assistant Professor of Mathematics

B.S., University of New Hampshire, 1949; M.A., *ibid.*, 1955. Appointed 1949.

Roelof, Edmond C.

Assistant Professor of Physics

A.B., University of California, Los Angeles, 1959; Ph.D., University of California, Berkeley, 1966. Appointed 1971.

Rogers, Ada-Louise H.

Assistant Professor of Music

B.A., B.M., Brenau College, 1944; M.S., Juilliard School of Music, 1949. Appointed 1967.

Rogers, John E.

Associate Professor of Music

B.A., B.M., University of Georgia, 1960; M.M., Yale University, 1962; M.F.A., Princeton University, 1966. Appointed 1967.

†**Rogers, Owen M.**

Professor of Plant Science

B.V.A., University of Massachusetts, 1952; M.S., Cornell University, 1954; Ph.D., Pennsylvania State University, 1959. Appointed 1959.

Rohrabacher, Evelyn H.
Thompson School Assistant Professor of Communications
B.A., St. Joseph College, 1941; M.A., University of South Florida, 1968. Appointed 1971.

Romoser, George K.
Professor of Political Science
A.B., Rutgers University, 1951; A.M., University of Chicago, 1954; Ph.D., *ibid.*, 1958. Appointed 1961-62, 1967.

Rose, Alan H.
Assistant Professor of English
B.A., University of Pennsylvania, 1960; M.A., New York University, 1961; Ph.D., Indiana University, 1970. Appointed 1969.

Rosen, Sam
Professor of Economics
A.B., University of Wisconsin, 1942; A.M., Harvard University, 1948; Ph.D., *ibid.*, 1952. Appointed 1957.

Rosenbush, Michael J.
Assistant Professor of Russian
B.A., McGill University, 1957; M.A., Université de Montreal, 1964; Ph.D., *ibid.*, 1970. Appointed 1972.

Rosoff, Nina
Assistant Professor in the Whittemore School
B.A., Scripps College, 1965; M.S.W., University of Michigan, 1966; Ph.D., Case Western Reserve University, 1972. Appointed 1973.

Ross, Shepley L.
Professor of Mathematics
A.B., Boston University, 1949; A.M., *ibid.*, 1950; Ph.D., *ibid.*, 1953. Appointed 1955.

Rothwell, Kenneth J.
Professor of Economics
B.A., University of Western Australia, 1949; M.A., *ibid.*, 1955; Ph.D., Harvard University, 1961. Appointed 1963.

Rouman, John C.
Associate Professor of Classics
B.A., Carleton College, 1950; M.A., Columbia University, 1951; Ph.D., University of Wisconsin, 1965. Appointed 1965.

†**Routley, Douglas G.**
Professor of Plant Science
B.S.A., University of British Columbia, 1952; M.S., Pennsylvania State University, 1953; Ph.D., *ibid.*, 1957. Appointed 1957.

Rupp, Nancy C.
Assistant Professor of Physical Education
B.S., Sargent College, Boston University, 1950; M.A., State University of Iowa, 1955. Appointed 1970.

Rutman, Darrett B.
Professor of History
A.B., University of Illinois, 1950; Ph.D., University of Virginia, 1959. Appointed 1968.

Sabatelli, Philip J.
Assistant Professor of Speech and Drama
B.A., Temple University, 1964; M.A., *ibid.*, 1966; Ph.D., *ibid.*, 1970. Appointed 1969.

Samuels, Fred
Associate Professor of Sociology
B.S., City College of New York, 1950; M.A., University of Hawaii, 1963; Ph.D., University of Massachusetts, 1966. Appointed 1966.

Sandberg, John R.
Director of Development
B.A., University of Nebraska, 1942; M.B.A., Harvard University, 1943. Appointed 1968.

Sandler, Mel
Associate Professor of Hotel Administration
B.S., Georgetown University, 1941; M.A., Northwestern University, 1947; C.P.A. Appointed 1970.

Sasner, John J., Jr.
Associate Professor of Zoology
B.A., University of New Hampshire, 1957; M.S., *ibid.*, 1959; Ph.D., University of California, 1965. Appointed 1965.

Savage, Eugene Arnold
Director of Admissions
B.Ed., Plymouth State College, 1958; M.Ed., Boston University, 1963. Appointed 1967.

Savage, Godfrey H.
Professor of Mechanical Engineering
B.S.E., Princeton University, 1950; M.S., Stanford University, 1951; M.B.A., Harvard University, 1954; Engr., Stanford University, 1963; Ph.D., *ibid.*, 1970. Appointed 1965.

Sawyer, Albert K.
Professor of Chemistry
A.B., Colby College, 1940; M.S., University of Maine, 1947. Appointed 1949.

Sawyer, Philip J.

Professor of Zoology

B.S., University of New Hampshire, 1940; M.S., *ibid.*, 1948; Ph.D., University of Michigan, 1956. Appointed 1952.

Scharff, Robert C.

Assistant Professor of Philosophy

A.B., University of Illinois, 1960; Ph.D., Northwestern University, 1970. Appointed 1970.

Schibanoff, Susan

Assistant Professor of English

B.A., Cornell University, 1966; M.A., University of California at Los Angeles, 1967; Ph.D., *ibid.*, 1971. Appointed 1971.

Schickedanz, David I.

Assistant Professor of Psychology

B.S., University of Illinois, 1967; M.A., *ibid.*, 1970; Ph.D., University of Illinois at Champaign-Urbana, 1973. Appointed 1973.

Schickedanz, Judith

Assistant Professor of Home Economics

B.S.Ed., University of Illinois, 1967; M.S., *ibid.*, 1969; Ph.D., *ibid.*, 1973. Appointed 1973.

Schmidt, Marty J.

Assistant Professor of Psychology

B.S., Purdue University, 1968; M.S., *ibid.*, 1970; Ph.D., *ibid.*, 1972. Appointed 1972.

Schneer, Cecil J.

Professor of Geology

A.B., Harvard University, 1943; A.M., *ibid.*, 1949; Ph.D., Cornell University, 1954. Appointed 1950, 1954.

Schomaker, Linda

Instructor in Home Economics

B.S., State University of New York at Plattsburg, 1967; M.A., University of Connecticut, 1968. Appointed 1972.

†**Schreiber, Richard W.**

Professor of Botany

B.S., University of New Hampshire, 1951; M.S., *ibid.*, 1952; Ph.D., University of Wisconsin, 1955. Appointed 1957.

Schreiner, Ernst J.

Adjunct Professor of Forest Genetics

B.S., Syracuse University, 1926; Ph.D., Columbia University, 1930. Appointed 1964.

Schwarz, Marc L.

Associate Professor of History

A.B., Bates College, 1959; A.M.T., Harvard University, 1960; Ph.D., University of California at Los Angeles, 1965. Appointed 1967.

Scott, William H.

Thompson School Assistant Professor of Applied Business Management

B.S., Drexel Institute of Technology, 1961; M.Ed., University of New Hampshire, 1973. Appointed 1970.

Searls, Maryse P.

Instructor in The Arts

B.F.A., Cleveland Institute of Art, 1971; M.F.A., Alfred University, 1973. Appointed 1973.

Sears, William R.

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B.S., University of New Hampshire, 1973. Appointed 1973.

Seiler, David E.

Assistant Professor of Music

B.M. University of Wisconsin, 1961; M.M., *ibid.*, 1965. Appointed 1972.

Shapiro, Howard M.

Assistant Professor of Sociology

B.A., Brandeis University, 1964; M.A., Boston University, 1966; Ph.D., University of Minnesota, 1969. Appointed 1969.

Shar, Albert O.

Assistant Professor of Mathematics

B.A., Brandeis University, 1965; M.A., Fordham University, 1966; Ph.D., University of Pennsylvania, 1970. Appointed 1971.

Shaw, Winifred C.

Associate Professor of The Arts

B.S., Iowa State College, 1945; M.F.A., Cranbrook Academy of Art, 1953. Appointed 1954.

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Associate Professor of Physics

B.S., University of Illinois, 1960; M.S., California Institute of Technology, 1962; Ph.D., *ibid.*, 1966. Appointed 1969.

Sherman, Heidemarie C.

Assistant Professor of Economics

B.A., Wayne State University, 1962; M.A., *ibid.*, 1965; Ph.D., *ibid.*, 1970. Appointed 1967.

Sherman, James L.

Assistant Professor of German

B.A., Wayne State University, 1959; M.A., Middlebury College, 1961; M.A., University of Michigan, 1965; Ph.D., *ibid.*, 1969. Appointed 1967.

Shigo, Alex L.

Adjunct Professor of Plant Pathology

B.S., Waynesburg College, 1956; M.S., West Virginia University, 1958; Ph.D., *ibid.*, 1959. Appointed 1966.

Shor, Ronald E.

Professor of Psychology

B.A., Brandeis University, 1953; M.A., Kansas University, 1955; Ph.D., Brandeis University, 1960. Appointed 1967.

Shore, Samuel D.

Associate Professor of Mathematics

B.S., Juniata College, 1959; M.S., Pennsylvania State University, 1961; Ph.D., *ibid.*, 1964. Appointed 1965.

Siddall, David V.

Assistant Professor of English

B.A., Dartmouth College, 1953; M.A., Columbia University, 1960; Ph.D., Indiana University, 1970. Appointed 1965.

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Assistant Professor of Occupational Therapy

B.S., University of New Hampshire, 1951; M.Ed., University of Vermont, 1971. Appointed 1972.

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Professor of Mathematics

B.S., University of Chicago, 1947; M.S., *ibid.*, 1948; Ph.D., University of Illinois, 1952. Appointed 1962.

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Assistant Professor of English

B.A., New York University, 1967. Appointed 1973.

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B.S., University of Rochester, 1955; M.A., Harvard, 1956; Ph.D., *ibid.*, 1960. Appointed 1963.

Sims, Wilburn L.

Assistant Professor of Speech and Drama

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Certificate in Machine Design, Wentworth
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A.A.S., School for American Craftsmen at
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sity of Illinois, 1966; Ph.D., *ibid.*, 1969.
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sity of California at Berkeley, 1964. Ap-
pointed 1973.

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1962.

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1967; M.S.W., University of Michigan, 1970.
Appointed 1972.

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Associate Professor of French
B.A., Princeton University, 1951; M.A.,
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ton University, 1965. Appointed 1971.

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B.S., University of New Hampshire, 1937;
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ibid., 1947; Ph.D., *ibid.*, 1954. Appointed
1953.

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Appointed 1957.

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1962. Appointed 1971.

Wang, Tung-Ming

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B.S.C.E., National Chiao-Tung University,
1945; M.S.C.E., University of Missouri,
1954; Ph.D., Northwestern University,
1960. Appointed 1961.

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Technology*
B.S., University of New Hampshire, 1947;
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Springfield College, 1965. Appointed 1970.

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Diploma of Nursing, Hospital of the Univer-
sity of Pennsylvania, 1961; B.S.N., Univer-
sity of Pennsylvania, 1966; M.P.H., Johns
Hopkins School of Hygiene and Public
Health, 1969. Appointed 1972.

Watson, Deborah

Assistant Professor, Cataloger
B.A., University of New Hampshire, 1963;
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1972. Appointed 1967.

Watson, Robert I.

Professor of Psychology
A.B., Dana College, 1933; A.M., Columbia
University, 1935; Ph.D., *ibid.*, 1938. Ap-
pointed 1967.

Wear, Louise F.

Lecturer in Music
B.M., Oberlin Conservatory, 1940. Ap-
pointed 1972.

Wear, Robert E.

Associate Professor of Physical Education
B.A., Oberlin College, 1941; M.A., Univer-
sity of Michigan, 1951; Ph.D., *ibid.*, 1955.
Appointed 1964.

Webb, Dwight

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B.A., University of Redlands, 1955; M.A.,
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Webber, Laurance E.

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B.S., University of New Hampshire, 1934;
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Webber, William R.

Professor of Physics
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Iowa, 1955; Ph.D., *ibid.*, 1957. Appointed
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Weber, James H.

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Ohio State University, 1963. Appointed
1963.

- Weber, Stephen J.**
Assistant Professor of Psychology and Sociology
 H.A.B., Xavier University, 1967; M.A., Northwestern University, 1969; Ph.D., *ibid.*, 1971. Appointed 1971.
- Weeks, Silas B.**
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 B.S., Cornell University, 1937. Appointed 1954.
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 B.S., New York State College, 1957; M.S., Pennsylvania State University, 1958; Ph.D., *ibid.*, 1964. Appointed 1964.
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- West, James R.**
Instructor in Music
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- West, Paul T. (Major, USAF)**
Lecturer, Aerospace Studies
 B.S., Boston University, 1960; M.A., Troy State University, 1972. Appointed 1972.
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 B.S., West Virginia University, 1947; M.S., *ibid.*, 1949; Ph.D., *ibid.*, 1951. Appointed 1950.
- Wheeler, Douglas L.**
Associate Professor of History
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- Wheeler, Ellsworth H., Jr.**
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Danko, Thomas

Extension Area Agent, Poultry Management; Cheshire, Hillsborough, and Merrimack Counties and assistance in all counties

B.S., University of Massachusetts, 1952; M.S., University of New Hampshire, 1968.

Appointed 1957.

Dillon, Kathleen

4-H Youth Development Agent Merrimack County

B.S., University of New Hampshire. Appointed 1973.

Dodge, Arthur G., Jr.

Extension Area Forester, RC & D

A.A., Boston University, 1950; B.S., in For., University of Massachusetts, 1953; M.S.F., Harvard University, 1961. Appointed 1960.

Ellison, Daniel G.

Extension Area Agent, Resource Development

B.A., University of New Mexico, 1970. Appointed 1972.

Fabrizio, Richard F.

4-H Youth Development Agent, Grafton County

B.V.A., University of Massachusetts, 1959. Appointed 1965.

Farrey, Judith E.

4-H Program Assistant, Cheshire County

B.S., Tufts University, 1958. Appointed 1973.

***Ferguson, John R., Jr.**

Forester, Cheshire County

B.S., University of New Hampshire, 1960. Appointed 1965.

Finlay, Diane H.

4-H Youth Development Agent

B.S., University of New Hampshire, 1971.

Appointed 1973.

†Fiske, Paul R.

State Leader of Community Development

B.S., University of Maine, 1961; M.S., Michigan State University, 1968. Appointed 1971.

Foster, Lenette N.

Extension Agent, Nutrition Education

B.S., Colorado State University, 1954.

Appointed 1972.

Garland, Lynn B.

4-H Youth Development Agent, Rockingham County

B.S., University of Maryland, 1969. Appointed 1969.

George, Ernest A.

Extension Area Agent, Dairy; Cheshire, Hillsborough, Rockingham, and Strafford Counties

B.S., University of New Hampshire, 1951. Appointed 1955.

Gilman, Francis E.

Extension Agricultural Engineer

B.S., University of Maine, 1958. Appointed 1969.

Goss, Martha L.

Program Coordinator, EFNEP

B.S., Purdue University, 1966; M.A., Michigan State University, 1969. Appointed 1970.

Grass, Carolyn K.

Extension Agent, Nutrition Education

B.A., University of New Hampshire, 1955. Appointed 1972.

Grady, James E.

Country 4-H Youth Development Agent, Belknap County

B.S., University of New Hampshire, 1972. Appointed 1972.

Gundry, Barbara C.

Extension Home Economist, Nutrition, Hillsborough County

B.A., Ohio Wesleyan University, 1952. Appointed 1971.

Halford, Nicholas S.

Urban 4-H Agent, Manchester

B.S., Michigan State University, 1966.
Appointed 1973.

Head, Ivan E.

4-H Youth Development Agent, Sullivan County

B.S., University of New Hampshire, 1951;
M.Ag.Ed., *ibid.*, 1959. Appointed 1963.

Howe, Gerald W.

Agricultural Agent, Strafford County

B.S., University of Massachusetts, 1970;
M.S., *ibid.*, 1972. Appointed 1972.

Kendall, Shirley M.

Extension Home Economist, Cheshire County

B.S., Nason College, 1945. Appointed 1968.

Kennedy, Kevin B.

Extension Area Agent, Dairy; Grafton and Coos Counties

B.S.A., Ontario Agricultural College, 1949.
Appointed 1955.

Kincade, Merle F.

Extension Home Economist, Belknap County

B.E., Keene State College, 1945. Appointed 1971.

Kinder, Richard G.

Associate Forester, Grafton County

B.S., University of New Hampshire, 1960.
Appointed 1971.

Knoop, William E.

Extension Turfgrass Specialist, Plant Science

B.S., Iowa State University, 1965; M.S.A.,
University of Florida, 1969. Appointed 1970.

Knowles, Stanley W.

Forester, Rockingham County

B.S., University of New Hampshire, 1959;
M.S., *ibid.*, 1970. Appointed 1961.

Knox, Harry B.

4-H Youth Development Agent, Rockingham County

B.S., University of New Hampshire, 1950.
Appointed 1954.

***Leighton, Roger S.**

State Leader Forestry and CFM Supervisor

B.S., University of New Hampshire, 1941.
Appointed 1952.

Lessard, Carol C.

Extension Home Economist, Sullivan County

B.S., Seton Hill College, 1964; M.S., Hunter
College of New York University, 1972.
Appointed 1972.

Lord, Carleton R.

4-H Youth Development Agent, Carroll County

B.S., University of New Hampshire, 1964;
M.S., Pennsylvania State University, 1967.
Appointed 1970.

Lord, William G.

Agricultural Agent, Sullivan County

B.S., University of New Hampshire, 1970;
M.S., University of Massachusetts, 1972.
Appointed 1973.

Lovering, Edith L.

Extension Home Economist, Rockingham County

B.E., Keene State College, 1940. Appointed 1971.

Marple, Sylvia H.

Extension Nutrition Specialist

B.S., Winthrop College, 1963; M.S., *ibid.*,
1964. Appointed 1964.

Marriott, Bruce A.

Agricultural Agent, Belknap County

B.S., University of Massachusetts, 1964;
M.S., *ibid.*, 1971. Appointed 1973.

***Marty, Mamie**

Extension Home Economist, Strafford County

B.S., University of Wisconsin, 1942; M.S.,
ibid., 1965. Appointed 1964-68, 1968.

McGuire, Lena F.

Extension Home Economist, Belknap County

B.E., Keene State College, 1942. Appointed 1971.

McLaughlin, Winnifred D.

Extension Agent, Nutrition Education

B.S., Framingham State Teachers College,
1951. Appointed 1972.

Nickerson, D. Anne

Extension Housing Specialist

Cert. B. of Architecture, Smith Graduate
School of Architecture, 1940. Appointed 1963.

Nissen, Harriet J.

Extension Home Economist, Hillsborough County

B.S., Nason College, 1941; M.Ed., Cornell University, 1953. Appointed 1956.

Nordholm, Joel E., Jr.

Agricultural Agent, Grafton County

B.S., University of New Hampshire, 1950. Appointed 1970.

Patmos, Ray M., Jr.

County Forester, Coos County

B.S., University of New Hampshire, 1970. Appointed 1972.

***Piwowar, John S.**

Assistant Extension Dairy Specialist

B.S., Pennsylvania State University, 1968; M.S., *ibid.*, 1972. Appointed 1972.

Pohl, Peter W.

Forester, Carroll County

B.S., University of New Hampshire, 1966. Appointed 1969.

Pratt, Leighton C.

Agricultural Agent, Coos County

B.S., University of Vermont, 1951; M.S., University of Rhode Island, 1953. Appointed 1969.

Roberts, Clive E.

4-H Youth Development Agent, Coos County

B.A., Fort Lewis College, 1972. Appointed 1973.

Robie, Dwight A.

4-H Youth Development Agent, Merrimack County

B.S., University of New Hampshire, 1971. Appointed 1971.

Sargent, Leslie B., Jr.

Forester, Grafton County

B.S., University of New Hampshire, 1943. Appointed 1954.

Schroeder, Calvin E.

4-H Youth Development Agent, Strafford County

B.S., University of New Hampshire, 1967. Appointed 1969.

Scott, Donald H.

Forester, Belknap County

B.S., Michigan Technical University, 1956; M.S., University of Michigan, 1957. Appointed 1969.

Seavey, David C.

Agricultural Agent, Merrimack County

A.A.S., Thompson School of Agriculture, 1963; B.S., University of Rhode Island, 1966; M.S., University of New Hampshire, 1969. Appointed 1970.

Sorenson, David C.

Agricultural Agent, Carroll County

B.S., University of Rhode Island, 1964; M.S., *ibid.*, 1967. Appointed 1969.

Stevens, Robert A.

Program Specialist, 4-H

B.S., University of New Hampshire, 1937. Appointed 1955.

Stewart, Edwina P.

Extension Home Economist, Grafton County

B.S., Farmington State Teachers College, 1943. Appointed 1965.

Stimson, Ruth G.

Extension Home Economist, Rockingham County

B.S., University of New Hampshire, 1940; M.Ed., *ibid.*, 1944. Appointed 1942.

***Stocking, Marion I.**

Extension Home Economist, Carroll County

B.S., Simmons College, 1949; M.A., University of Connecticut, 1970. Appointed 1958.

***Szymujko, Joseph A.**

Forester, Sullivan County

B.S., University of New Hampshire, 1954. Appointed 1957.

***Thonney, Sarah L.**

4-H Development Agent, Hillsborough County

B.A., Washington State University, 1972. Appointed 1972.

***Upham, Edward F.**

Agricultural Agent, Rockingham County

B.S., University of Massachusetts, 1953; M.S., *ibid.*, 1954. Appointed 1960.

***Vashaw, Lois J.**

Extension Home Economist, Coos County

B.E., Framingham State College, 1972. Appointed 1972.

Walke, Raymond H.

Plant Scientist

B.S., Lehigh University, 1960; M.A.L.S., Wesleyan University, 1967. Appointed 1972.

Walker, Melissa
Program Specialist, 4-H
B.S., University of Rhode Island, 1960.
Appointed 1973.

Williams, Charles H.
Extension Area Agent, Ornaments
B.S., Pennsylvania State University, 1956;
M.S., Michigan State University, 1967.
Appointed 1969.

***Wood, Dorothy A.**
Extension Home Economist, Hillsborough County
B.S., Boston University, 1949. Appointed 1971.

***Wyman, Christine C.**
4-H Youth Development Agent, Strafford County
B.S., University of New Hampshire, 1944.
Appointed 1963.

Administrative Offices

Academic Affairs

David W. Ellis, *Vice Provost*

Academic Computing Activities

Jerry A. Warren, *Director*

Administrative and Computational Services

Roderick R. Ricard, Jr., *Director*

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Eugene A. Savage, *Director*

Affirmative Action

Eugene Franceware, *Acting Director*

Alumni Relations

Carmen Ragonese, *Director*

Auxiliary Enterprises

Montgomery Childs, *Director*

Bookstore

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Allan B. Prince, *Vice Provost*

Ronald Olmstead, *Budget Officer*

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Ralph G. Smallidge, *Controller*

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Center for Education Field Services

Jason E. Boynton, *Director*

Center for Emergency Planning and Operations

E. Warren Clarke, *Coordinator*

Center for Industrial and Institutional Development

Donald A. Moore, *Director*

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Rev. Lawrence Rouillard, *Campus Minister*

Rev. Edward W. Meury, Rev. Charles N. Gross, *Protestant*, Durham Community Church

Rev. Leon P. Gaulin and Rev. Joseph Desmond, *Catholic Chaplains*, Pastor St. Thomas More, Roman Catholic Church

Rev. Albert W. Snow, Rector, St. George's *Episcopal Church*

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Cooperative Extension Service

Maynard C. Heckel, *Director*

Counseling and Health Services

Peter Cimboric, *Director*

Counseling and Testing Center

Robert C. Congdon, *Director*

Dean of Students Office

Jane E. Newman, *Dean*

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Dining Services

Jane E. Griswold, *Director*

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Engineering Design and Analysis Laboratory

Godfrey H. Savage, *Director*

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Health Studies, School of

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Intercollegiate Athletics

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International Student Affairs

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Institutional Research and Planning

John B. Hraba, *Dean*

Jackson Estuarine Laboratory

Arthur C. Mathieson, *Director*

Liberal Arts, College of

Allan A. Spitz, *Dean*

Library

Donald E. Vincent, *Librarian*

**Life Sciences and Agriculture,
College of**

Harry A. Keener, *Dean*

Marine Science and Technology

E. Eugene Allmendinger, *Executive Officer*

Media Services

John D. Bardwell, *Director*

Merrimack Valley Branch

Gordon O. Thayer, *Director*

Roger S. Bernard, *Dean*

**New England Center for
Continuing Education**

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Arthur S. Adams, *Consultant*

Ombudsman

C. Robert Keeseey

Personnel Office

Sylvia Donahue, *Acting Director*

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Vincent E. Todd, *Director*

President's Office

Thomas N. Bonner, *President*

**Physical Plant Operation and
Maintenance**

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Provost

Eugene S. Mills

Public Administration Service

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Public Television, (WENH-TV)

Keith J. Nighbert, *Manager*

Publications

Emily K. Smith, *Director*

L. Franklin Heald, *University Editor*

Radiation Safety Officer

William Dotchin, *Radiation Safety Officer*

Recreation and Student Activities

Michael O'Neil, *Director*

Registration and Records

Leslie C. Turner, *Registrar*

Research and Special Programs**Administration**

Robert N. Faiman, *Vice Provost*

Reserve Officers Training Corps

Col. Vincent S. Cahill, Jr., *Professor of Aerospace Studies*

Lt. Col. Wilfred W. West, *Professor of Military Science*

Residential Life

David Bianco, *Director*

Resources Development Center

William F. Henry, *Chairman*

School of Continuing Studies

Maynard C. Heckel, *Dean*

Space Science Center

Roger L. Arnoldy, *Director*

Student Affairs

Richard F. Stevens, *Vice Provost*

Jane E. Newman, *Dean*

Summer Session

Edward J. Durnall, *Director*

System Personnel

Gary Wulf, *Director*

Technology, College of

Richard S. Davis, *Dean*

Thompson School of Applied Science

Lewis Roberts, Jr., *Director*

Treasurer's Office

Norman W. Myers, *V.P.—Treasurer*

W. Kent Martling, *Associate Treasurer*

University Relations

Peter Hollister, *Director*

Water Resources Research Center

Gordon L. Byers, *Director*

**Whittemore School of Business and
Economics**

Jan E. Clee, *Dean*

ENROLLMENT STATISTICS — FALL SEMESTER — DURHAM CAMPUS ONLY

	1970-1971	1971-1972	1972-1973	1973-1974	1970-1971	1971-1972	1972-1973	1973-1974	1970-1971	1971-1972	1972-1973	1973-1974
	Men				Women				Total			
Freshmen	1206	1085	1149	1134	1002	939	1039	942	2208	2024	2188	2076
Sophomores	1165	1195	1135	1204	909	976	999	1059	2074	2171	2134	2263
Juniors	1011	996	1068	1007	828	808	933	968	1839	1804	2001	1975
Seniors	751	852	950	1041	608	718	771	898	1359	1570	1721	1939
1st Year - T.S.A.S.	193	179	166	167	12	23	30	48	205	202	196	215
2nd Year - T.S.A.S.	83	125	122	135	5	9	24	40	88	134	146	175
Graduates - Master's	424	391	399	409	157	184	176	195	581	575	575	604
Graduates - Doctorates	167	186	168	191	45	54	49	45	212	240	217	236
Graduates - Unclassified	91	98	90	79	59	58	64	55	150	156	154	134
Special	72	60	43	54	47	48	53	47	119	108	96	101
Totals	5163	5167	5290	5421	3672	3817	4138	4297	8835	8984	9428	9718
Extension Credit Courses	666	785	806	760	678	748	687	755	1344	1533	1493	1515
Summer Session*	1970	1971	1972	1973	1970	1971	1972	1973	1970	1971	1972	1973
	1062	1141	1271	1508	973	1143	1388	1732	2035	2284	2659	3240

* Does not include Institutes and Special Summer Session in Technology.

ENROLLMENT STATISTICS — FALL SEMESTER — DURHAM CAMPUS ONLY

	1970-1971	1971-1972	1972-1973	1973-1974	1970-1971	1971-1972	1972-1973	1973-1974	1970-1971	1971-1972	1972-1973	1973-1974
Baccalaureate Curricula	Life Sciences and Agriculture				Liberal Arts				Technology			
Senior	119	171	246	365	824	946	971	841	162	162	152	254
Junior	171	216	324	364	1157	1059	1069	993	175	145	171	180
Sophomore	170	292	329	440	1337	1229	1244	1140	188	210	148	223
Freshman	245	237	402	347	1290	1213	1145	941	268	224	213	334
Total	705	916	1301	1516	4608	4447	4429	3915	793	741	684	991
Baccalaureate Curricula	Whittemore School				Health Studies							
Senior	143	181	201	249	111	110	151	230				
Junior	212	230	251	260	124	154	186	178				
Sophomore	208	224	243	262	171	216	170	198				
Freshman	182	158	223	254	223	192	205	200				
Total	745	793	918	1025	629	672	712	806				
Graduate Curricula*	Graduate School											
Master's	581	575	575	604								
Doctorates	212	240	217	236								
Unclassified	150	156	154	134								
Total	943	971	946	974								
Associate Degree Curricula*	Thompson School											
2nd Year	88	134	146	175								
1st Year	205	202	196	215								
Total	293	336	342	390								

* Graduate Curricula and Associate Degree Curricula should not be confused with any particular "college" column, they are separate entries.

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