1971

URI Undergraduate Course Catalog 1971-1972

University of Rhode Island

VOLUME LXVII, NUMBER 3, September 1971

Bulletin of the University of Rhode Island. Published quarterly by the University of Rhode Island, Kingston, Rhode Island 02881. Second-class postage paid at Wakefield, Rhode Island.

BULLETIN OF THE

UNIVERSITY OF RHODE ISLAND

1971-1972

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The University

The University of Rhode Island is a coeducational institution supported by the state of Rhode Island and founded in 1892 as one of the land-grant colleges. It is located in the village of Kingston, in historic "South County," 30 miles south of Providence and six miles from the ocean.

The function of a university is the discovery and dissemination of truth. The University of Rhode Island carries out this function through its activities in the three major areas of instruction, research, and extension. To enable it to do so most effectively, the University has given support to the principle of freedom in inquiry and expression for both faculty and students, pointing out, however, that such academic freedom carries with it duties correlative with rights. The University holds that the common good depends upon the free search for truth and its free exposition.

Consistent with the University's land-grant tradition, preparation for a life's work and for intelligent and responsible citizenship are major goals of instruction.

All programs aim at a balance of studies in the natural and social sciences, the humanities, and professional subjects.

Undergraduate students may earn a Bachelor of Science degree in any one of the seven colleges of the University. Study in the College of Arts and Sciences may also lead to the degree of Bachelor of Arts, Bachelor of Fine Arts, or Bachelor of Music. In the two-year programs in dental hygiene and commercial fisheries, the degree of Associate in Science is conferred.

Study at the graduate level leads to the master's degree in over 60 areas of study and the degree of Doctor of Philosophy in 25.

The teaching faculty numbers about 800, and there are over 10,000 graduate and undergraduate students at the University's main campus. About four-fifths of the undergraduate come from Rhode Island with a liberal representation from other states and foreign countries.

The University of Rhode Island is an Equal Opportunity employer.

HISTORY

The University was originally chartered as the state agricultural school in accordance with an act of the Rhode Island legislature on March 23, 1888. The Oliver Watson Farm in South Kingstown was purchased for the site of the school, and the old farmhouse, now restored, still stands on the campus today. The school became the state college by act of the state legislature on May 19, 1892, creating the Rhode Island College of Agriculture and Mechanic Arts, and the first class of 17 members was graduated in 1894.

Funds for the creation of state colleges came from the Morrill Act of 1862 which provided for the sale of public lands, the income from which was to be used to create at least one college in each state with the principal objective of teaching agriculture and mechanic arts. From this grant of land comes the name land-grant colleges, applied to the national system of state colleges.

In 1909 the name of the college was changed to Rhode Island State College. The original program of study in science, engineering and agriculture was revised and expanded. On March 23, 1951, by act of the state legislature, the college became the University of Rhode Island and the various schools became colleges within the University. In July 1970 the Board of Regents for Education succeeded the Board of Trustees of

State Colleges as governing body for the state's institutions of higher learning. An historical outline may be found on page 265.

THE CAMPUS

The University's main campus encompasses 1100 acres in the village of Kingston just off R.I. Route 138. The center of the University is an elm-bordered quadrangle of handsome granite buildings on Kingston Hill. Surrounding this are other academic buildings, student residence halls, and fraternity and sorority houses. On the plain below are the gymnasiums, athletic fields and tennis courts, and a freshwater pond. Agricultural experiment areas, dairy barns, and greenhouses are nearby, with other facilities a mile from the central campus.

The University has two other large tracts of land: the 132-acre Narragansett Bay Campus, six miles to the east, where the Graduate School of Oceanography, the Rhode Island Atomic Reactor, and several federal laboratories devoted to the marine sciences are located; and the 2300-acre W. Alton Jones Campus, 20 miles away in West Greenwich, the site of research and conference facilities, and a Youth Science Center and camp. The Division of University Extension has a building near the State House in Providence which is headquarters for the University's adult education program.

ACCREDITATION

The courses and programs of study offered by the University of Rhode Island have been approved by national accrediting agencies and are accepted for credit toward college degrees by other approved institutions of higher learning. The national accrediting agencies which have approved the quality of the course offerings of the University of Rhode Island include the American Association of Universities, New England Association of Colleges and Secondary Schools, University of the State of New York, Engineers Council for Professional Development, the American Chemical Society, the American Council on Pharmaceutical Education, the National League for Nursing, and the American Association of Collegiate Schools of Business. The University is also an approved member institution of the American Association of University Women, the National University Extension Association, and the Council of Graduate Schools in the United States.

THE UNIVERSITY LIBRARY

The University Library is located in a four-level, air-conditioned building designed to accommodate almost half a million volumes and to provide the most advanced facilities for study and research. The open-stack arrangement permits direct access to the collection which currently numbers about 400,000 books, periodicals, documents, manuscripts, microfilms, and micro-cards. Special collections are devoted to rare books, Rhode Island history, "South County" authors and University history. The library also has a collection of long-playing records available for loan. Specialized libraries are located in Pastore Chemical Laboratory and in the Pell Library of the Graduate School of Oceanography.

RESIDENT INSTRUCTION

Undergraduate Major Programs

Undergraduates have a wide choice of programs from which they may select major areas of study as follows:

College of Arts and Sciences

Anthropology, Art, Bacteriology, Botany, Chemistry, Dental Hygiene (two or four years), Economics, English, French, Geography, Geology, German, History, Italian, Journalism, Mathematics, Medical Technology, Music, Philosophy, Physical Education (men and women), Physics, Political Science, Psychology, Sociology, Spanish, Speech, Teacher Education (elementary and secondary), Theatre, Zoology.

College of Business Administration

Accounting, Business Education, Finance, General Business Administration, Insurance, Management Science, Marketing Management, Office Administration, Organizational Management and Industrial Relations, Production and Operations Management.

College of Engineering

Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Applied Mechanics, Engineering Science.

College of Home Economics

General Home Economics; Child Development and Family Relations; Food and Nutritional Science, and Food Services; Home Economics Education; Textiles, Clothing and Related Art.

College of Nursing

College of Pharmacy

Pharmacy (five years), Ventilation Therapy.

College of Resource Development

Agricultural Science, Agricultural Technology, Commercial Fisheries (two years), Natural Resources.

Graduate Study

Graduate study is offered leading to the degrees of Master of Arts, Master of Science, Master of Biological Science, Master of Business Administration, Master of Community Planning, Master of Library Science, Master of Public Administration, Master of Marine Affairs, and Doctor of Philosophy. The Graduate School coordinates graduate study programs and determines policy and regulations for graduate study (see page 81). The Graduate Library School was instituted in 1963 (see page 86). The Graduate School of Oceanography was established in 1961 and is located on the Narragansett Bay Campus of the University (see page 87).

Summer Study

Summer study opportunities are provided in a Summer Session of two consecutive terms. Students may take six or seven credit hours of course work in each term. A distinguished visiting faculty supplements the regular University staff in offering undergraduate and graduate programs of study. A number of workshops, conferences and institutes are conducted which are of special interest to teachers and professionals in many fields. These are listed in the University's *Summer Session Bulletin.*

RESEARCH

An active program of research is carried on in all colleges of the University. In addition to the strong research programs in the various departments, the University has established the following programs in specially defined areas. Support comes from foundations, commercial firms, federal and state governments, and the University.

Agricultural Experiment Station

Established in 1888, the Agricultural Experiment Station is concerned with basic and applied investigation in natural and human resources. This research aims at conserving and managing resources, at improving the quality of environments, at abating pollution and recycling waste materials, at enhancing rural environments, at developing more rewarding home life, and at supporting resource-using industry and business in the region.

Research is conducted in food and resource chemistry, resource economics, plant and soil science, plant pathology and entomology, forest and wildlife management, animal science, and animal pathology. A strong orientation to estuarine and marine problems and an interdisciplinary approach to resource research are station characteristics. Current information on the progress of research is reported quarterly in *Rhode Island Resources*—complete results on individual projects are issued in Station bulletins. All are available to Rhode Island residents upon request to the director.

Bureau of Government Research

The bureau was organized in 1960 to provide service to municipalities and to the state. It operates as an independent unit within the University. The bureau maintains a municipal consulting service which assists Rhode Island communities in dealing with problems of governmental organization and administration. It has a publications program including a research series, an information series, and a monthly newsletter, and operates a program of conferences and awards. The bureau assists in the administration of the graduate program in public administration, maintains a public administration library and provides an information service for local government units.

The Computer Laboratory

The Computer Laboratory handles the University's computational needs for instruction and research. The laboratory has an IBM system/360 model 50 with 512K of high speed core storage, 1024K of bulk core storage, disk storage units, magnetic tape, card, and printer input/output devices, and an off-line plotter. A number of remote consoles are coupled to this facility. On campus, these consoles are located in the Computer Laboratory; the Departments of Chemical, Civil, Electrical, Industrial, Mechanical and Ocean Engineering; the Graduate School of Oceanography; and the Colleges of Business Administration and Pharmacy. Off-campus installations include the Division of University Extension, Wheaton College, and various high schools in the state. A PDP-9 computer with graphics display console, located in the Department of Electrical Engineering, is also linked to the 360 system. The staff of the Computer Laboratory develops and maintains programming systems and application programs for University use. Staff members, who hold a joint appointment with the Department of Computer Science and Experimental Statistics, provide consultation in numerical methods, statistical analysis, and computational techniques.

Division of Engineering Research and Development

This division was established in 1942 to coordinate the research activities of the College of Engineering. It disseminates the results of basic or fundamental investigations; conducts fundamental and applied research projects, particularly those of assistance to individual firms in Rhode Island; provides opportunities for graduate students and

highly qualified undergraduates to participate in research studies; and offers opportunities for members of the engineering faculty, through research, to keep abreast of advances in the profession.

The division is an integral part of the College of Engineering, and members of the college participate in all division projects. Facilities are available for research in the fields of chemical, civil, electrical, industrial, mechanical, materials, nuclear, environmental, and ocean engineering. The division publishes the results of faculty research in bulletins, leaflets and reprints.

Graduate School of Oceanography

The Graduate School of Oceanography is located on the 132-acre Narragansett Bay Campus. The land borders the shore and includes a basin and dock within easy reach of both the bay and the open ocean. The University operates several vessels, the largest of which is a 180-foot ocean-going research ship, *Trident*.

A number of buildings make up the shore facilities including laboratories, offices, the Claiborne Pell Marine Science Library and a new 12,000-square-foot research aquarium.

The research program includes basic and applied studies in physical, chemical, geological, and biological oceanography (including fishery biology).

Institute of Environmental Biology

This institute provides an interdisciplinary approach to problems in environmental biology. It is an adminstrative organization consisting of faculty members active in graduate training and research in environmental biology in botany, electrical engineering, forestry, oceanography, pharmacology, and zoology, and of adjunct faculty members in associated federal and private laboratories.

Laboratories for Scientific Criminal Investigation

These laboratories in the Department of Pharmacology and Toxicology of the College of Pharmacy provide instruction, research, and service in the field of scientific criminal investigation. The laboratory staff works closely with the Rhode Island Attorney General's Office and also provides technical consultation for various law enforcement agencies, and special instruction and research in criminalistics, in which faculty members of various departments participate. The program sponsors a special course for police and law enforcement agencies.

Law of the Sea Institute

Established in 1965, the institute conducts summer conferences designed to elucidate legal and jurisdictional problems in ocean resource exploitation. A year-round program of research in this field is anticipated and a series of occasional publications is planned. The institute is administered through the University and directed by a board composed of specialists drawn from various parts of the country.

Research Center in Business and Economics

The research activities of the College of Business Administration are centered in this organization established in 1965. The center initiates, conducts, and services research activities of the faculty in the fields of accounting, business education and office administration, business law, economics, finance, insurance, management science, marketing management, organizational management and industrial relations, and production and operations management. The center publishes the *Rhode Island Business Quarterly*, a journal whose main focus is upon the business and economic issues which directly or indirectly concern Rhode Island.

Sea Grant College Program

The University, in 1968, became one of the first institutions to receive broad-base support under the Sea Grant College and Program Act of 1966. Funds for a variety of marine research, education, and public service activities are administered by the Provost for Marine Affairs and a University advisory committee. Projects involve faculty and graduate students in the Graduate School of Oceanography, and in the colleges.

University Marine Resources Program

This program fosters research in all colleges of the University contributing to effective utilization and conservation of the marine environment, and it cooperates with state and local agencies.

Rhode Island Water Resources Center

The Rhode Island Water Resources Center, which was established in 1965, is the state center for research and training in all phases of water resources. There is a similar center or institute in each of the 50 states and Puerto Rico, established through Public Law 88-379 in 1964. The states work cooperatively with the federal government in an effort "to assist in assuring the nation at all times of a supply of water sufficient in quantity and quality to meet the requirements of its expanding population."

Each center currently receives a federal appropriation each year to carry on its work. Congress may appropriate additional sums to match, on a

dollar-for-dollar basis, funds made available to the center by the state or other non-federal sources to meet the necessary expenses for specific water resources research projects.

Principal investigators of projects need not be employed at the University of Rhode Island; in fact centers are encouraged by the act to plan and conduct programs with such other agencies and individuals as may contribute to the solution of the water problems involved.

EXTENSION

Cooperative Extension Service

An educational organization involving the federal and state governments and cooperating agencies (Eastern, Northern, Providence and Southern Rhode Island Cooperative Extension Services), the service's main function is to extend educational resources to all Rhode Islanders. It helps people identify their needs, problems and opportunities, and arrive at a promising course of action based on their desires, abilities and resources.

Extension programs are concerned with the following areas: 1) home economics provides an adult educational program for the homemaker reflecting the needs of contemporary living with emphasis on consumer and management education, clothing, housing and home furnishing, child development and human relations, and nutrition; 2) 4-H and youth programs provide activities for the development of youth toward the realization of their individual potentials as responsible citizens; 3) individual consultation and community resource development furnishes information related to home grounds, general or specialized farms, nurseries, orchards, forests, etc., and helps groups to take action to enhance the social, cultural and economic well-being of the community.

Offices of the Cooperative Extension Service are located in Providence, Olneyville, Newport, Greenville and East Greenwich.

Division of University Extension

The division provides adult residents of Rhode Island with an opportunity to enhance their liberal and professional education. Undergraduate credit courses are offered in the sciences and the humanities, engineering, business, and home economics. Academic programs lead to the degrees of Bachelor of Science in General Business Administration, Master of Business Administration, Master of Arts in English, and Master of Public Administration, and a continuing education program for women leads to the Bachelor of Arts in English, History or Psychology; or the Bachelor of Science in Home Economics Education or Child Development and Family Relations. The division operates certification programs for various professions as well as individual credit and non-credit courses. Institutes, seminars, conferences, and short courses are planned for business, industry, labor, government, and the professions. A counseling service includes psychological testing, and group and individual guidance. The division also does research on academic and administrative questions relative to continuing education for adults.

The teaching staff is drawn from resident faculty of the University and specialists in professional and business fields. Headquarters are in the University Extension Building, Providence. Evening courses are offered in Providence, on the Kingston Campus, and in such local communities as Pawtucket, Woonsocket, Newport, Westerly, and Quonset Point. A catalog of extension courses may be obtained on request to the Division of University Extension, Promenade and Gaspee Streets, Providence, Rhode Island 02908.

International Center for Marine Resource Development

The purpose of the center is to help developing nations make and carry out sound policies for the use of their marine resources. Instituted in 1969 with funds from the federal government, the center accomplishes its mission by building programs and providing funds to educate experts in marine resource management, by fostering appropriate technical, economic and social research and by providing information and consulting services.

Marine Advisory Service

The service provides field specialists and information to the state's marine community under the public service responsibility of the Sea Grant Program. Projects include work with commercial fishermen, marina operators, local and state government, elementary and secondary schools, marine resource managers, and individuals and businesses interested in marine enterprises. The Marine Advisory Service has headquarters at the Pell Library on the Narragansett Bay Campus.

New England Marine Resources Information Program

This regional program assists business, industry, and the public through transfer of useful scientific and technical information on ocean subjects. It consists of an information center based at the Pell Library on the Narragansett Bay Campus. The program is administered through a director and planning committee, the latter including representation from all New England states. A newsletter of interest to the New England marine community is published.

PROGRAM IN GERONTOLOGY

This is a regional program for New England, and its purpose is to study the social-psychological aspects of aging, to develop programs designed to serve the aged, and to implement educational programs in social gerontology. Regional activities are coordinated through the New England Center for Continuing Education, Durham, New Hampshire. A newsletter and other publications are distributed to agencies and individuals in the field of social gerontology.

FACULTY GOVERNMENT

The Faculty Senate represents the faculty and was authorized in 1960 by the general faculty to conduct in a responsible and efficient manner the business assigned to faculty jurisdiction by law or by the Board of Regents. The Graduate Council is the representative body for the graduate faculty in determining the academic policies for graduate study.

THE ALUMNI ASSOCIATION

Anyone who has attended the University for at least two semesters is automatically a member of the Alumni Association. The organization, which now numbers over 20,000, exists to promote the interests of the University and maintain the ties of alumni with their alma mater. The association publishes an *Alumni Bulletin* and has an annual fund drive.

UNIVERSITY OF RHODE ISLAND FOUNDATION

The University of Rhode Island Foundation was created in 1957 to encourage and administer gifts from private sources, with the primary purpose of building a substantial endowment, the income from which would assure continuing support to the University. The foundation is particularly concerned with activities of the University, its students and faculty for which adequate provision is not ordinarily made by appropriations from public funds.

Student in Big Brother-Big Sister program brings his "little brother" to the campus.

Student Life and Services

An enriching collegiate experience results from a wise balance of academic and extracurricular activities. The University is fortunate in its country location, which allows space and opportunity for all sorts of outdoor activities and for a homogeneous campus life. The University has a strong student government and recognizes a wide variety of student organizations which offer to every undergraduate an opportunity to pursue his special interests and to develop qualities of leadership, character and personality. As far as possible, these organizations are operated by students and supported from a student activities fee, voted and expended by students.

Much of the undergraduate social and recreational life centers about housing units, fraternities and sororities, and the Memorial Union. A student board of directors working with the Director of Student Activities determines policy for the Union and plans a full program of social, cultural, intellectual and recreational activities.

PHILOSOPHY OF STUDENT LIFE

Upon registration at the University of Rhode Island, a student automatically becomes a member of the University community with all the rights, privileges, and responsibilities that go with membership. Such rights and privileges include full use of the educational opportunities offered, the extensive physical facilities found on the campus, the opportunity to belong to student organizations, and to participate in social, recreational, cultural and spiritual activities, and the privilege of making decisions within the scope of the University's goals as an educational institution. As in any democracy, these rights and privileges are accompanied by responsibilities: the responsibilities to progress educationally, to respect the rights of others, and to know and obey the rules and regulations developed by the University community for the good of the total membership.

STUDENT SERVICES

Dean of Students

The Dean of Students' staff is concerned with the extracurricular and social life of students on the campus. They are available to consult with students regarding personal problems. The Dean of Students also serves as counselor on veterans' educational problems.

International Students

The Director of International Student Affairs consults with and advises foreign students on academic, financial, housing, and social problems. All communications from foreign students concerning applications for admission to undergraduate or graduate programs are handled by his office.

Counseling Center

The Counseling Center staff assists students, generally on a one-to-one basis, with problems of personal concern. The staff psychologists, counselors, and the psychiatrist are available without fee for any student who requests their services. Professional group counseling, ranging from group therapy to communication groups fostering student interaction with their peers, is provided. The center personnel treat any difficulty presented by the student with absolute professional confidentiality. Staff members are available as consultants to assist other faculty and staff personnel on campus in their involvement with students.

Career Planning and Placement

The Career Planning and Placement Office helps the individual to choose a career, prepare for it, enter upon it and progress in it. The office provides for counseling individually and in groups, holds career conferences, maintains reference files on both occupations and specific employers, and arranges interviews with employers for seniors, graduate students and alumni.

Health

The University Health Services, located in Potter Building, provides health services to all undergraduate and graduate students who have paid the student health fee. It offers in-patient facilities during the academic year with registered nurses always on duty. Physicians are on call at all times for emergencies. Out-patient services are provided Monday through Friday and Saturday mornings. Physicians are present during these periods. Various special services are available, such as gynecology, urology, internal medicine, ear, nose and throat, and psychiatry. There are also facilities for laboratory and X-ray as well as various screening procedures.

Services not provided are available in the local community. Students who choose their own physician must assume responsibility for expenses incurred.

The Director of University Health Services is available at any time to discuss problems, services provided, or recommendations from students.

Housing

Residence halls and boarding facilities are available to students during both the regular academic year and the Summer Session. There are 19 residence halls on the campus including a quadrangle of women's housing and dining services. The Roger Williams housing complex provides apartment-type living units with a maximum of eight students to each unit. A typical unit has four bedrooms, two bathrooms, a living room, and an open-air balcony. Three buildings in the complex are assigned to men and three to women.

Graduate students may share a two-student apartment in the apartment area. The graduate apartments have a kitchen, bath, and combination living-sleeping room.

The Housing Office maintains a list of apartments or houses in the vicinity of Kingston, Wakefield, and Narragansett, a radius of approximately seven miles from the campus. Many of these rentals are seasonal from September until June 15 and are fully furnished.

Applications for all University housing should be made to the Director of Housing. Single students registering for rooms in the residence halls will have their applications filled in order of receipt. Room assignments will be made to the extent of facilities, and roommate requests will be granted when possible. For rates and contracts, see pages 18, 19; for visitation policies, see page 13.

Lounges in the dormitories serve as recreation centers for resident students. Study-bedrooms are furnished with desk, chairs, dressers, drapes, and single beds. Automatic laundry facilities are available in each residence hall.

Dining

The three University dining rooms are operated for the convenience of the resident students, and provide wholesome food well served at reasonable prices. All students living in a University dormitory are required to take meals in a University dining room. Parents and guests of students, faculty, staff, alumni, and guests of the University may obtain service in the Memorial Union or the Faculty Center. For rates and contracts, see page 19.

Memorial Union

The Union building, which opened in 1954 as a memorial to the men of the University who died in two world wars, and was enlarged in 1965, performs a wide variety of services and houses numerous facilities designed to provide a broad social, cultural, intellectual, and recreational program.

The Union includes such facilities as meeting rooms, lounges, bowling lanes, student organizations and chaplains' offices, the University Bookstore, a restaurant, cafeteria, snack bar, private dining rooms, ballroom, and party room. Additionally, substantial commuter facilities are provided to accommodate the needs of non-resident students. Services provided include an information center, barber shop, bank, travel agency, laundry pickup station, Western Union office, and record and art print libraries. The director's office coordinates student organizations and maintains a master schedule of campus events.

Lecture and Arts Series

University lectures and an Arts Series are presented throughout the year to enrich the more formal academic program of the University. A series of lectures of general and specialized interest is presented by visiting scholars. The Arts Council on which faculty, students, and administration are represented plans the Arts Series which includes musical and dance concerts, film programs, and theatre presentations. The Student Entertainment Committee sponsors a popular entertainment series and the Student Lecture Series Committee brings

speakers of national or international prominence to campus. Both are supported by student funds.

STUDENT RULES

Rules and regulations set forth in this catalog are subject to change without notice.

Alcoholic Beverages

The possession or consumption of intoxicating beverages by students is prohibited anywhere on the campus or in University-affiliated buildings, including all fraternities, sororities, and residence halls. The single exception is in the Memorial Union Pub which serves beer and wine to persons 21 years of age and over. The regulation is based primarily upon educational considerations, but also upon due respect for state laws regarding the sale and distribution of intoxicating beverages to minors.

Motor Vehicles

Traffic and parking are strictly regulated to promote maximum campus safety. All vehicles shall be registered with the Traffic Control Office in the Police Department, and shall be operated according to University traffic regulations. The University reserves the right to revoke the permit of, and to discipline, any student who fails to exhibit a responsible attitude in his use of motor vehicles. Resident freshmen under 21 years of age on the day of registration are not permitted to have motor vehicles, either on the campus or in the immediate vicinity.

Visitation Policy

In accordance with the new visitation policy, students have three visitation options for 1971-72.

No visitation hours. Guests of the opposite sex may not be in a student's room at any time.

Limited visitation hours. Students may have guests of the opposite sex in their rooms, Sunday through Thursday, from 12 noon until midnight. On Fridays, Saturdays, and the nights before holidays, visitation hours begin at 12 noon and continue until 1:45 a.m. the following morning. Residents of any corridor may decide to have limited visitation hours.

Unlimited visitation hours. At any time within each 24-hour period, seven days a week, students may have guests of the opposite sex in their rooms. The student and parents, following discussion, must choose one option as listed on the residence hall contract and then both must sign the housing contract. If the student is of legal age on the date the contract is signed, the signature of the parent is not required.

Rooms

Rooms may be occupied on Saturday at 1:00 p.m. before the opening of the semester and must be vacated 24 hours after a student's last examination in the spring semester. Residence halls are closed during the Thanksgiving, Christmas and spring recesses.

STUDENT ORGANIZATIONS

Student Government

The Student Senate is a legislative body which represents the students to the administration and faculty and supervises extracurricular activities. It also distributes the activities tax among the various student organizations through its tax committee. Individual residence halls form their own governments which establish and enforce rules within University guidelines. The Interfraternity Council supervises fraternity affairs and passes regulations governing fraternity life; the Panhellenic Council does the same thing for sororities.

Honor Societies

The University has chapters of a number of national honor societies, election to which is a recognition of accomplishment. The Society of the Sigma Xi is the scientific honor society and Phi Kappa Phi is the honor society for general scholarship. Mortar Board recognizes women's scholarship and leadership. In more specialized areas are the following: Alpha Kappa Delta (sociology), Alpha Zeta (agriculture), Beta Gamma Sigma (business), Kappa Delta Pi (education), Lambda Tau (medical technology), Omicron Delta Epsilon (economics), Omicron Nu (home economics), Phi Alpha Theta (history), Phi Sigma (biological science), Pi Mu Epsilon (mathematics), Pi Sigma Alpha (political science), Rho Chi (pharmacy), Scabbard and Blade (military), Sigma Delta Pi (Spanish), Sigma Pi Sigma (physics), Tau Beta Pi (engineering), and Tau Kappa Alpha (debating).

Religion

As befits a state university, the widest latitude is given to all creeds and religious beliefs. The University, however, does all in its power to encourage the practice of religion on campus. To the extent possible, offices for religious advisers or chaplains of various faiths are provided on campus in the Memorial Union, and facilities for religious services are also available. In addition, the Roman Catholic Center and the Episcopal Center, both adjacent to the campus, are open to all students. Synagogues and churches of various denominations in the area welcome students to their services.

Religious organizations meet regularly for worship and study, and sponsor other activities through-

out the academic year. Religious organizations on the campus are Canterbury (Episcopal), Catholic Center Board of Governors, United Ministry (Protestant), Christian Science Organization, Hillel Foundation (Jewish), Lutheran Association, the URI Intervarsity Group, and the Council for Christian Ministry which coordinates the work of the Christian groups.

Varsity Organizations

In addition to intercollegiate athletic teams, a number of organizations represent the University in competition, exhibitions, and public performances and they are supervised by faculty coaches or directors. The University Band, Chorus, and Orchestra are under music department direction, and students may receive credit for participation in any one of these. The University Theatre, under theatre department direction, presents several plays each year. The URI Debate Council is directed by members of the speech department and participates in intercollegiate debates. The Cheerleaders are active at varsity football and basketball games and rallies. The Women's Athletic Association encourages and organizes intercollege and intramural competition in various sports. The URI Showman's Club, directed by the College of Resource Development, participates in cattle-judging contests.

Athletics

The University offers an extensive program of athletics, sufficiently varied to provide an opportunity for every student to participate. A new physical education center for men and women has three pools, and a swimming program for recreation and competition is being developed.

The men's intercollegiate teams participate in baseball, basketball, football, golf, riflery, tennis, track, soccer, sailing and wrestling. The University has a notable record of victories in basketball, football, sailing, and track.

In addition to membership in the New England Conference of State Universities (Yankee Conference), the University holds membership in the National Collegiate Athletic Association and the Eastern College Athletic Conference.

There are unlimited opportunities for women wishing to compete in sports with other institutions. Groups are active in sportdays, playdays and intercollegiate games throughout the New England area. Activities include archery, badminton, basketball, dance, field hockey, softball, tennis, and volleyball.

Intramural programs for men and women combine the values of competitive athletics and informal sports, and are in operation all year.

Those with sports interests may join the Horsemen's Club, the Weight Lifters Club, the Skin Divers Club, Orchesis (dance club), the Yacht Club which has fleets of International 420 and Beverly dinghies on Salt Pond, or the Crew Club which uses Worden's Pond, Rhode Island's largest freshwater lake, for its practice.

Fraternities and Sororities

There are approximately 1200 fraternity and sorority members in University or chapter-owned housing. The organizations are service as well as social groups serving the University and individual fraternity and sorority members by promoting scholarship, citizenship and small group living. Within the past six years ten new houses have been built in a newly opened section of the campus.

The fraternities, all of which are nationally affiliated, are Alpha Epsilon Pi, Chi Phi, Lambda Chi Alpha, Phi Gamma Delta, Phi Kappa Psi, Phi Mu Delta, Phi Sigma Delta, Phi Sigma Kappa, Pi Lambda Phi, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Epsilon Phi, Tau Kappa Epsilon, Theta Chi, and Theta Delta Chi.

The sororities, all nationally affiliated, are Alpha Chi Omega, Alpha Delta Pi, Alpha Xi Delta, Chi Omega, Delta Delta Delta, Delta Zeta, Kappa Alpha Theta, Lambda Delta Phi, Sigma Delta Tau, and Sigma Kappa.

Each residence hall also has its own organization as do the commuters.

Other Organizations

The students publish a semi-weekly newspaper, a yearbook and a literary publication. WRIU is the campus radio station.

There are about 30 professional organizations related to the students' academic interests and major study.

There are also a number of groups serving social, recreational, cultural and political interests. Foremost among these groups is the Memorial Union Board of Directors. Blue Key is the official student welcoming and hospitality group and Alpha Phi Omega is also concerned with service to the campus.

The All Nations Club includes international students and others interested in the peoples and cultures of other countries. The Graduate Student Association is open to all graduate students for whom it publishes a newsletter and plans a program of activities. The Commuters' Association serves the needs of commuting students.

For the politically minded there are the Student Mobilization Committee, Young Americans for Freedom, Young Republicans and the Student Committee against Racism.

Admissions, Expenses, and Student Aid

ADMISSION TO COLLEGE

The University desires that its undergraduates shall be men and women who are not only competent to do a good job in the classroom, but are also possessed of wide interests and positive qualities of character and personality. Students are selected for enrollment primarily on the basis of their academic competence without regard to age, race, sex, creed or national origin. Any person with a strong preparatory record, who possesses better than average intelligence, or who has special aptitudes or talents, should not hesitate to apply.

Applicants are given individual consideration, but it is expected that all candidates will offer 16 units of college preparatory work as outlined below. If these requirements are not fully satisfied by secondary school certificate, they may be met wholly or in part by successful performance on appropriate examinations administered by the College Entrance Examination Board or the University.

Unit Requirements

College of Arts and Sciences

English	4
Mathematics (Algebra 2, or Algebra 1 and Plane Geometry 1)	2
Physical or Natural Science	1
History or Social Science	1
Any Single Foreign Language	2
Additional	6

Majors in Chemistry and Physics require four units of mathematics.

Majors in Physical Education for Men may substitute other college preparatory studies for a foreign language.

College of Business Administration

English	4
Algebra and Plane Geometry	3
Physical or Natural Science	1
History or Social Science	2
Additional	6

College of Engineering

English	4
Mathematics (Algebra, Plane and Solid Geometry, and Trigonometry)	4
Physics and Chemistry	2
History, Social Science and/or Foreign Language	3
Additional	3

College of Home Economics

English	4
Algebra and/or Plane Geometry	2
Science—Chemistry preferred	1
History or Social Science	1
Any Single Foreign Language	2
Additional	6

College of Nursing

English	4
Algebra and/or Plane Geometry	2
Chemistry	1
Other Physical or Natural Science	1
History or Social Science	1
Additional	7

College of Pharmacy

English	4
Algebra and/or Plane Geometry	2
Physical or Natural Science	1
History or Social Science	1
Any Single Foreign Language	2
Additional	6

College of Resource Development

English	4
Algebra and/or Plane Geometry	2
Physical or Natural Science	1
History or Social Science	1
Additional	8

NOTE: Additional units should be selected as far as possible from languages, history, mathematics or science.

APPLICATION PROCEDURES

Students should discuss their hopes and plans for study at the University with their academic counselors as early as possible to establish realistic goals and program selections, and to insure that their applications will receive a strong official endorsement. Admissions counselors at the University are happy to correspond with students on individual problems. Requests for application forms and information should be directed to the Office of Admissions, University of Rhode Island, Kingston, Rhode Island 02881.

Applications and requests for admissions information from foreign students should be addressed to the Director for International Student Affairs in Taft Hall at the University.

Beginning freshmen are normally admitted only at the start of the fall semester in September. High school seniors are urged to submit applications early in their final year of preparatory study as the University subscribes to a "rolling admissions" policy, reviewing folders as rapidly as complete credentials are submitted. However, some applicants find it to their advantage to hold their forms until senior mid-year grades are available so that their progress in the last year may be assessed by the Selection Committee. Closing date for freshman applications is March 1, and most decisions are reported in February, March, and April.

Early decision is made on the application of any freshman candidate who has established a superior academic record, who has achieved above-average scores on the CEEB Scholastic Aptitude Test, and whose potential as a superior student is reflected in the secondary school endorsement. Applications which meet these qualifications and which are clearly labeled "Early Decision Candidate" are considered on a priority basis if filed prior to November 1.

ENTRANCE TESTS

All candidates for admission are required to take the Scholastic Aptitude Test, the English Composition Achievement Test, and at least two other achievement tests, administered by the College Entrance Examination Board in areas in which the candidate will continue his studies in college:

(a) Intermediate mathematics (or optionally, advanced mathematics) must be completed by students who will carry any mathematics in their freshman year at college;

(b) a foreign language test must be completed by all who plan to continue study of a language begun in high school;

(c) a laboratory science test should be completed by students who plan to follow any curriculum involving a concentration in the sciences.

Applicants are encouraged to take these tests as early as may be practicable; delay beyond the March date materially reduces a candidate's prospects for approval. Full information concerning these tests may be obtained from local high schools or by writing to CEEB Headquarters at P.O. Box 592, Princeton, New Jersey 08540.

Applicants for the curriculum in Dental Hygiene are also required to take the Dental Hygiene Aptitude Test. Full information concerning this test may be obtained from the University Admissions Office or from the American Dental Hygienists Association, 304 East 45th Street, New York, New York 10017.

Persons applying for undergraduate admission from a foreign country must complete an English proficiency test available at the U.S. Information Center or the U.S. Consulate, and three achievement tests selected from other languages, mathematics, laboratory sciences, or social studies.

INTERVIEWS

Personal interviews are not part of the normal admissions procedure. It would be impossible for the admissions staff to interview all candidates, and individual conferences are arranged only if a unique problem requires personal discussion. *Group conferences* are scheduled several afternoons each week during the fall and winter months, and students and their parents are invited to participate in these meetings to get acquainted with the University. Visitors are requested to phone ahead (401–792-2164) to be scheduled for these meetings so that adequate guide service may be provided.

ADMISSION WITH ADVANCED STANDING

Advanced placement for freshmen is granted candidates who have completed college-level

courses in high school as participants in the Advanced Placement Program. Decision in each case is based on a review of the candidate's record and scores on the Advanced Placement Tests of the College Entrance Examination Board. Entrance with advanced standing can accelerate the completion of degree requirements, or it can enrich the undergraduate program with greater scope for elective or advanced courses.

Transfer students who have attended, or are attending another college or university, are required to submit official transcripts of all work completed and a statement of honorable separation from each institution attended in addition to the usual high school record and entrance examination score reports. Except in very unusual circumstances, candidates incurring academic or disciplinary dismissal from other colleges are not eligible for admission. Candidates accepted with transfer credit are classified as freshmen, sophomores, juniors, or seniors according to the number of credits accepted for transfer. Priority in transfer assignments is granted candidates seeking entry at the junior or senior level. Freshman and sophomore transfers are usually considered for enrollment only at the start of the academic year in September, but junior and senior-level candidates may file for enrollment at the beginning of any semester.

Adult students who have developed a meaningful competence in basic subject areas may demonstrate their mastery by completing the College Level Examinations sponsored by the College Entrance Examination Board. Advanced placement and a credit allowance are based on a review of the candidate's test scores and preparatory experience.

Physical Examination

Every applicant accepted for admission is required to present a certificate from a physician showing that the applicant has been vaccinated against smallpox within four years and is otherwise healthy. Certificates must be returned to the Office of Admissions not later than two weeks prior to registration day. Eye tests and a dental examination are also recommended.

Interstate Cooperation Program

Under the cooperative plan of the New England Board of Higher Education (NEBHE), the University of Rhode Island will accept qualified students from other New England states in certain specified programs of study without charging the usual non-resident tuition fee. Certain programs at other of the New England state universities are open to Rhode Islanders on a reciprocal basis. Details on the operation of this program are available on request from the New England Board of Higher Education, 20 Walnut Street, Wellesley, Massachusetts 02181.

Special Program for Talent Development

The University encourages the application of economically and socially disadvantaged individuals and has instituted a pre-matriculation program designed to assist such applicants whose education is below college preparatory level. There is special financial provision for students in this program. Interested individuals should apply to the Dean of Admissions as early as possible in their high school careers.

STUDENT EXPENSES

Charges and fees set forth in this catalog are subject to change without notice.

The total cost for a year of resident study at the University is about $2400 for citizens of Rhode Island and about $3300 for out-of-state residents.* These figures include $200 for books and supplies, $350 for miscellaneous personal expenses, and $50 for travel.

Students commuting to the University from their homes should anticipate expenses approximating $1700 a year. This figure includes $200 for books and supplies, and $750 for commuter travel, lunches, and miscellaneous personal expenses.

All charges are payable by the semester and are due and payable on receipt of the bill. Checks or money orders should be made payable to the University of Rhode Island.

Schedule of Fees

All Students Pay Per Year	
General Fee	$614
Memorial Union Fee	40
Student Activity Tax	29
Accident and Sickness Insurance	13
Student Health Fee	65
Students Living on Campus Add	
Room Rent	500 or 600
Board—Monday Breakfast through Friday Dinner (15 meals)	565
or Monday Breakfast through Sunday Noon (20 meals)	600
*Out-of-State Students Add**	
Tuition	900

* See above for exception to this under NEBHE interstate program.

Tuition

For non-residents of the state, tuition is $900 a year. Tuition is free for residents of Rhode Island. To be exempted from tuition, the applicant must present a statement from the clerk of the city or town in which he claims residence, certifying that the parent or legal guardian is a legal resident. If the applicant is over 21, he must furnish a certified statement that he has been a resident of this state at least one year prior to his first registration. Time spent in residence at the University cannot be used to establish exemption from tuition. The Dean of Admissions will supply the form for such a certified statement. If it is not returned before registration day, payment of tuition will be required.

General Fee

All students, both resident and non-resident, pay a general fee of $614 per year. This fee covers the cost of benefits enjoyed by all students such as use of library, testing services, guidance, personnel supervision, placement, athletics, etc. Special fees are charged for private music lessons.

Application Fee and Advance Deposit

Ten dollars ($10) must accompany each application for admission. (See page 16 for application procedure.)

An advance deposit of $50 is required from every accepted student. The advance deposit, which is applied on the first term bill, will be forfeited if the applicant later withdraws his name.

Students returning after an absence of one or more semesters are subject to the same application fee and advance deposit as entering freshmen. Applications for readmission may be obtained at the Office of the Registrar and must be filed by April 14 for the fall semester and December 1 for the spring semester.

Student Assessments

Each student is assessed $29 per year which is used to support debating, dramatics, class dues and the cost of the college yearbook and the student newspaper. The Memorial Union fee of $40 per year is also assessed.

Special Fees

Students failing to appear for registration at the appointed time are liable for a late registration fee of $15 plus $5 for each succeeding day of tardiness. Each addition or removal of a course from a student's registration incurs a $10 change-of-registration fee. Expenses for class trips in all courses, and expenses incident to practice-teaching in vocational education courses, are charged to the students concerned.

Diplomas and transcripts will not be issued to students who have any unpaid financial obligation to the University.

Health Service Fees

All undergraduate students, both resident and non-resident, pay a student health fee of $65 per year.

Health Services care is restricted to minor illnesses and accidents. Students hospitalized at the Potter Building who hold meal tickets may use them to defray food expense.

All medical expenses incurred outside the University Health Services shall be the responsibility of the student.

All full-time undergraduate and graduate students are required to participate in the University's Student Medical Insurance Program, unless they can give evidence of comparable coverage in another plan. The University plan covers a 12-month period beginning in September, at an annual cost of $13. This rate is subject to change by the carrier.

Refunds

Refunds of payments made or credits against amounts due to the University shall be made to students who officially withdraw according to the following scale:

	Refund
First two weeks	80%
Third week	60%
Fourth week	40%
Fifth week	20%
After five weeks	None

Attendance period in which withdrawal occurs is counted from first day of registration, and includes weekends and holidays.

Housing Rates

Following are the rates on University housing for the year 1971-72. For complete information write to the Director of Housing, Roger Williams Commons. All rates quoted are for double rooms. For single rooms, where and when available, $50 per year is added to the double rate. Board is mandatory for those students living in residence halls.

Residence Halls

$500	Adams, Barlow, Bressler, Browning, Butterfield, Hutchinson, Merrow, Peck, Tucker, Weldin
$600	Aldrich, Burnside, Coddington, Dorr, Ellery, Fayerweather, Gorham, Heathman, Hopkins

Graduate Student Apartments

$ 85 per month, plus electricity, for combination bed-living-room apartment.

$105 per month, plus electricity, for one-bedroom apartment.

Housing Contract

University housing is contracted for the *entire academic year.* A deposit of $100 is required at the time of filing application for a room in the residence halls. This deposit will be applied on the semester bill. Cancellation of the housing application can be made only when the Director of Housing is notified in writing. A cancellation of the housing application will result in a pro rata credit on the semester bill according to the following schedule:

	Credit
During April	$100
During May	75
During June	50
During July	25
After July	None

The full amount of the deposit will be refunded when the student is dismissed by the University.

All residence hall rates are quoted for the period specified in the contract. Payments are due upon receipt of the bill from the Bursar's Office. Checks and money orders are payable to the University of Rhode Island. A student vacating his assigned quarters before the end of the period under contract will be held responsible for the total charges for the entire period. No refund will be given a student who moves from University quarters to a private home or decides to commute.

Dining Contract

All students living in University residence halls are required to purchase a 15-meal contract for three meals per day, Monday through Friday, for $282.50 per semester. A 20-meal contract at $300 per semester is available at the student's option.

Individual meal tickets may be purchased by students living off campus or commuting from home, on a space-available basis. Under this plan, tickets are purchased at the dining room entrance. Luncheons average $1.50 and dinners $2.20 per meal. The Memorial Union snack bar and cafeteria are available for those commuting students who do not desire to purchase individual tickets.

Only students withdrawing from the University will receive Dining Services refunds on a pro-rated basis. Please refer to page 18 for the scale.

STUDENT AID

The Student Aid Office has complete information on the various forms of financial assistance and awards most of the scholarships and loans. A list of name scholarships and loans may be found on page 260.

Applications for scholarship or loan aid should be filed before March for the following year. The University participates in the College Scholarship Service (CSS) of the College Entrance Examination Board, and subscribes to the principle that the amount of financial aid granted a student should be based on financial need. In order to meet the March 1 deadline, entering students should submit a Parents' Confidential Statement (PCS) by February 1 to College Scholarship Service, P.O. Box 176, Princeton, New Jersey 08540. Upperclass applicants will be instructed on deadlines and procedures for filing their renewal applications and PCS's. Applications for all types of financial aid must be filed annually for consideration by the Committee on Financial Aid to Students.

Loan Programs

There are three types of federal loans available to University of Rhode Island students. The amount of the average loan granted in these programs for any academic year is determined by the federal funding available for that year. The National Defense Student Loan Program provides loans, not to exceed $1000 per year, for full-time or half-time undergraduate or graduate students. The Nursing Student Loan Program is for full-time students in the College of Nursing in amounts not to exceed $1500 per year. The Health Profession Student Loan Program provides a maximum of $2500 for full-time students in the College of Pharmacy.

Loans under the above programs are made on the basis of financial need and satisfactory performance. Interest rates, repayment procedures, and cancellation features differ for each of the programs.

A number of privately contributed loan funds is also available to students through the office of the Director of Student Aid.

Short-term loans for emergency reasons are administered by the Dean of Students.

It is also possible for a student to borrow money under the Government Insured Loan Program which is processed through the Higher Education Assistance Corporation in each state. For this a student should apply to his local bank. Loan maximums are $1000 per year for undergraduate students and $1500 for graduate students. No repayments are required during the college years. The

federal government pays interest to the bank while the student is in college. Upon completion of his studies, the student repays the loan in six to ten years at seven percent interest.

Scholarships and Grants

The Committee on Financial Aid to Students awards assistance primarily on the basis of academic performance, financial need and campus citizenship. Certain awards are restricted to candidates from a given school or college and these are made with the recommendation and approval of the dean of that college.

The list of scholarships on page 260 is limited to annual grants of $200 and larger, or endowments of $5000 and larger. Some awards are limited to candidates meeting specific qualifying requirements established by the donor. Information on numerous smaller grants and awards is obtainable from the office of the dean of each college.

Additional federal programs are available to URI students. Educational Opportunity Grants offer stipends of $200 to $1000 per year for students from low-income families. The Health Professions Scholarship Program is available to pharmacy students in financial need to a maximum of $2500 per year. Nursing scholarships provide up to $1500 per year to nursing students with financial need.

Work Opportunity

The Student Aid Office maintains listings for off-campus summer jobs, and part-time jobs during the academic year, both on and off the campus. The University has a minimum per hour rate of $1.60 for student work, and jobs include those in the dining services, library, and other specialized work for departments or administrative offices. It is generally unwise for students to plan to work during their first semester on campus.

The federal College Work-Study Program is designed to help students from low-income families and others with need. It provides jobs to eligible students within the limits of available funds.

General Academic Requirements and Programs

Consistent with its policy of allowing the greatest latitude possible in course selection, the University offers a wide choice to fill its general education requirements and encourages students to select free electives that cross departmental and college lines. The opportunities, as well as the requirements, are presented in this chapter.

GENERAL EDUCATION REQUIREMENTS

All undergraduate students in baccalaureate degree programs at the University and in its Division of University Extension are required to select and pass 45 credits of course work from the following divisions A, B, and C. Of these, 18 credits shall be taken in one division, 15 credits in a second, and 12 credits in a third.

Division A

Any course for which the prerequisites have been met in art; English (except 110); languages (except 101 and 102); linguistics; literature in English translation; music (literature and history); philosophy; Theatre 100, 381, 382; and Speech 231, 331, 332. Only one studio course in art may be applied to this requirement.

Division B

Any course for which the prerequisites have been met in astronomy; biochemistry; biology; botany; chemistry; climatology (Geography 404); earth science; genetics; geology; mathematics; meteorology (Geography 403); microbiology (bacteriology-virology); oceanography; physics; and zoology.

Division C

Any course for which the prerequisites have been met in anthropology; economics; Education 102, 312, 403; geography (except 403, 404); history (except 393); Journalism 433, 435, 438; political science; psychology (except 210, 381, 410, 434); sociology; and Speech 210, 310, 374.

Division D (effective 1972-73)

A new Division D will become effective in the 1972-73 academic year. Students may then elect up to nine credits in communications, but may not reduce any other divisional requirements by more than three credits. Courses, now being offered, that will fulfill requirements in division D include: English 110 and 120; Journalism 212 and 224; Business Education 421; SCRATCH 000W, 000X, 000Y, 000Z; Speech 101, 102, 215, 220.

Exception

Advanced ROTC students may apply a maximum of six credits of military science to the general education requirements. No more than three credits may be applied to divisions A, B, or C.

OTHER ACADEMIC REQUIREMENTS

Certain courses are required of freshmen in the Colleges of Business Administration, Home Economics, Pharmacy, Nursing and Resource Development. These are listed in the individual college's curriculums.

The basic responsibility for meeting all course and credit requirements for the degree must rest with each individual student.

Progress toward graduation may be accelerated

by Summer Session study. A student may take two courses in each of two summer terms. Thus, in three summers he can complete about 36 credits, the equivalent of two semesters of work. A student wishing to accelerate should consult his academic adviser at the earliest possible opportunity in order to plan the sequence of his courses.

INTERDEPARTMENTAL STUDY

Interdepartmental study encourages students to select free electives (throughout the course listings) without regard to departmental and college lines. Further information is available from the department chairmen.

Food Science and Technology

The University is among the group of universities participating in the Food Technology Consortium and students who are interested in food science and technology are encouraged to follow a course of study that meets the standards established by the Institute of Food Technologists. Course selections include: Animal Science 123, 378, 441, 444; Bacteriology 412, 432; Food and Nutritional Science 337, 438, 441, 502, 504; Food and Resource Chemistry 421, 431, 432, 501, 502, 526; Resource Economics 105, 140, 441, 442.

Urban Affairs

Because of its location near the center of the Northeastern Megalopolis, the University has special reason to recognize a responsibility in the field of urban affairs. Students desiring to broaden their knowledge in this field will find a large number of courses concerned with the urban physical structure, urban social institutions, and individuals in an urban environment. These include: Child Development and Family Relations 340, 480; Civil Engineering 346, 371; Community Planning and Area Development 411, 503, 531; Education 550, 583, 590; Geography 411, 512, 543; Insurance 433; Organizational Management and Industrial Relations 422; Political Science 422, 460, 463, 481, 498; Psychology 435, 542; Social Welfare 311; Sociology 312, 330, 336, 340, 410, 430, 432, 434, 436.

PRE-PROFESSIONAL PREPARATION

Competition for places in professional schools is keen, and a superior academic record throughout college is necessary for admission to these graduate schools. Since requirements for the professional schools vary in their "essential" and "recommended" subjects, the student should consult the catalog of the professional school and then plan his undergraduate program accordingly.

Pre-law students usually major in history, political science, or economics. Those seeking careers as social workers may enroll as majors in sociology, including in their curriculum the social welfare courses. A basic foundation for graduate study, whether directed toward college teaching or research careers, can be provided through any of the liberal arts majors. The Bachelor of Arts curriculum provides specific majors for those planning to become journalists or public school teachers.

Pre-Medical, Pre-Dental, Pre-Veterinary Medical

For students who plan professional study of medicine, dentistry, osteopathic medicine or veterinary medicine, guidance and program coordination is provided by the Faculty Pre-Medical-Pre-Dental Advisory Committee which also sends letters of recommendation for selected applicants to professional schools. Students should contact this committee as soon as they are admitted. Most applicants for medical school are advised to complete a well-rounded, four-year baccalaureate program, with a thorough preparation in the basic natural sciences.

Each student should consult the prerequisites for each professional school to which he may expect to apply for admission. These are listed in *Medical School Admission Requirements,* published by the Association of American Medical Colleges, and *Admission Requirements of American Dental Schools,* by the American Association of Dental Schools, which are revised annually. Medical schools generally require a 3.2/4.0 quality-point average and high scores on the required Medical College Admission Test taken preferably in the spring of the third undergraduate year. Since only about 45 of 100 applicants to medical schools are admitted, it is wise to plan for an alternative career.

A recommended course of study is outlined below. Those courses printed in italic are indispensable for admission to any medical school.

Chemistry. At least 16 semester-hour credits, including general inorganic, qualitative and quantitative analysis, and organic; physical chemistry is sometimes required and is frequently recommended, *CHM 101, 102, 112, 114,* 212, *227, 228, 229, 230* and in some cases 331 and 332, all with the associated laboratory courses.

Biology. At least 11 credits, including general animal biology, genetics, and embryology, *ZOO 111 or BIO 102,* 313 and GEN 352.

Physics. At least 8 credits, including *PHY 111, 112.*

Mathematics. At least 6 to 9 credits, through calculus, MTH 141, 142.

English and Communications. At least 12 credits, *including ENG 101, 102, or SCRATCH, or ENG 110, 120* and a year of literature.
Modern Foreign Language. At least 6 credits.
Psychology. At least 3 credits, PSY 113.
Sociology. At least 3 credits, SOC 202.

Some suitable major concentrations are biology (zoology, bacteriology), chemistry, psychology, and sociology, but other majors are encouraged if basic requirements are completed. A number of students in the College of Pharmacy apply to medical schools or dental schools.

The recommendations for pre-medical preparation apply also to pre-dental and pre-veterinary medical students, who will be counseled by the same advisory committee. A Dental College Admission Test is required, and one or more of certain aptitude tests for veterinary medicine. Experience in agriculture and animal husbandry is expected by some veterinary medical schools, and some pre-veterinary students will therefore enroll in the College of Resource Development.

HONORS PROGRAM

Students who achieve a cumulative average of 3.0 (after three semesters) or 3.2 (after five semesters) may be eligible for participation in the University Honors Program. However, the Honors Program Committee may require a higher quality point average or exclude seniors who do not intend to participate in this phase of the program. Designed to provide academic flexibility for superior students, this program is basically department oriented and provides for a University-wide colloquium, voluntary class attendance, and an honors thesis. The program is administered by a Faculty Honors Program Committee.

INTELLECTUAL OPPORTUNITY PLAN

This plan encourages students to increase their intellectual breadth and discover aptitudes in new areas of knowledge. A student above the freshman level who is not on probation may register under this plan for courses considered by the college in which he is enrolled as free, unattached electives. The option does not apply to military science. Grades will be S (satisfactory) or U (unsatisfactory). The S grade is credited toward degree requirements, but not included in the quality point average. A student may elect up to three S/U courses each semester and up to two S/U courses during a calendar summer.

RESERVE OFFICERS TRAINING CORPS

The Department of Military Science offers general military science programs emphasizing military history and the fundamental tactics and techniques common to all branches of the army. Designed to provide the army with junior officers, the military science programs seek to develop leadership, character, initiative, managerial ability, acceptance of responsibility, and an understanding of the defense requirements of the nation.

The complete course of instruction comprises four years—a basic program of two years and an advanced program of two years—leading to a commission as a second lieutenant in the Army Reserve or for selected students in the Regular Army. A two-year program is also offered, covering the advanced courses during the junior and senior years. Prior to entering the advanced program, a cadet must attend a six-week basic summer camp, and obtain the permission of the dean of his college and the Department of Military Science.

The general military science programs afford the student the opportunity of applying for active duty in the branch in which he desires to serve, and are offered on a voluntary basis. A six-week summer camp is required between the third and fourth years of both the two-year and four-year programs. Cadets receive a retainer pay of $50 per month while enrolled in the advanced program, and $337 for the six-week summer camp.

Enrollment in the advanced program in the junior and senior years is by application for qualified male candidates from any college in the University. Advanced cadets are selected by a faculty reviewing board of the Department of Military Science. Students accepted in this program contract with the army to complete the program and must do so unless they receive permission from the army to terminate the program. Acceptance of a commission, if tendered, is mandatory for completion of the program, and graduates may expect to be called to active duty as second lieutenants for a period ranging from six months to two years. Students may leave the basic program at any time during official drop periods or between semesters.

Qualified students enrolled in ROTC may apply for one, two, or three-year ROTC scholarships at the Department of Military Science. Students who receive National Defense Student Loans may, under certain conditions, have these loans cancelled at the rate of 12.5 percent per year of active service.

REGISTRATION

Registration for each semester consists of three separate procedures: registering for course selections, payment of fees, and obtaining a class program.

Registering for Course Selections

Students must obtain registration cards at the announced time and place. Currently enrolled students register in November for the spring semester, and in April for the fall semester. It is the student's responsibility to make an appointment with his adviser to consult about his program for the coming year and then submit his completed cards during the registration period, according to the announced instructions.

New and transfer students will be instructed concerning registration procedures.

Payment of Fees

Arrangements must be made with the Bursar for complete payment of tuition and/or fees by the due date. Class programs will be issued only for those students who have registered for course selections and satisfied payment requirements with the Bursar.

Class Programs

Students may not attend classes without class programs. These are issued prior to the first day of classes according to instructions from the Office of the Registrar.

Drop and Add

During the two-week period after the beginning of classes (drop and add period), students may adjust their schedules after obtaining the class program. Students must obtain the approval of their advisers if they wish to drop or add a course. Courses may not be *added* after the drop and add period. Courses may be *dropped* until mid-semester. Any course dropped after mid-semester shall be recorded as a "failure."

Signatures

Those documents which require it must include the legal signature of the appropriate faculty member. Forgery of staff names on registration cards, drop and add cards, or other course cards will make the document invalid and may subject the student to academic discipline.

Change of Address

It is the responsibility of the student to complete a change of address form in the Office of the Registrar whenever a change is made in his local, campus, or mailing address.

GRADES AND POINTS

All grades are reported as A, B, C, D, F, S or U. These marks indicate the following student standing:

A, superior.
B, good, above average but not superior.
C, average.
D, low grade, below average, passing.
F, failure.
S, satisfactory.
U, unsatisfactory.

Grades are given quality point values as follows:

A, 4 points; B, 3 points; C, 2 points; D, 1 point; F, S and U, 0 points.

A grade may be reported as "incomplete" only when failure is caused by illness or by some comparable reason not within the control of the student. Incomplete grades are subject to regulations specified in the *University Manual.* Courses failed must be repeated with a passing grade if required for graduation within any college.

Certain courses do not lend themselves to precise grading and for these, only S (satisfactory) or U (unsatisfactory) shall be given to all students enrolled. Such courses are indicated by *S/U credit* in the description.

Dismissal for Low Scholarship

Students will be dropped for low scholarship according to rules established by the faculty and published in the *University Manual.* A copy of these rules will be supplied upon request.

WITHDRAWAL FROM COLLEGE

A student wishing to withdraw from the University at any time other than at the end of a semester is required to secure a "withdrawal form" from the Office of the Dean of Students. This form, when completed, is taken to the Office of the Bursar for settlement of account.

The student who leaves the University during the course of a semester without officially withdrawing is held responsible for his registration for the semester, which means failing marks in all subjects and consequent suspension or dismissal action on his record, as well as loss of any refund privilege.

GRADUATION

To graduate, a student must have completed the work of the curriculum in which he is enrolled and also have earned a total number of quality points equal to at least twice the total number of credits for which he has registered in that curriculum.

A maximum limit of ten full semesters in one four-year curriculum will be allowed any student

for graduation. Three five- or six-week summer terms will be considered the equivalent of one semester.

Exceptions to the above requirement may be made upon recommendation by the college concerned.

Except in special cases, which shall be considered by the faculty of the college in which the student is registered, the work of the senior year must be taken in residence.

A student must complete the degree requirement of six semesters at the University in the curriculum in which he is registered. If he then enrolls in an accredited professional college and receives a recognized professional degree, he may apply for the degree of Bachelor of Science from the University of Rhode Island. The award will be made at the next regular commencement. For veterans, only four semesters in residence are required. The other two may be fulfilled by his record in the service, evaluated in terms of University credit.

Fine Arts Center

College of Arts and Sciences

ROBERT LEPPER, JR., Interim Dean
FRANCIS X. RUSSO, Associate Dean
DOUGLAS M. ROSIE, Assistant Dean
WILBUR DOCTOR, Assistant Dean

The departments of the College are Art, Bacteriology and Biophysics, Biochemistry, Botany, Chemistry, Computer Science and Experimental Statistics, Dental Hygiene, Economics, Education, English, Geography, Geology, History, Journalism, Languages, Mathematics, Military Science, Music, Philosophy, Physical Education for Men, Physical Education for Women, Physics, Political Science, Psychology, Sociology and Anthropology, Speech, Theatre, and Zoology. The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog preceded in each case by the name of the chairman and the teaching faculty.

The objective of the College of Arts and Sciences is to enable students to understand our intellectual and spiritual heritage, the physical and biological world in which we live, and man's social, economic, and political development. Beyond this, the College provides several aspects of professional training and a strong foundation for graduate study. In all its functions the College is dedicated to fostering a spirit of inquiry and independent thought. Emphasis is placed upon intellectual growth and the deep satisfaction derived from knowledge for its own sake.

The College has programs of study leading to the following degrees: *Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music.* The Department of Dental Hygiene provides programs leading to both the *Bachelor of Science* and the *Associate in Science* degrees.

For information about pre-professional preparation, see page 22.

HONORS PROGRAMS

Comprehensive honors programs are available for especially qualified junior and senior students. By providing flexibility in courses and individualized instruction, honors students are encouraged to achieve their full intellectual potentialities. Eligibility depends on the quality of academic achievement during the first two years of enrollment and upon formal recommendations by the student's major department and the dean of the college. Honors programs are available in bacteriology, biology, botany, chemistry, economics, education, English, geography, geology, history, journalism, languages, mathematics, philosophy, physical education for women, physics, political science, psychology, sociology, speech, and zoology.

PROFICIENCY EXAMINATIONS

Students who show evidence of advanced knowledge or who have taken "enriched" programs in high schools may be exempt from certain courses and requirements if they take departmental proficiency examinations. A student who successfully passes such an examination earns credits as well as exemption from the course.

The following subjects have been approved for proficiency examinations: biology, botany, chemistry, Earth Science 105 and 106, English 110

(only), Geology 103 and 104, History 101, 102, 141, and 142, mathematics, music, physics, sociology, Speech 101 (only), and zoology. These examinations are administered by department chairmen and results are reported to the dean's office. Students wishing to take proficiency examinations should contact the department.

BACHELOR OF ARTS CURRICULUMS

The liberal arts program provides a general cultural background and an opportunity to major in any of 24 fields of study. The student must complete at least 45 credits of general education courses, and he must also develop a major field of concentration. The curriculum requirements for the Bachelor of Arts degree listed below include the general education courses required of all undergraduates as listed on page 21. All students must pass a minimum of 120 credits. *No credit will be given for courses taken on other campuses without prior approval from the office of the academic dean.*

CURRICULUM REQUIREMENTS

A total of 120 passed credits are required for graduation. At least 42 of these credits must be courses numbered 300 or above.

Distribution Requirements

18 credits shall be taken in one division (A, B, or C below).

15 credits shall be taken in a second division (A, B, or C below).

12 credits shall be taken in a third division (A, B, or C below).

Within each division, no more than two courses (6-8 credits) may be taken for distribution credit in one department (discipline) or subject matter area.

See general education requirements, page 21, concerning distribution requirements effective September 1972.

DIVISION A

Art. Any art course for which prerequisites have been met, not more than one of which may be a studio course.

English. Any course for which the prerequisites have been met, except ENG 110.

Language. Any course for which the prerequisites have been met, except 101 and 102.

Literature in English Translation. CLA 391, 392 and 393; FRN 391, 392 and 393; GER 391 and 392; SPA 391 and 392; RUS 391 and 392.

Music. Any music course in literature and history for which the prerequisites have been met.

Philosophy. Any course for which the prerequisites have been met.

Speech. SPE 231, 331 and 332.

Theatre. THE 100, 381 and 382.

DIVISION B

Astronomy. AST 108.

Bacteriology. BAC 201.

Biochemistry. BCH 311.

Botany. BOT 111 or BIO 101 and any course for which these are prerequisite.

Chemistry. Any course for which prerequisites have been met.

Geography. GEG 403 and 404; ESC 101.

Geology. Any course for which the prerequisites have been met; ESC 105 and 106.

Mathematics. MTH 107, 108, 109 and 141, and any course for which these are prerequisite.

Oceanography. OCG 401.

Physics. Any course for which prerequisites have been met.

Zoology. ZOO 111 or BIO 102 and any course for which these are prerequisite.

DIVISION C

Anthropology. Any course for which prerequisites have been met.

Economics. Any course for which prerequisites have been met.

Education. EDC 102, 312 and 403.

Geography. Any course for which prerequisites have been met, except GEG 403 and 404.

History. Any course for which prerequisites have been met, except HIS 393.

Journalism. JOR 433, 435 and 438.

Political Science. Any course for which prerequisites have been met.

Psychology. Any course for which prerequisites have been met, except PSY 300, 381, 410 and 434.

Sociology. Any course for which prerequisites have been met.

Speech. SPE 210, 310 and 374.

CONCENTRATION

Concentration (27-30 credits) in a subject is defined as including not only those courses in a department, but also courses in related subjects offered by the student or required by a department in satisfaction of the concentration requirements.

Concentration will consist of no fewer than 27 credits, but no department may mandate more than 30 credits for a concentration, *exclusive* of required prerequisites offered by other departments. The number of credits required for concentration *inclusive* of prerequisites in other departments may not exceed 36.

Under no circumstances may concentration courses be used to fulfill distributional requirements.

The student should declare his concentration before the end of the fourth semester.

In consultation with his adviser, and with the approval of the dean, a student may be permitted to modify the normal requirements of the department in which he is concentrating. With such approval, the program, consisting of no fewer than 27 nor more than 30 credits, will constitute the student's concentration.

Major areas include:

Anthropology
Art
Biology
Chemistry
Economics
English
French
Geography
Geology
German
History
Italian
Journalism
Mathematics
Music
Philosophy
Physics
Political Science
Psychology
Sociology
Spanish
Speech
Teacher Education *elementary*
Teacher Education *secondary*
Theatre

ELECTIVES

The student will elect courses sufficient in credits (39-48 credits) to complete the 120 credits required for graduation. Courses may be taken in any college. Credits (9-18) may be taken in the concentration up to a maximum of 45 credits inclusive of all courses and their prerequisites mandated by a department.

Juniors and seniors normally register for 15 or 16 credit hours per semester.

ANTHROPOLOGY

Students desiring to concentrate in anthropology must complete 30 credits in this and related fields, including:

201 Human Origins	3
203 Cultural Anthropology	3
401 History of Anthropological Theory	3
402 Methods of Anthropological Inquiry	3

The remaining 18 credits may be selected from course offerings in anthropology. No more than 6

of these credits may be selected in the area of sociology, with the approval of the student's concentration adviser.

Students whose interests lie primarily in social and cultural anthropology are encouraged to elect courses from among the following:

305 Peoples of the Far East
309 Religions of Non-literate Peoples
311 Indians of North America
313 The Ethnology of Africa
315 Cultures and Societies of Latin America
319 Cultural Behavior and the Environment
321 Social Anthropology
322 Anthropology of Modernization
323 Politics in Small-scale Societies
325 Language and Culture
407 Economic Anthropology
506 Psychological Anthropology

Students whose interests lie mainly in physical anthropology and archeology are encouraged to select from among the following:

202 World Prehistory
301 Introduction to Physical Anthropology
303 New World Archeology
317 Archeology*

ART

Students may concentrate in either art history or art studio.

Students concentrating in art history must complete 30 credits in art history, including:

251 and 252 Introduction to History of Art	6
353 Art of Egypt and Mesopotamia or 354 The Art of Greece and Rome	3
355 Early Christian and Byzantine Art or 356 Medieval Art	3
357 Italian Renaissance	3
359 Baroque Art	3
361 or 362 Modern Art	3

An additional 3 credits must be selected from the following:

265, 266 History of Asian Art
272 Pre-Colombian Art
273 African Art

An additional 6 credits must be selected from the following:

462 Modern Art Seminar: Art since 1945
469, 470 Art History—Senior Projects

* Periodically offered during Summer Session for 6 credit hours and taught as a field school utilizing the theory and methods of archeology to the discovery, excavation and analysis of a prehistoric site in the New England region.

Students concentrating in art history should achieve intermediate level efficiency in at least one foreign language.

Students concentrating in art studio must complete 30 credits in art, including:

101 and 103 Two-dimensional and Three-dimensional Studio	6
251 and 252 Introduction to History of Art	6
207 Drawing	3
Elective in Art History	3

An additional 6 credits must be selected from the following:

221 and 322 Painting
231 and 332 Printmaking I and II
233 and 334 Graphic Design I and II
243 and 344 Three-dimensional Studio

An additional 6 credits must be selected from the following:

405 and 406 Studio-Seminar III and IV
469 and 470 Art History—Senior Projects

Students in this concentration will be required to register in 6 credits of art during the freshman year and 6 credits during the sophomore year. ART 120 may not be counted toward degree requirements if ART 251 and 252 have been previously completed. A minimum of 9 credits of non-studio study in art is required. It is recommended that art majors elect at least 3 credits in the allied fields of music or theatre. Students enrolled prior to fall, 1970, may use up to 9 credits of electives for further courses in art without increasing their total graduation requirements.

BIOLOGY

Students selecting this field of concentration must complete a minimum of 28 credits in biology, including the following basic courses:

BIO 101 and 102 or BOT 111 and ZOO 111	6-8
BAC 201	4
Botany (exclusive of BOT 111)	6
Zoology (exclusive of ZOO 111)	6

The remaining 6-8 credits may be selected from one or all of the areas in biology. Students in this concentration must elect a year of chemistry. Those wishing to prepare for a career as a professional bacteriologist, botanist or zoologist should enroll in the bachelor of science curriculum in biology described on page 36.

CHEMISTRY

Students selecting this field of concentration must complete a minimum of 28 credits in chemistry, including:

101, 102 or 103, 105 General Chemistry I	4
112, 114 General Chemistry II	4
227, 229 Organic Chemistry I	4
228, 230 Organic Chemistry II	4

PHY 111 and 112 and two years of mathematics are strongly recommended.

ECONOMICS

Students selecting this field of concentration must complete a minimum of 27 credits in economics, including:

123 or 125 and 126 Economic Principles	6
361 Survey of Economic Thought	3
427 and 428 Intermediate Economic Theory	6

In addition, at least four courses (12 credits) must be completed from the following:

302 Economic Development of the U.S.
333 Transportation Principles
334 Money and Banking
337 Business and Government
342 Public Finance
400 Economics Seminar
438 International Trade and Policy
451 and 452 Assigned Work
463 Economic Growth and Development
464 Comparative Economic Systems
475 Mathematical Economics
576 Econometrics
MGT 321 Labor Problems
BST 201 and 202 Elementary Statistics
EST 411 and 412 Statistical Methods in Research I, II

ENGLISH

Students selecting this field of concentration must complete a minimum of 30 credits in English. The following requirements pertain only to these first 30 credits:

Three courses (9 credits) on the 200-level, the maximum on this level being four courses (12 credits).

Balance of courses on the 300-, 400- or *500-level, including a minimum of three courses (9 credits) on the 400-level or above.

FRENCH

Students selecting French as their concentration are required to complete 30 credits in French courses numbered 103 or higher, of which no less than 9 are to be taken in literature. Courses in literature may be selected from among FRN 325, 326, courses at the 400-level, and, with permission of the instructor, courses at the 500-level. Courses in linguistics may also count toward the concentration.

Additionally, students of proven competence in French language and literature, with permission of the adviser, the section head, the department chairman and the dean of the college, may take courses in related fields such as history, art or philosophy toward their concentration.

GEOGRAPHY

Students selecting this field of concentration must complete a minimum of 29 credits, including:

103 Economic Geography	3
121 Cultural Geography	3
131 Political Geography	3
421 Cartography	3
451 Land Utilization or 411 Urban Geography	3
491 or 492 Special Problems in Geography	3
ESC 101 Earth Science	4
ESC 105, 106 Earth Science	4
Geography elective	3

It is recommended that students majoring in geography also register for OCG 401.

GEOLOGY

Students selecting this field of concentration must complete a minimum of 27 credits in geology, including:

103 Physical Geology	3
104 Historical Geology	3

105, 106 (ESC 105, 106) may not be included.

Students intending to pursue graduate work in the geosciences should consider the B.S. curriculum in geology.

GERMAN

Students selecting this field of concentration will be required to complete at least 30 credits in German not including GER 101,102 or GER 391, 392. GER 205, 206 or equivalent is prerequisite to the courses on the 400-level. LIN 409, 410 may be used for concentration credit.

HISTORY

Students selecting this field of concentration must complete a minimum of 30 credits in history, including:

A minimum of 6 and a maximum of 12 credits in courses numbered 100 to 299.

The balance of required credits in courses numbered 300 or above, including one undergraduate

* Undergraduates wishing to take these courses *must* secure permission of the instructor.

seminar, HIS 395. Under unusual circumstances, with permission of the chairman of the department, a student may substitute, in place of the seminar, HIS 391, leading to a substantial research paper.

Undergraduates wishing to take courses on the 500-level must secure the permission of the department.

ITALIAN

Students selecting this field of concentration will be required to take 30 credits in Italian not counting ITL 101, 102. LIN 409, 410 may be used for concentration credit.

JOURNALISM

Students selecting this field must complete a minimum of 27 credits in journalism, as follows:

210 Introduction to Mass Communications	3
212 News Writing and Reporting	3
325 Copy Editing	3
326 Advanced Reporting	3
334 History of Journalism in the U.S.	3
361 Internship in News Writing and Reporting	3
433 Contemporary Press Problems	3
438 Government and Legal Aspects of Mass Communications	3
440 Criticism, Opinion and Interpretation in the Mass Media	3

LANGUAGES

See French, German, Italian and Spanish.

MATHEMATICS

Students selecting this field of concentration must complete 30 credits in mathematics, including:

141 Introductory Calculus with Analytic Geometry	3
142 Intermediate Calculus with Analytic Geometry	3
215 Introduction to Algebraic Structures	3
243 Calculus and Analytic Geometry of Several Variables	3
316 Algebra	3
335 Advanced Calculus I	3
336 Advanced Calculus II	3

Six credits are to be selected from the following:

322 Concepts of Geometry	3
353 Foundations of Mathematics	3
425 Topology	3
444 Ordinary Differential Equations	3
451 Introduction to Probability and Statistics	3
462 Functions of a Complex Variable	3

It is strongly recommended that students considering graduate study in mathematics take MTH 425 and 462.

MTH 107 Introduction to Finite Mathematics, 108 Topics in Mathematics, 109 Algebra and Trigonometry, and 125 Fundamentals of Euclidean Geometry are *not* open to students majoring in mathematics.

MUSIC

Students selecting music as a concentration will complete 30 credits as follows:

101 Introduction to Music	3
113, 114 Diatonic Harmony and Ear Training	6
215, 216 Advanced Harmony and Ear Training	6
221, 222 History of Music	6
251 to 254 Applied Music	6
317 Form and Analysis	3

PHILOSOPHY

Students selecting this field of concentration must complete no less than 27 credit hours in philosophy. Three credits must include:

101 Logic: Principles of Reasoning or 251 Symbolic Logic	3

An additional 6 credits must be selected from:

121 History of Ancient Philosophy	3
122 History of Medieval Philosophy	3
123 History of Modern Philosophy	3
124 History of Recent Philosophy	3

The remaining minimum of 18 credit hours may be freely chosen from the departmental offerings. However, students planning graduate work in philosophy are advised to take 251 Symbolic Logic, 441 Metaphysics, 442 Epistemology, and at least two other courses numbered above 400.

PHYSICS

Students selecting this field of concentration must complete a minimum of 30 credits in physics and mathematics, including:

111, 112 General Physics or 213, 214, 285, 286 Elementary Physics and Physics Laboratory	4
322 Mechanics	3
331 Theory of Electricity and Magnetism	3
381, 382 Advanced Laboratory Physics	4
401, 402 Seminar in Physics	2
451 Atomic Physics	3
491, 492 Special Problems	4
MTH 244 Differential Equations	3

It is strongly recommended that students take MTH 141 and 142 in the freshman year. If the

student is considering graduate study, it is recommended that courses in French, German or Russian be elected.

POLITICAL SCIENCE

Students selecting this field of concentration must complete a minimum of 30 credits in political science, including:

113 American Politics	3
116 International Politics	3
341, 342 Political Theory	6

An additional 18 credits will reflect the emphasis desired by the student, though he should select at least one course in three of the following four fields:

American politics and public administration
American law and theory
International relations
Comparative government

PSYCHOLOGY

Students in this field of concentration must complete a minimum of 30 credits to be distributed as follows:

113 General Psychology	3
232 Developmental Psychology	3
235 Theories of Personality	3
254 Behavior Problems and Personality Disorders	3
300 Quantitative Methods in Psychology	3
301 Introduction to Experimental Psychology	3

PSY 301 is required of all psychology majors and is a prerequisite for all courses in psychology numbered above 301, unless permission of the department is granted to be exempted from this requirement. Three courses must be selected from those numbered 310, 361, 381, 391, 434, 435, and one additional 3-credit course shall be selected from those numbered 300 or above for which the prerequisites have been met.

SOCIOLOGY

Students selecting this field of concentration must complete a minimum of 30 credits in sociology, including:

202 General Sociology	3
204 Social Psychology	3
*301 Theory and Methods of Sociological Research	3
492 History of Sociological Thought	3

SOC 202 and 204 should be taken during the sophomore year; 301 should be taken *no later* than the first semester of the junior year; and 492 is to be taken during the senior year whenever possible.

The remaining 18 credits are to be distributed in the two areas indicated below.

Area I, Social Institutions and Social Structure, 12 credits selected from:

206 Development of Human Societies
310 Rural Sociology
312 The Family
336 Social Stratification
408 Industrial Sociology
410 Complex Organizations
412 Occupations, Professions, and Social Structure
414 Demography
*423 Ecology of the Community
434 Urban Sociology
436 Sociology of Politics
*442 Sociology of Education
*444 Sociology of Religion
502 Contemporary Sociological Theory
508 Individual and Social Organization
512 Concepts of Social Structure

Area II, Social Organization and Deviant Behavior, 6 credits selected from:

208 Issues and Problems in Contemporary American Society
314 Juvenile Delinquency
324 Medical Sociology
330 Criminology
338 Population Problems
340 Minority and Majority Relations
416 Seminar in Criminology
*420 Sociology of the Environment
430 Social Pathology and Social Change
438 Aging and Society
440 Sociology of Mental Illness
510 Seminar in Deviance

Students planning careers in social work are advised to take courses listed under Social Welfare as electives. Social Welfare courses do not count toward the concentration in sociology. Students contemplating further work in anthropology are advised to take courses in anthropology as electives.

This curriculum applies to students graduating in 1972 and later.

SPANISH

Students selecting Spanish as a concentration will normally complete 30 credits.

Language learning: SPA 103, 104, 205, 206 (depending on level begun), 0-12 credits.

Introduction to the use of Spanish in teaching

* Pending approval.

or in literary studies: SPA 325, 326, 407, 408 (all four suggested for students in teacher education program, one course minimum required), 3-12 credits.

Literature: SPA 472 and 481, 6 credits.

The remaining hours to a minimum of 30 may be chosen from Spanish courses numbered between 430 and 574. LIN 409 and 410 and, with permission of the adviser, section head, department chairman, and dean of the college, courses in allied fields such as history, art and anthropology may also be selected.

SPEECH

This program provides maximum flexibility in planning for a wide variety of academic and occupational goals, including pre-professional preparation for graduate programs in speech pathology and audiology. The speech curriculum is personalized for each student. While the student plays a dominant role in curriculum planning, his program is closely supervised by his adviser and specific curricular and extracurricular experiences are planned as integral parts of each student's program. In addition to meeting the general education requirements, the Department of Speech has established certain guidelines for its undergraduate majors.

For students electing an undergraduate area of concentration in general speech, it is recommended that 27 credits be the minimum for the area of concentration. These 27 credits must include the following:

Rhetoric and Public Address	6-9
Oral Interpretation of Literature	3-6
Speech Sciences and Speech Education	3-6

For students electing an undergraduate concentration in speech science, a 30-hour concentration, the following core is recommended:

372 Auditory and Speech Mechanisms or equivalent such as ZOO 142 Human Physiology or ZOO 121 Human Anatomy
260 Speech Development and Correction
261 Survey of Hearing and Deafness
373 Phonetics
375 Language Development

In addition, 6 hours of directed electives are chosen from the following:

374 Communication Processes
410 Semantics
CDF 200 Growth and Development of the Child
PSY 103 Towards Self Understanding
PSY 235 Theories of Personality
EDC 312 Psychology of Learning
EDC 371 Educational Measurements

The remaining 9 hours are free electives in speech.

For students electing an undergraduate concentration in speech, a 30-hour concentration, the core and directed electives are the same as for speech science. The remaining 9 hours may be education electives. This does not represent undergraduate teacher training.

TEACHER EDUCATION

The Department of Education offers a curriculum designed to prepare students for the baccalaureate degree in teacher education. The curriculum affords a balanced program of academic preparation and professional training. The emphasis is upon providing the teacher candidate with an academic foundation that will enable him to translate such material into meaningful classroom learning activities. The department is determined to preserve the highest standards of an academic preparation while also being concerned with the "how to teach" aspect of teaching.

The required professional courses in a curriculum are made up of the elements which contribute directly to the teacher's understanding and skill in guiding learning and in working with laymen and colleagues in carrying out the role of the school in society. The following courses are required in the professional sequence:

103 Introduction to American Education
313 Psychology of Learning
372 Educational Tests and Measurements
484 Supervised Student Teaching
485 Seminar in Teaching

In addition, secondary education students will take EDC 430 Methods and Materials in Secondary Education and elementary education students will take EDC 427, 428 Child and Curriculum I and II. It is intended that the secondary school teacher should be a specialist in an academic area. The elementary teacher also requires acquaintance with a wide variety of academic disciplines and depth in one. On either level, the teacher must be prepared to channel his understanding of an academic discipline so that it will challenge both the slow pupils and the more advanced ones in his classroom. The emphasis upon academic achievement in the public schools is such that no less than a command of a specific field is acceptable for a teacher. Therefore, students in the Department of Education will, in cooperation with their advisers, develop a sequence of courses in academic areas which will assure them of subject matter competency and satisfy the legal requirements for teacher certification, 27-30 credits, in an academic subject area.

THEATRE

For students selecting a Bachelor of Arts concentration in theatre, it is recommended that courses in dramatic literature offered by the Department of English be used as partial fulfillment of the Division A curriculum requirements for the Bachelor of Arts degree. A minimum of 30 credits in the theatre must be completed from the four categories below.

Required courses

101 Introduction to Theatre Studies	3
110 Introduction to Acting	2
161 Stagecraft	3
201 Principles of Theatre	3

Students are expected to complete the credits from this category by the end of the sophomore year.

An additional 3 credits must be selected from the following:

ENG 255 Survey of English Drama
ENG 365 Modern Drama
ENG 433 Elizabethan Drama
ENG 446 Modern American Drama
ENG 465 Greek and Roman Drama
ENG 472 Shakespeare

Advanced courses

With the concurrence of his adviser, each student must select 9 credits from a combination of at least two of the following divisions:

Theatrical Performance (course numbers with the second digits 1, 2, or 3)
Theatre Business and Management (second digit 4)
Theatrical Design and Technology (second digits 5, 6, or 7)
Theatre History and Theory (second digits 8 or 9)

These courses must be at the 300-level or above with the exception of THE 211 and 212, which may be applied to the fulfillment of this requirement.

Electives

In order that each student may develop a program suitable to his own needs, he may freely elect in consultation with his adviser, courses in theatre necessary to complete the 30-credit requirement. With the approval of the Department of Theatre, the student may also substitute courses that are appropriately related to his own program, but which are offered by other departments of the University. Courses in dramatic literature, visual design, speech, voice, dance, and music are considered particularly advantageous for the theatre student.

Under the provisions of the Bachelor of Arts curriculum, up to 15 credits of additional courses from the student's major concentration may be taken as free electives in his total study program. However, the theatre student should consult his adviser before attempting to go beyond the normal 30-credit concentration.

BACHELOR OF SCIENCE CURRICULUMS

The general curriculum for the Bachelor of Science degree consists of the general education requirements for all undergraduates, as listed on page 21, 12 credits of free electives, and a major of 30-45* credits within a department. In addition, a department may require for its concentration certain courses in other departments, with the stipulation that this will not preclude their application to the distribution requirements. Courses in the concentration department cannot be used to satisfy the distribution requirements. No more than 130† credits can be required in a program.

Each concentration within the B.S. curriculum has certain more specific requirements, as given on the following pages. These changes become effective in September 1970 and students enrolled in a B.S. curriculum may choose to fulfill the requirements under which they entered or to come under the new requirements.

BACTERIOLOGY, BOTANY, ZOOLOGY

This curriculum provides specialization in the fundamental principles of bacteriology, botany or zoology, and it is concerned with the application of biological science to problems of modern life. It also provides preparation for graduate work in biological fields and for admission to professional schools of medicine, dentistry, and veterinary medicine.

By the end of the sophomore year, the students must select a concentration in bacteriology, botany, or zoology.

Bacteriology

A minimum of 30 credits in bacteriology is required, including BAC 201. The student concentrating in bacteriology may include any course in bacteriology; APA 534 and 536; BOT 416, 432, and 534; OCG 567; PLP 561; ZOO 331, 441, and 512. A student who plans to attend graduate school should take MTH 141 and 142 and CHM 331 and 332. In addition, the student must take BOT 111; ZOO 111; CHM 101, 102 or 103, 105, 112, 114, 227, 229, 228, 230 and 212; BCH 310; PHY 213, 285, 214 and 286 or 111 and 112; MTH 109 or 141 and 141 or 142; and a modern language to the intermediate level.

Botany

A minimum of 30 credits in botany is required and must include BOT 111, 221, 262, 323, 352, 411, 442, and 416 or 432. In addition, the student must take BAC 201; CHM 101, 102 or 103, 105, 112, 114, 227, 229, 228 and 230; PHY 213, 285, 214, 286 or 111 and 112; ZOO 111; ENG 110; SPE 102; MTH 141 and 142.

Zoology

A minimum of 30 credits in zoology is required and must include ZOO 111, 262, 313, 316, 345, 354, 395, and 396; GEN 352. In addition, the student must take BOT 111; CHM 101, 102 or 103, 105, 112, 114, 227, 229, 228 and 230; MTH 141 and 142; PHY 213, 285, 214, 286 or 111 and 112; and a modern language to the intermediate level.

FRESHMAN YEAR

First Semester

BOT 111 General Botany or ZOO 111 General Zoology	4
CHM 101, 102 General Chemistry or CHM 103, 105 General Chemistry	4
MTH 109 Algebra and Trigonometry or MTH 141 Introductory Calculus with Analytical Geometry	3
*Modern language or elective	3
General education requirement or free elective	3
	17

Second Semester

BOT 111 General Botany or ZOO 111 General Zoology	4
CHM 112, 114 General Chemistry	4
MTH 141 Introductory Calculus with Analytical Geometry or †MTH 142 Intermediate Calculus with Analytical Geometry	3
*Modern language or elective	3
General education requirement or free elective	3
	17

* The student concentrating in chemistry, for ACS accreditation purposes, will be allowed 48 credits.
† The student concentrating in physical education, because of the necessity for teacher accreditation, will be allowed 136 credits.

* Not required of botany majors.
† MTH 142 is required of botany and zoology majors.

SOPHOMORE YEAR

First Semester

*BAC 201 General Microbiology	4
CHM 227, 229 Organic Chemistry	4
General education requirements or free electives	9
	17

Second Semester

Curriculum requirements	3-4
CHM 228, 230 Organic Chemistry	4
General education requirements or free electives	9
	16-17

Total credits required: 130

CHEMISTRY

Designed to prepare the student for a career in chemistry, this curriculum provides a thorough training in both theories and practices in the fields of analytical, physical, organic and inorganic chemistry. Those who complete this curriculum are prepared to continue with graduate study leading to an advanced degree, to follow the teaching profession, and to enter specialized fields in development, control, technical sales, and research either in the chemical industry or in industries involving chemical processes.

The curriculum has been approved by the American Chemical Society on the Professional Training of Chemists. Graduates receive a certification card issued by the Society and are eligible for senior membership after two years of experience in the field of chemistry.

FRESHMAN YEAR

First Semester

CHM 191 General Chemistry	5
MTH 141 Introductory Calculus with Analytical Geometry	3
†Language or free elective	3
General education requirements	6
	17

Second Semester

CHM 192 General Chemistry	5
MTH 142 Intermediate Calculus with Analytical Geometry	3
*Language or free elective	3
General education requirements	6
	17

* Not required of zoology majors.

SOPHOMORE YEAR

First Semester

CHM 227, 229 Organic Chemistry	4
MTH 243 Calculus and Analytical Geometry of Several Variables	3
PHY 213 Elementary Physics	3
PHY 285 Physics Laboratory	1
†Language or free elective	3
General education requirement	3
	17

Second Semester

CHM 228, 230 Organic Chemistry	4
MTH 244 Differential Equations	3
PHY 214 Elementary Physics	3
PHY 286 Psysics Laboratory	1
†Language or free elective	3
General education requirement	3
	17

JUNIOR YEAR

First Semester

CHM 441 Physical Chemistry	3
CHM 335 Physical Chemistry Laboratory	2
CHM 425 Qualitative Organic Analysis	4
Physics elective	3
General education elective	3
	15

Second Semester

CHM 442 Physical Chemistry	3
CHM 336 Physical Chemistry Laboratory	2
CHM 412 Instrumental Methods of Analysis	3
CHM 414 Instrumental Methods of Analysis Laboratory	2
General education electives	6
	16

† Students who desire certification by the American Chemical Society are required to complete intermediate German or Russian.

SENIOR YEAR

First Semester

CHM 401 Inorganic Chemistry	3
*Curriculum requirements	3-6
Free electives	9-6
	15

Second Semester

CHM 392 Seminar in Chemistry	1
*Curriculum requirement	3-0
Free electives	12-15
	16

Total credits required: 130

DENTAL HYGIENE

This Bachelor of Science curriculum offers maximum flexibility in providing professionally oriented study and a foundation in general education. It is designed to prepare the student to assume responsible positions in education, such as in schools of dental hygiene, hospital programs, and school systems as well as private practice. Students who complete this curriculum are prepared to continue with graduate study.

The dental hygiene curriculum has been accredited by the Council on Dental Education of the American Dental Association. Upon completion of the required 70 credits in dental hygiene, the student is awarded the Associate in Science degree.† A total of 125 credits is required for the Bachelor of Science degree. At the completion of the first clinical year, students are placed in private dental offices for one month of field training experience.

The required professional courses are made up of the elements which contribute directly to the skill and understanding of dental hygiene and are required in the professional sequence.

A concentration of 30 credits in dental hygiene includes:

101 Orientation to Dental Hygiene	1
125 Oral Anatomy	3
135 Prophylactic Techniques Laboratory	1
141 Dental Assisting	1
126 General and Oral Histology and Embryology	3
128 Periodontics	1
136 Dental Hygiene Clinic	2
227 General and Oral Pathology	3
231 Roentgenology	2
237 Dental Hygiene Clinic	2
238 Dental Hygiene Clinic	2
244 Dental Materials and Operative Technique	1
246 Ethics, Jurisprudence and Office Management	1
250 Dental Health Education	2
252 Public Health	2
254 Survey of Dental Specialties	1
260 Preventive Dentistry	2
	30

In addition, candidates for the Bachelor of Science degree are required to take the following courses:

CHM 101, 102 or 103, 105 General Chemistry	4
CHM 124 Organic Chemistry	4
ENG 110 Composition	3
ENG 120 Literature and Composition	3
ZOO 121 Human Anatomy	4
ZOO 142 Introduction to Human Physiology	3
PEW 172 First Aid	1
BAC 201 General Microbiology	4
SOC 202 General Sociology	3
SOC 204 Social Psychology	3
FNS 207 General Nutrition	3
PCL 221 Dental Therapeutics	2
PSY 113 General Psychology	3
PSY 232 Developmental Psychology	3
SPE 101 Fundamentals of Oral Communication	3
EDC 102 Introduction to American Education	3
EDC 312 The Psychology of Learning	3
EDC 371 Educational Measurements	3
MTH 107 Introduction to Finite Mathematics	3
	58

Total credits required: 125

GEOLOGY

This curriculum is designed as a basic foundation for graduate study and careers in the earth sciences. In addition to training for research and teaching opportunities in geology, it offers preparation for further work in geochemistry, geophysics, paleontology, paleoecology, mineral resources, engineering geology, environmental geology and oceanography.

Students concentrating in geology should note the requirement for field experience. A summer field camp normally is undertaken following the junior year and related costs are the responsibility of the student.

* CHM 353, 354 or any 400-level or, with permission of the department, any 500-level course in chemistry.

† For the Associate in Science degree only, see page 48.

FRESHMAN YEAR

First Semester

*MTH 109 Algebra and Trigonometry	3
GEL 103 Physical Geology	3
BOT 111 General Botany or BIO 101 General Biology	4 or 3
General education requirements	6
	16 or 15

Second Semester

*MTH 141 Introductory Calculus with Analytic Geometry	3
GEL 104 Historical Geology	3
ZOO 111 General Zoology or BIO 102 General Biology	4 or 3
ESC 101 Principles of Earth Science	4
General education requirement	3
	17 or 16

SOPHOMORE YEAR

First Semester

CHM 101, 102 General Chemistry or CHM 103, 105 General Chemistry	4
*MTH 142 Intermediate Calculus with Analytic Geometry	3
PHY 213, 285 Elementary Physics or PHY 111 General Physics	4
GEL 410 Geomorphology	3
General education requirement	3
	17

Second Semester

CHM 112, 114 General Chemistry	4
PHY 214, 286 Elementary Physics or PHY 112 General Physics	4
Elective	3
General education requirements	6
	17

* Students with adequate preparation in algebra and trigonometry may take MTH 141 in the first semester and MTH 142 in the second semester of the freshman year.

JUNIOR AND SENIOR YEARS

In addition to the remainder of the general education requirements (page 21) and free electives, the following geology courses are required:

410 Geomorphology (if not taken in sophomore year)	3
420 Mineralogy	3
421 Optical Mineralogy	3
430 Petrology	3
440 Introduction to Paleontology	3
450 Introduction to Stratigraphy and Sedimentation	3
470 Structural Geology	3
Approved summer camp (between junior and senior years)	4

Students must also take an approved course in statistical methods or computer science and 12 credits of science electives which constitute an integrated group in earth science. These are selected in consultation with the faculty adviser.

Total credits required: 122

MATHEMATICS

This curriculum is designed to include the basic theories, techniques, and applications of mathematics. The required courses introduce the student to the principal areas of mathematics, and they provide a foundation for advanced study at the graduate level. This curriculum prepares students for graduate study in mathematics, and also for industrial employment.

The student must acquire at least 39 credits in mathematics exclusive of MTH 107, 108, and 109. The program usually includes MTH 141, 142, and 243; however, students who have had a substantial introduction to calculus should consult with the department chairman to determine whether they are ready to begin study at a higher level than MTH 141. In addition, the program must include MTH 215, 316, 335, 336, 425, 451, and 462. The department recommends that the student also take MTH 353 and 442.

The student must complete a minor concentration of 18 or more credits in one of these three areas: biological science, physical science, or the social sciences.

The program must include PHY 213, 285, and 214, 286.

Total credits required: 130

MEDICAL TECHNOLOGY

This curriculum is designed to prepare men and women for work in a hospital or other medical laboratory. During the first three years on campus, the emphasis is on general education and basic courses in biology, mathematics, and chemistry necessary as background in the applied sciences. Upon completion of these academic courses, the senior year provides a 52-week course in an approved hospital school of medical technology. This clinical program includes didactic and laboratory instruction in diagnostic methods. After successfully completing the course, the student is eligible for the national examination given by the Registry of Medical Technologists.

FRESHMAN YEAR

First Semester

CHM 101, 102 General Chemistry or CHM 103, 105 General Chemistry	4
BOT 111 General Botany or ZOO 111 General Zoology	4
MTH 109 Algebra and Trigonometry or MTH 141 Introductory Calculus with Analytical Geometry	3
MTC 101 Medical Technology Seminar	1
General education requirement	3
	15

Second Semester

CHM 112, 114 General Chemistry	4
MTC 102 Medical Technology Seminar	1
ZOO 111 General Zoology or BOT 111 General Botany	4
General education requirements	6
Free elective	3
	18

SOPHOMORE YEAR

First Semester

CHM 227, 229 Organic Chemistry	4
PHY 111 General Physics	4
MTC 201 Medical Technology Seminar	1
General education requirements	6
	15

Second Semester

CHM 228, 230 Organic Chemistry	4
PHY 112 General Physics	4
MTC 202 Medical Technology Seminar	1
General education requirement	3
Free electives	6
	18

JUNIOR YEAR

First Semester

BAC 201 General Microbiology	4
CHM 212 Quantitative Analysis	4
General education requirements	6
Free elective	3
	17

Second Semester

BAC 432 Pathogenic Bacteriology	3
Biology elective	3
General education requirement	3
Free electives	6
	15

SENIOR YEAR

The hospital clinical program provides 32 credits.

Total credits required: 130

PHYSICAL EDUCATION FOR MEN

This curriculum is designed to prepare men to teach primarily in the field of physical education at either the elementary or secondary levels. Sufficient electives are provided to permit students to fulfill state certification requirements for an academic subject ordinarily taught in secondary schools.

Each student must complete a biology teaching minor by electing an additional three-hour course in biology or zoology. Students concentrating in physical education must elect one of each of the coaching courses offered in the spring semester

of the junior year and the fall semester of the senior year, or they may complete all of the coaching courses.

Advanced ROTC cadets are to arrange for second semester senior year military science with the Military Science Department.

Each student must also: (a) purchase, at the beginning of the freshman year, the regulation uniform required of all freshmen; (b) provide his own gymnasium shoes; (c) rent a locker in the gymnasium; (d) purchase, the second semester of the sophomore year, a special instructor's uniform.

FRESHMAN YEAR

First Semester

ENG 110 Composition	3
History (any course providing the prerequisites have been met)	3
BIO 101 General Biology	3
SPE 101 Fundamentals of Oral Communication	3
PEM 121 Soccer and Physical Conditioning	1
PEM 123 Foundations of Health	3
PEM 125 Tumbling and Stunts	1
	16-17

Second Semester

ENG 120 Literature and Composition	3
History (any course providing the prerequisites have been met)	3
BIO 102 General Biology	3
PHL 103 Introduction to Philosophy	3
PEM 122 Aquatics	1
PEM 124 History and Principles of Physical Education	2
PEM 126 Basic Gymnastics	1
MTH 107 Finite Mathematics	3
	18-19

SOPHOMORE YEAR

First Semester

PHY 109 Introduction to Physical Science or CHM 109 Basic Principles of Chemistry	4
ZOO 121 Human Anatomy	4
PSY 232 Developmental Psychology	3
PEM 241 Golf and Wrestling	1
PEM 243 Prevention and Care of Athletic Injuries	2
Electives	3-6
	17-19

Second Semester

CHM 109 Basic Principles of Chemistry or PHY 109 Introduction to Physical Science	4
ZOO 142 Introduction to Human Physiology	3
PSY 232 Developmental Psychology	3
PEM 242 Badminton and Tennis	1
PEM 244 Physical Education for the Elementary School	2
Electives	2-6
	15-18

JUNIOR YEAR

First Semester

English Literature or Fine Arts	3
ZOO 143 Physiology of Muscular Activity	3
PEM 363 Principles of Athletic Coaching	3
PEM 365 Physical Education Observation and Assisting	2
PEM 367 (or EDC 367) School Health Program	3
PEM 369 Tests and Measurements in Physical Education	3
	17

Second Semester

Fine Arts or English Literature	3
EDC 312 The Psychology of Learning	3
PEM 360 Rhythm and Dance	1
PEM 362 Coaching of Track and Field or PEM 364 Coaching of Baseball	2
PEM 366 Physical Education Assisting	1
PEM 368 (or EDC 368) Methods and Materials in Physical Education	2
PEM 370 Applied Anatomy and Kinesiology	3
Elective	3
	18

SENIOR YEAR

First Semester

Elective (not in major or minor field)	3
EDC 430 Methods and Materials in Secondary Teaching	3
PEM 380 Curriculum and Administration of Physical Education	3
PEM 382 Community Recreation	2
PEM 384 Coaching of Football or PEM 386 Coaching of Basketball	2
PEM 410 Adaptive and Corrective Physical Education	3
Biology elective	3
	19

Second Semester

EDC 484 Supervised Student Teaching	12
EDC 485 Seminar in Teaching	3
	15

Total credits required: 144

PHYSICAL EDUCATION FOR WOMEN

This curriculum is designed for women students who wish to teach physical education at the elementary or secondary school level. In addition to a concentration in the professional area, students are provided a liberal education background. Completion of the program fulfills the requirements for teacher certification by the state of Rhode Island.

Note: students must purchase a uniform for student teaching as prescribed by the department, prior to the second semester of the sophomore year.

FRESHMAN YEAR

First Semester

BIO 101 General Biology	3
MTH 107 Finite Mathematics	3
PEW 101 Physical Education	1
PEW 260 Foundations of Health	3
General education requirements or free electives	6
	16

Second Semester

BIO 102 General Biology	3
PEW 102 Physical Education	1
PEW 172 First Aid	1
PEW 270 Introduction to the History and Philosophy of Physical Education	3
General education requirements or free electives	9
	17

SOPHOMORE YEAR

First Semester

CHM 101, 102 or 103, 105 General Chemistry or PHY 111 General Physics	4
PEW 203 Physical Education	1
PEW 285 Principles of Teaching Physical Education	2
PEW 290 Recreation Programs and Leadership	2
PSY 113 General Psychology	3
ZOO 121 Human Anatomy	4
General education requirement or free elective	3
	19

Second Semester

CHM 104, 106 or 112, 114 General Chemistry or PHY 112 General Physics	4
PEW 204 Aquatics	1
PEW 295 Physical Education in Elementary Schools	2
PEW 300 The Theory of Teaching Team Sports	2
PSY 232 Development Psychology	3
ZOO 142 Introduction to Human Physiology	3
General education requirement or free elective	3
	18

JUNIOR YEAR

First Semester

EDC 312 The Psychology of Learning	3
*PEW 212 Physical Education Practicum	1
PEW 301 The Theory of Teaching Team Sports	2
PEW 324 Rhythmic Analysis and Accompaniment	2
PEW 351 Tests and Measurements in Physical Education	3
ZOO 143 Physiology of Muscular Activity	3
General education requirement or free elective	3
	17

Second Semester

EDC 333 Procedures in Health Instruction	3
*PEW 213 Physical Education Practicum	1
PEW 320 Kinesiology	3
PEW 328 The Theory and Teaching of Individual and Dual Sports	2
PEW 331 Theory and Teaching of Dance	2
General education requirements or free electives	6
	17

SENIOR YEAR

First Semester

*PEW 214 Physical Education Practicum	1
PEW 329 The Theory and Teaching of Individual and Dual Sports	2
PEW 380 Organization and Administration of Physical Education	3
PEW 410 Corrective and Adapted Physical Education	3
General education requirements or free electives	8
	17

Second Semester

EDC 484 Supervised Student Teaching	12
EDC 485 Seminar in Teaching	3
	15

Total credits required: 136

* Practicum courses during the junior and senior years are activity courses that follow PEW 101 through PEW 204. These courses are especially designed to provide instruction in all necessary additional activities. They are also open to other upperclassmen who have permission of the department chairman.

PHYSICS

This curriculum provides a general background in theoretical and practical physics, and it qualifies the student for industrial research or advanced training in the industrial laboratories and in the technical bureaus of the government. Students also will have an adequate foundation for graduate work leading to higher degrees in physics.

The junior year is devoted largely to the classical problems and the theories of physics, and the more recent developments of the subject are treated in the senior year. Initiative, independent solution of laboratory problems, and research are encouraged in the advanced laboratory courses.

A well-prepared student, upon consultation with the department, may begin his study of physics in the first semester of the freshman year.

FRESHMAN YEAR

First Semester

MTH 141 Introductory Calculus with Analytical Geometry	3
General education requirements	12
	15

Second Semester

MTH 142 Intermediate Calculus with Analytical Geometry	3
PHY 213, 285 Elementary Physics	4
General education requirements	9
	16

SOPHOMORE YEAR

First Semester

MTH 243 Calculus and Analytical Geometry of Several Variables	3
PHY 214, 286 Elementary Physics	4
General education requirements	9
	16

Second Semester

MTH 244 Differential Equations	3
PHY 334 Optics	3
PHY 340 Introduction to Modern Physics	3
General education requirements	6
	15

JUNIOR YEAR

First Semester

Mathematics elective	3
PHY 331 Theory of Electricity and Magnetism	3
PHY 381 Advanced Laboratory Physics	3
General education requirement	3
Free electives	6
	18

Second Semester

Mathematics elective	3
PHY 322 Mechanics	3
PHY 382 Advanced Laboratory Physics	3
Free electives	9
	18

SENIOR YEAR

First Semester

PHY 483 Laboratory and Research Problems in Physics	3
PHY 451 Atomic and Nuclear Physics	3
PHY 421 Introduction to Theoretical Physics	3
Free electives	6
	15

Second Semester

PHY 484 Laboratory and Research Problems in Physics	3
PHY 402 Seminar in Physics	1
PHY 452 Nuclear Physics	3
PHY 431 Introduction to Theoretical Physics	3
Free electives	6
	16

Total credits required: 129

BACHELOR OF FINE ARTS CURRICULUMS

These curriculums provide the opportunity to discover and develop creative capacities in the fine arts. The emphasis is on richness of program and quality of experience rather than the development of isolated skills. Applicants registering for work toward the Bachelor of Fine Arts degree must receive permission of their concentration department. Students concentrating in art and in theatre specializing in scene design must submit portfolios. Theatre students who wish to specialize in acting must arrange for an audition with the De-

partment of Theatre. Others must arrange for an interview with a departmental representative. Further details and appointments may be obtained through the University Admissions Office.

CURRICULUM REQUIREMENTS

In keeping with the University's general education policy, all candidates for the Bachelor of Fine Arts degree in art and theatre are required to select and pass 45 credits of course work in three divisions. Of the total 45 credits, 18 shall be taken in one division, 15 in a second, and 12 in a third. Within each division, no more than 2 courses may be taken in one department or subject matter area for general education credit. Courses in art may not be used to meet these requirements. See page 21 for course selections in divisions A, B, and C.

ART

All freshman students planning to concentrate in art will be registered initially in the Bachelor of Arts program. Those students who demonstrate, during the freshman year, the special ability in art expected of fine arts registrants, and whose portfolios have been reviewed and approved by the Department of Art will be permitted to transfer to the Bachelor of Fine Arts program. Development of the freshman program will be under the supervision of the Department of Art advisers.

Students admitted to the B.F.A. program in art must complete a minimum of 48 credits in art. Studio courses required of all majors include:

101 Two-dimensional Studio	3
103 Three-dimensional Studio	3
207 Drawing	3
208 Drawing	3

Outstanding entering students may, upon recommendation of their adviser and approval of the art faculty, be excused from any or all of the courses in this section and substitute upper level courses for these credits. Normally, however, most students will be required to take these courses.

An additional 6-15 credits must be selected from studio courses numbered below 400.

An additional 12-21 credits must be selected from studio courses numbered above 400 with at least 6 credits in ART 403 and/or 404, and at least 6 credits in ART 405 and/or 406. Courses with variable credit loads must be elected in 3-credit multiples. Thus, a 3-9 credit course may be elected for 3, 6, or 9 credits only.

An additional 9 credits must be selected in art history. Students anticipating graduate study in art should note that some graduate schools require 12 credits in art history for entrance.

Student work accomplished as part of a course may, with the consent of the student, be retained by the Department of Art for teaching or exhibition purposes. When this work is no longer useful to the department, the student will be notified so it may be reclaimed within 60 days. Student works selected by the art faculty for inclusion in the permanent collection of the University may be purchased through negotiations with the student.

This program applies to new students who have entered since the fall of 1970. Students enrolled prior to that date may use the electives remaining after completion of the general education and concentration requirements to increase their art credits without increasing total graduation requirements.

Distribution of credits

General education requirements	45
Major requirements	
Studio	39
Art history	9
Electives	27

Total credits required: 120

THEATRE

A student of theatre may be admitted to the University in either the Bachelor of Arts or Bachelor of Fine Arts program. Permission to register for work toward the Bachelor of Fine Arts degree in theatre must be obtained through departmental evaluation by audition, interview, or submission of a portfolio appropriate to the student's planned area of specialization.

Students in the B.F.A. program in theatre must complete 48 credits in theatre studies according to the required categories below. To qualify for graduation with a Bachelor of Fine Arts degree in theatre, each student must be approved, subject to annual review, for departmental certification of proficiency in one of the four divisions of the theatre curriculum: theatrical performance, theatre business and management, theatrical design and technology or theatre history and theory.

A total of 124 credits is required for graduation.

Required courses

101 Introduction to Theatre Studies	3
111 Introduction to Acting	3
161 Stagecraft	3
201 Principles of Theatre	3
	12

Students will be expected to complete the credits from this category by the end of the sophomore year.

An additional 3 credits must be selected from the following:

ENG 255 Survey of English Drama
ENG 365 Modern Drama
ENG 433 Elizabethan Drama
ENG 446 Modern American Drama
ENG 465 Greek and Roman Drama
ENG 472 Shakespeare

Specialization

The B.F.A. candidate selects 48 credits in his area of specialization. The concentration may not exceed 48 credits without a corresponding increase in the minimum credits required for graduation. It is expected that these courses will be selected primarily from the division in which the student plans to obtain certification of proficiency. However, with the concurrence of the student's adviser, these courses may be supplemented by other theatre courses or through selection of appropriate courses offered by other departments of the University. Courses in dramatic literature, visual design, speech, voice, dance, and music are considered particularly advantageous depending upon the student's area of specialization.

Courses outside the specialization

With the concurrence of his adviser, each student must select 12 credits from a combination of at least two of the divisions of the theatre curriculum other than the division in which the student plans to obtain certification of proficiency. These include:

Theatrical performance (course numbers with the second digits 1, 2, or 3)
Theatre business and management (second digit 4)
Theatrical design and technology (second digits 5, 6, or 7)
Theatre history and theory (second digits 8 or 9)

These courses must be at the 300-level or above with the exception of THE 211 and 212 which may also fulfill this requirement.

BACHELOR OF MUSIC CURRICULUMS

The Bachelor of Music degree is designed to prepare qualified students for careers in the field of music. The student may select one of six areas of concentration dependent upon his aims and abilities. These are: (1) piano, (2) voice, (3) an orchestral instrument, (4) music history and literature, (5) theory and composition, and (6) music education.

All areas provide for a good background in academic subjects and each curriculum contains basic courses for the development of sound musicianship. An audition conducted by members of the music department staff is required for permission to register for work toward the Bachelor of Music degree.

Concentration in the music education curriculum includes courses in educational psychology, methods, and a teaching internship which leads to state certification for teachers.

The total number of credits for graduation is 125.

CURRICULUM REQUIREMENTS

In keeping with the University's general education policy, all candidates for the Bachelor of Music degree are required to select and pass 45 credits of course work in three divisions. See page 21 for course selections in divisions A, B, and C.

Students concentrating in music education may include 6 credits in music to meet division A requirements, and 3 credits in psychology and 6 credits in education to meet division C requirements.

All students in this degree program must take the following music courses:

101 Introduction to Music	3
221, 222 History of Music	6
113, 114 Diatonic Harmony and Ear Training	6
215, 216 Advanced Harmony and Ear Training	6
317 Form and Analysis	3
	24

In addition, each student selects one of the following areas of concentration.

Piano

261, 262, 263, 264 Applied Piano, 3 each	12
461, 462, 463, 464 Applied Advanced Piano, 4 each	16
399A Chamber Music Ensemble	4
418 Composition	3
420 Counterpoint	3
481, 482 Piano Literature and Pedagogy	4
Electives	14
	56

Voice

261, 262, 263, 264 Applied Voice, 3 each	12
461, 462, 463, 464 Applied Advanced Voice, 4 each	16
251, 252, 253, 254 Applied Piano, 2 each	8
311 Choral Conducting	2
393 Chorus or Ensemble Elective	8
Electives	10
	56

Students concentrating in voice also must take 15 credits of foreign language in any three or more languages at any level. The requirement may be modified or satisfied by advanced placement.

Orchestral Instrument

261, 262, 263, 264 Applied Instrument, 3 each	12
461, 462, 463, 464 Applied Advanced Instrument, 4 each	16
312 Instrumental Conducting	2
418 Composition	3
420 Counterpoint	3
321 Orchestration	3
391 Orchestra, 392 Marching Band, 394 Wind Ensemble, or Ensemble Elective	8
Electives	9
	56

Music Theory and Composition

251, 252, 253, 254 Applied Instrument or Voice	8
251, 252, 253, 254 Applied Minor, 2 each	8
451, 452, 453, 454 Applied Advanced Instrument or Voice, 2 each	8
418 Composition	3
420 Counterpoint	3
321 Orchestration	3
427, 428 Sixteenth-Century Counterpoint	4
541 Special Project	3
391 Orchestra, 392 Marching Band, 393 Chorus, or 394 Wind Ensemble	4
Electives	12
	56

Students concentrating in composition must take MUS 117, 419 and 422.

Music History and Literature

251, 252, 253, 254 Applied Instrument or Voice, 2 each	8
451, 452, 453, 454 Applied Advanced Instrument or Voice, 2 each	8
391 Orchestra, 392 Marching Band, 393 Chorus, or 394 Wind Ensemble	4
304 Introduction to Contemporary Music	2
407 The Symphony	3
408 The Opera	3
418 Composition	3
420 Counterpoint	3
431 The Baroque Era	3
432 The Classical Era	3
433 The Romantic Era	3
441 Special Project	0-6
Electives	13
	56

Students concentrating in music history and literature must have 15 credit hours of foreign languages with intermediate level proficiency in at least one language. The requirement may be modified or satisfied by advanced placement.

Music Education

251, 252, 253, 254 Applied Instrument or Voice, 2 each	8
451, 452, 453, 454 Applied Advanced Instrument or Voice, 2 each	8
311, 312 Conducting	4
321 Orchestration	3
391 Orchestra, 392 Marching Band, 393 Chorus, or 394 Wind Ensemble	8
171 to 180 Voice or Instrumental Classes	8
339, 340 Methods and Materials in Teaching Music	6
EDC 484 Supervised Student Teaching	6
Electives	5
	56

Students concentrating in music education are required to take a minimum of 18 credit hours in education and music education for state certification. Courses in the Department of Education include: 102 Introduction to American Education, 312 Psychology of Learning, 484 Supervised Student Teaching.

ASSOCIATE DEGREE IN DENTAL HYGIENE

The Department of Dental Hygiene offers a two-year program leading to the Associate in Science degree. The curriculum is designed to prepare the student to perform ancillary clinical services which contribute to the maintenance of good oral health, educate both children and adults in oral hygiene, and assist the dentist to allow him more time for the treatment of patients.

The program is designed to allow transfer students from other colleges and curriculums to attain the Associate in Science degree.

The curriculum is accredited by the Council on Dental Education of the American Dental Association. Two months of experience as a dental assistant is recommended for all students entering the dental hygiene program. At the completion of the first clinical year, the student is placed in a private dental office for one month of field training experience.

FRESHMAN YEAR

First Semester

CHM 101, 102 or 103, 105 General Chemistry	4
ENG 110 Composition	3
ZOO 121 Human Anatomy	4
DHY 101 Orientation to Dental Hygiene	1
DHY 125 Oral Anatomy	3
DHY 135 Prophylactic Techniques Laboratory	1
DHY 141 Dental Assisting	1
	17

Second Semester

ENG 120 Literature and Composition	3
CHM 124 Organic Chemistry	4
ZOO 142 Introduction to Human Physiology	3
PEW 172 First Aid	1
DHY 126 General and Oral Histology and Embryology	3
DHY 128 Periodontics	1
DHY 136 Dental Hygiene Clinic	2
	17

SOPHOMORE YEAR

First Semester

BAC 201 General Microbiology	4
SOC 202 General Sociology	3
FNS 207 General Nutrition	3
PCL 221 Dental Therapeutics	2
DHY 227 General and Oral Pathology	3
DHY 231 Roentgenology	2
DHY 237 Dental Hygiene Clinic	2
	19

Second Semester

PSY 113 General Psychology	3
SPE 101 Fundamentals of Oral Communication	3
DHY 238 Dental Hygiene Clinic	2
DHY 244 Dental Materials and Operative Technique	1
DHY 246 Ethics, Jurisprudence and Office Management	1
DHY 250 Dental Health Education	2
DHY 252 Public Health	2
DHY 254 Survey of Dental Specialties	1
DHY 260 Preventive Dentistry	2
	17

Total credits required: 70

College of Business Administration

RICHARD R. WEEKS, Dean
EUGENE M. JOHNSON, Assistant Dean

The departments of the College of Business Administration are Accounting, Business Education and Office Administration, Finance and Insurance, Management Science, Marketing Management, and Organizational Management and Industrial Relations. The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog, preceded in each case by the name of the chairman and the teaching faculty.

The ten curriculums in this College allow the student to develop competence in a special field of interest and prepare him to meet the changing complexities of life and leadership in the business community. Curriculums are offered in accounting with possible emphasis on governmental, private, and public accounting; business education; business education with an option in distributive education; finance; general business administration; insurance; management science; marketing; marketing with an option in advertising; office administration, organizational management and industrial relations; and production and operations management.

Basic courses required of all undergraduates at the University introduce the student to the humanities, social sciences, physical and biological sciences, and the arts, which are becoming more and more important for success in the business world. The business curriculums develop the student's professional capabilities through a broad group of business courses with specialization in one area of study. Business programs provide a strong foundation in accounting, computer science, economics, finance, law, management science, marketing, organizational management and industrial relations, production and operations management, and statistics. The College is strengthening its emphasis on the behavioral studies and computer technology to meet the needs of the business community and society as a whole. Emphasis is placed upon the total business environment as a part of the national and world economic structure. In all areas of learning, theory as well as analysis and decision-making is stressed.

Ordinarily students must take required business courses at the University of Rhode Island. Those who expect to obtain a degree from this University must obtain prior approval to take work at other institutions.

The College of Business Administration is a professional school and has divided its courses into lower and upper divisions. The lower division courses constitute those taught in the freshman and sophomore years; the upper division, those taught in the junior and senior years. Junior college transfer credits may be applied only to lower division courses.

A student enrolled in the College of Business Administration must complete the curriculum in one of the major areas of concentration and must obtain an average of 2.00 points or better in all required courses in his major area of concentration. Each student selects his major area of study by the second semester of his sophomore year. A series of meetings is held which introduces him to the various major programs within the College of Business Administration.

FRESHMAN YEAR

(Common to all curriculums except Business Education and Office Administration.)

First Semester

MGS 101 Introduction to Quantitative Analysis for Business and Economics	3
MGS 107 Introduction to Computer Programming for Business	3
General education elective in Division A	3
General education elective in Division B	3
General education elective in Division C	3
	15

Second Semester

MGS 102 Introduction to Quantitative Analysis for Business and Economics	3
General education elective	3
General education elective in Division A	3
General education elective in Division B	3
General education elective in Division C	3
	15

SOPHOMORE YEAR

First Semester

ACC 201 Elementary Accounting	3
BST 201 Business Statistics	3
ECN 125 Economic Principles	3
General education elective in Division A	3
General education elective	3
	15

Second Semester

ACC 202 Elementary Accounting	3
BST 202 Business Statistics	3
ECN 126 Economic Principles	3
General education elective in Division A	3
General education elective	3
	15

ACCOUNTING

The increased scope of governmental and business activities has greatly extended the field of accounting and has created an unprecedented demand for accountants both in government and in industry. This curriculum has been designed to meet that demand.

In addition to providing a general cultural and business background, the curriculum offers specialized training in the fields of general accounting, cost accounting, and public accounting. It offers specific, basic training to students who wish to become general accountants, industrial accountants, cost analysts, auditors, credit analysts, comptrollers, income tax consultants, teachers of specialized business subjects, certified public accountants, government cost inspectors, government auditors.

The broad scope of the courses offered makes it possible for a student who is interested in any of the fields of accounting to obtain fundamental training in the field of his choice, whether this training is to be used as an aid to living or as a basis for graduate study. For those interested in graduate study, the Master of Science degree in accounting will provide the education recommended by the American Institute of Certified Public Accountants for the practice of public accounting. See *Graduate School Bulletin* for description.

JUNIOR YEAR

First Semester

ACC 311 Intermediate Accounting	3
ACC 321 Cost Accounting	3
ECN 427 Intermediate Economics	3
MGS 363 Electronic Data Processing for Business and Industry	3
OMR 301 Principles of Management	3
	15

Second Semester

ACC 312 Intermediate Accounting	3
ECN 428 Intermediate Economics	3
MMG 323 Marketing Principles	3
MGS 309 Production Management	3
Free elective	3
	15

SENIOR YEAR

First Semester

ACC 443 Federal Tax Accounting	3
BSL 333 Law in Business Environment	3
FIN 321 Corporation Finance	3
MGS 365 Management Science I	3
Free elective	3
	15

Second Semester

ACC 431 Advanced Accounting	3
ACC 461 Auditing	3
BSL 334 Law in Business Environment or BSL 342 Property Interests	3
GBA 410 Business Policy	3
Free elective	3
	15

Total credits required: 120

BUSINESS EDUCATION

This curriculum, which fulfills the requirement of the R. I. State Board of Education for certification, offers students an opportunity to prepare themselves to become teachers of business subjects. Two concentrations are available in the curriculum: (1) social business-secretarial, (2) distributive education.

A student electing the distributive education concentration will also be certified to teach social business subjects. Students selecting the social business-secretarial concentration will be eligible for certification in both of these areas.

In addition to business and education courses, the programs also provide a broad liberal background. The curriculum for the freshman and sophomore years is common to both concentrations.

FRESHMAN YEAR

First Semester

BED 121 Elementary Typewriting	2
ENG 110 Composition	3
History (any course numbered 100-199)	3
PEM 101 or PEW 101 Physical Education	1
MGS 101 Introduction to Quantitative Analysis for Business and Economics	3
*Biological or physical science	3
	15

Second Semester

BED 122 Advanced Typewriting	2
ENG 120 Literature and Composition	3
History (any course numbered 100-199)	3
PEM 102 or PEW 102 Physical Education	1
MGS 107 Introduction to Computer Programming for Business	2
*Biological or physical science	3
Speech elective	3
	17

SOPHOMORE YEAR

First Semester

ACC 201 Elementary Accounting	3
BST 201 Business Statistics	3
ECN 125 Economic Principles	3
PEM 203 or PEW 203 Physical Education	1
Humanities elective	3
Elective	3
	16

Second Semester

ACC 202 Elementary Accounting	3
ECN 126 Economic Principles	3
EDC 102 Introduction to American Education	3
PEM 204 or PEW 204 Physical Education	1
PSY 113 General Psychology	3
Humanities elective	3
	16

SOCIAL BUSINESS-SECRETARIAL CONCENTRATION

JUNIOR YEAR

First Semester

ACC 301 Accounting for Business Teachers	3
BED 321 Elementary Shorthand	4
BED 326 Business Machines	3
BSL 333 Law in a Business Environment	3
EDC 312 The Psychology of Learning	3
MMG 323 Marketing Principles	3
	19

Second Semester

BED 322 Advanced Shorthand	4
BSL 334 Law in a Business Environment	3
EDC 430 Methods and Materials in Secondary Teaching	3
OMR 301 Principles of Management	3
Humanities elective	3
	16

SENIOR YEAR

First Semester

BED 323 Dictation and Transcription	4
EDC 441 Methods and Materials of Teaching Business Subjects	4
FIN 321 Corporation Finance	3
MGS 363 Electronic Data Processing for Business and Industry	3
Elective (not in major field)	3
	17

Second Semester

EDC 484 Supervised Student Teaching	12
EDC 485 Seminar in Teaching	3
	15

Total credits required: 131

* To be selected from AST 108; BIO 101, 102; BOT 111; CHM 101, 103, 104, 107, 112; ESC 101, 105; GEL 104, 108; PHY 109, 111, 112; ZOO 111.

DISTRIBUTIVE EDUCATION CONCENTRATION

JUNIOR YEAR

First Semester

ACC 301 Accounting for Business Teachers	3
BED 326 Business Machines	3
BSL 333 Law in a Business Environment	3
EDC 312 The Psychology of Learning	3
MMG 323 Marketing Principles	3
Humanities elective	3
	18

Second Semester

BSL 334 Law in a Business Environment	3
EDU 430 Methods and Materials in Secondary Teaching	3
OMR 301 Principles of Management	3
MGS 363 Electronic Data Processing for Business and Industry	3
Marketing elective	3
	15

SENIOR YEAR

First Semester

BED 427 Organization, Administration and Methods of Teaching Distributive Education	3
BED 428 Coordinating and Developing Curriculum for Distributive Education	3
FIN 321 Corporation Finance	3
Elective (not in major field)	3
Marketing Management elective	3
Elective	3
	18

Second Semester

EDC 484 Supervised Student Teaching	12
EDC 485 Seminar in Teaching	3
	15

Total credits required: 130

FINANCE

Courses in finance are designed to provide students with an understanding of financial institutions, investments, and mercantile and trade credit. This field of specialization prepares students for executive careers in (1) commercial banks and related financial institutions; (2) investment banking and investment management; (3) financial management, including careers as treasurers, controllers, credit managers, budget executives and administrators in business enterprises; and (4) administrative work in governmental financial institutions.

JUNIOR YEAR

First Semester

BSL 333 Law in a Business Environment	3
FIN 321 Corporation Finance	3
FIN 332 Financial Institutions	3
OMR 301 Principles of Management	3
Liberal elective	3
	15

Second Semester

FIN 330 Problems in Business Finance	3
MMG 323 Marketing Principles	3
MGS 309 Production Management	3
MGS 363 Electronic Data Processing for Business and Industry	3
Professional elective	3
	15

SENIOR YEAR

First Semester

FIN 422 Investments	3
FIN 410 Capital Markets	3
Free elective	3
Professional electives	6
	15

Second Semester

FIN 440 Problems in Security Investments	3
GBA 410 Business Policy	3
Free elective	3
Liberal elective	3
Professional elective	3
	15

Total credits required: 120

GENERAL BUSINESS ADMINISTRATION

The general business administration curriculum offers the student an opportunity to study all phases of business operation. It is particularly suitable for (1) those students who are planning to operate their own businesses and are seeking a broad business background, (2) those who are preparing for positions in large organizations with training programs in which specialization is taught after employment, and (3) those who desire a general business background at the undergraduate level prior to taking more specialized graduate work.

Students who major in the general administration curriculum shall be limited to a maximum of 9 credit hours of professional electives in a specific major or concentration. A general business administration student should take a broad spectrum of courses and not concentrate in one special field of study.

JUNIOR YEAR

First Semester

BSL 333 Law in a Business Environment	3
FIN 321 Corporation Finance	3
OMR 301 Principles of Management	3
MMG 323 Marketing Principles	3
MGS 363 Electronic Data Processing for Business and Industry	3
	15

Second Semester

BSL 334 Law in a Business Environment or BSL 342 Property Interests	3
FIN 330 Problems in Business Finance	3
OMR 302 Manufacturing Industries in the United States	3
MMG 462 Marketing Research	3
MGS 309 Production Management	3
	15

SENIOR YEAR

First Semester

Professional electives	6
Free electives	9
	15

Second Semester

GBA 410 Business Policy	3
Professional electives	6
Free electives	6
	15

Total credits required: 120

INSURANCE

Insurance is a basic industry which functions throughout the economy to indemnify loss and reduce risk. In performing these functions, insurance companies through their home and branch offices, their agencies and bureaus, currently employ about a million persons in a great variety of jobs (selling, administrative, technical, research, etc.).

For success in this industry, the professional concept with its emphasis on expert knowledge has become increasingly important, and students in this curriculum are prepared for and encouraged to work toward the professional designations conferred by the American College of Life Underwriters (C.L.U.) and the American Institute of Property and Liability Underwriters (C.P.C.U.).

The curriculum offers comprehensive preparation for diversified career opportunities in insurance, including satisfaction of state requirements for agents' and brokers' licenses in fire and marine, casualty and surety, and life and accident-sickness fields. It is approved by state insurance departments in Rhode Island and New York.

JUNIOR YEAR

First Semester

BSL 333 Law in a Business Environment	3
INS 301 General Principles and Practices of Insurance	3
OMR 301 Principles of Management	3
FIN 321 Corporation Finance	3
MGS 363 Electronic Data Processing for Business and Industry	3
	15

Second Semester

INS 313 Property Insurance	3
MMG 323 Marketing Principles	3
MGS 309 Production Management	3
Free elective	3
Professional elective	3
	15

SENIOR YEAR

First Semester

INS 314 Property Insurance	3
INS 333 Social Insurance	3
Free electives	6
Liberal elective	3
	15

Second Semester

BSL 342 Property Interest	3
GBA 410 Business Policy	3
INS 325 Life Insurance	3
INS 322 Automobile Insurance	3
Professional elective	3
	15

Total credits required: 120

MANAGEMENT SCIENCE

The application of modern mathematical and statistical tools to the formulation, analysis, and implementation of operational problems in business, industry, and government (especially in military establishments) has been increasing at an accelerated rate. Models such as linear programming, inventory control, queue, decision theory, game theory, sequencing and scheduling, project evaluation and reviewing, etc. have become important administrative tools.

This quantitative business analysis curriculum is designed to develop proficiency in work toward management positions in business, industry, or government; as well as serve as a foundation for further study toward the Master of Business Administration and Doctor of Philosophy degrees. It attempts to use an integrated approach to the subject, and thus to combine both theory and application within a framework of reference.

JUNIOR YEAR

First Semester

MGS 365 Management Science I	3
FIN 321 Corporation Finance	3
MMG 323 Marketing Principles	3
OMR 301 Principles of Management	3
MGS 363 Electronic Data Processing for Business and Industry	3
	15

Second Semester

MGS 366 Management Science II	3
FIN 330 Problems in Business Finance	3
MGS 309 Production Management	3
MMG 462 Marketing Research	3
Professional elective	3
	15

SENIOR YEAR

First Semester

BST 375 Bayesian Statistics in Business	3
BSL 333 Law in a Business Environment	3
Professional elective	3
Liberal elective	3
Free elective	3
	15

Second Semester

MGS 476 Management System Analysis	3
GBA 410 Business Policy	3
Professional elective	3
Free electives	6
	15

Total credits required: 120

MARKETING MANAGEMENT

One of our major economic problems is to market the tremendous productivity of our factories. Despite an ever-increasing ability to buy, consumers must be willing to buy. A marketing manager's responsibility, therefore, is to determine the needs and desires of consumers, of industry, and of the entire economy. Marketing research provides the necessary information to develop such necessary products as well as insights into communications and distribution channels best suited to reach consumers. Marketing, therefore, embraces such functions as marketing research, product planning and pricing, advertising creation and management, sales administration, merchandising, transportation, promotion and public relations.

Advertising and marketing are two options offered in marketing management. In each option the student obtains a balanced preparation for the various opportunities in marketing and advertising.

JUNIOR YEAR

First Semester

FIN 321 Corporation Finance	3
OMR 301 Principles of Management	3
MMG 323 Marketing Principles	3
MMG 334 Consumer Behavior	3
MGS 363 Electronic Data Processing for Business and Industry	3
	15

Second Semester

FIN 330 Problems in Business Finance	3
MMG 335 Fundamentals of Advertising	3
MMG 462 Marketing Research	3
MGS 309 Production Management	3
Free elective	3
	15

MARKETING OPTION

SENIOR YEAR

First Semester

BSL 333 Law in a Business Environment	3
MMG 332 Sales Management	3
MMG 443 Retail Store Management	3
Professional elective	3
Free elective	3
	15

Second Semester

GBA 410 Business Policy	3
MMG 464 Marketing Policy and Problems	3
MMG 452 International Marketing	3
Free electives	6
	15

ADVERTISING OPTION

SENIOR YEAR

First Semester

BSL 333 Law in a Business Environment	3
MMG 332 Sales Management	3
MMG 474 Advertising Seminar	3
Professional elective	3
Free elective	3
	15

Second Semester

GBA 410 Business Policy	3
MMG 464 Marketing Policy and Problems	3
MMG 475 Advertising Campaigns	3
Free electives	6
	15

Total credits required: 120

OFFICE ADMINISTRATION

This curriculum prepares students to assume responsible positions in business, industry, government service, and the professions as executive secretaries or administrative assistants.

A broad background in general business administration subjects, together with office skills and liberal electives for cultural enrichment, provide the student with the qualifications necessary for success in this challenging career.

Note: Students in this curriculum may be excused from taking BED 121 Elementary Typewriting, and BED 321 Elementary Shorthand, upon passing a satisfactory examination in these subjects. Students must, however, elect substitute courses with credits equal to the number of credits in the courses from which they are excused.

FRESHMAN YEAR

First Semester

BED 121 Elementary Typewriting	2
MGS 101 Introduction to Quantitative Analysis for Business and Economics	3
MGS 107 Introduction to Computer Programming for Business	3
General education elective in Division A	3
General education elective in Division B	3
	14

Second Semester

BED 122 Advanced Typewriting	2
MGS 102 Introduction to Quantitative Analysis for Business and Economics	3
General education elective in Division A	3
General education elective in Division B	3
Free elective	4
	15

SOPHOMORE YEAR

First Semester

ACC 201 Elementary Accounting	3
ECN 125 Economic Principles	3
General education elective in Division A	3
General education elective in Division C	3
General education elective	3
	15

Second Semester

ACC 202 Elementary Accounting	3
BST 201 Business Statistics	3
ECN 126 Economic Principles	3
PSY 113 General Psychology	3
General education elective in Division A	3
	15

JUNIOR YEAR

First Semester

BED 321 Elementary Shorthand	4
BED 326 Business Machines	3
BSL 333 Law in a Business Environment	3
MGS 363 Electronic Data Processing for Business and Industry	3
OMR 301 Principles of Management	3
	16

Second Semester

BED 322 Advanced Shorthand	4
BED 327 Business Communications	3
BSL 334 Law in a Business Environment	3
FIN 321 Problems in Business Finance	3
MMG 323 Marketing Principles	3
	16

SENIOR YEAR

First Semester

BED 323 Dictation and Transcription	4
BED 325 Records Administration	2
General education electives	6
Free elective	3
	15

Second Semester

BED 324 Advanced Dictation and Transcription	2
BED 328 Office Procedures and Administration	3
GBA 410 Business Policy	3
MGS 309 Production Management	3
OMR 300 Personnel Administration	3
	14

Total credits required: 120

PRODUCTION AND OPERATIONS MANAGEMENT

Issues, concepts and techniques encountered in efficiently managing the modern production function in industry and business are the main concerns of this curriculum. The modern production function is here defined in a wider sense, to include all kinds of operations which employ men and machines to produce visible goods as well as to render intangible services. A basic understanding of the management task of design and evaluation of all the possible alternative operations and processes is emphasized. Practices and implications of computer-based systems and operations in management are also investigated.

Specific topics discussed include assignment of facilities; product research and development; control of quality and quantity; design of operations and processes; aggregate planning of employment, inventory and production; budget and cost analysis; capital costs and investment criteria; information and material flows; evaluation of system performance.

JUNIOR YEAR

First Semester

MGS 365 Management Science I	3
FIN 321 Corporation Finance	3
MMG 323 Marketing Principles	3
OMR 301 Principles of Management	3
MGS 309 Production Management	3
	15

Second Semester

MGS 366 Management Science II	3
FIN 330 Problems in Business Finance	3
MGS 310 Materials Management	3
MMG 462 Marketing Research	3
MGS 363 Electronic Data Processing for Business and Industry	3
	15

SENIOR YEAR

First Semester

MGS 457 Advanced Production Management	3
BSL 333 Law in a Business Environment	3
OMR 303 Personnel Administration and Organizational Behavior	3
Liberal elective	3
Free elective	3
	15

Second Semester

MGS 458 Advanced Production Management	3
GBA 410 Business Policy	3
Professional elective	3
Free electives	6
	15

Total credits required: 120

College of Engineering

LEWIS D. CONTA, Dean
ERNEST B. GOODWIN, Assistant Dean

The departments of the College are Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Applied Mechanics, and Ocean Engineering. The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog, preceded in each case by the name of the chairman and the teaching faculty.

The College of Engineering offers six undergraduate curriculums: chemical, civil, electrical, industrial, mechanical engineering, and engineering science. An ocean engineering program is offered for graduate students only. Entrance requirements for this program are listed in the Graduate School section of this catalog. Because the same fundamental concepts underlie all branches of engineering, the freshman year courses are essentially the same for all curriculums, and the choice of a specific branch of engineering is generally delayed until the beginning of either the second term, or the second year of study.

All of the engineering curriculums are based on an intense study of mathematics and the basic sciences, and of the engineering sciences common to all branches of the profession. On this base is built the specific study in depth of the important principles and concepts of each separate discipline. These principles are applied to the understanding and solution of problems of current interest and importance in the field. Each curriculum is designed to provide the knowledge and ability necessary for practice as a professional engineer, or for successful graduate study.

The goal of the College is to stimulate the students to become creative responsible engineers, aware of the social implications of their work, and flexible enough to accommodate to the rapid changes taking place in all branches of engineering.

Engineering students, in common with all other students in the University, must meet the general education requirements listed on page 21 of this catalog. In these courses students are exposed to and challenged by concepts from the humanities and social sciences to insure that the social relevance of their engineering activities will never be forgotten.

A student on probation may register for no more than 15 credits per semester. For all others, the maximum course load is 20 credits per semester.

FRESHMAN YEAR IN ALL CURRICULUMS

First Semester

CHM 191 General Chemistry	5
EGR 101 Introduction to Engineering or EGR 102 Basic Graphics	1
MTH 141 Introductory Calculus with Analytic Geometry	3
General education electives in Division A or C	6
	15

Second Semester

*Natural science elective in Division B	3-5
EGR 101 Introduction to Engineering or EGR 102 Basic Graphics	1
MTH 142 Intermediate Calculus with Analytic Geometry	3
MCE 162 Statics or PHY 213 and 285 Elementary Physics and Physics Laboratory	3-4
†General education electives in Division A or C	6
	16-19

CHEMICAL ENGINEERING

The American Institute of Chemical Engineers defines chemical engineering as "the application of the principles of the physical sciences, together with the principles of economics and human relations, to fields that pertain directly to processes and process equipment in which matter is treated to effect a change of state, energy content or composition."

As chemical engineers are widely employed in all major industries, they need a strong foundation in chemistry, physics, mathematics and basic engineering subjects. The first two years of the curriculum have this as an objective. Chemical engineering courses include: the use of analog and digital computers, thermodynamics, transport phenomena, mass transfer operations, metallurgy, materials engineering, process dynamics and control, kinetics and plant design. Several elective courses are offered to give the chemical engineering student additional specialized knowledge. The student has the opportunity to operate small-scale equipment, to determine efficiencies and operating characteristics, and to visit chemical plants in the area. Intensive work in the solution of complex problems is given in which economics and optimization of engineering design are emphasized.

Chemical engineers may become competent in research, process development, plant design, production supervision, sales engineering, marketing, teaching and management. Almost a third of all chemical engineers are employed in technical administration. Students graduating from this curriculum are well prepared for industry, public service, or graduate study.

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* Students who intend to major in chemical engineering must elect CHM 192 and PHY 213, 285. Engineering science majors must elect CHM 192 or 110.

† Chemical engineering majors are also advised to elect ECN 123 Elements of Economics in their freshman year.

SOPHOMORE YEAR

First Semester

CHE 211 Introduction to Chemical Engineering	2
CHE 212 Chemical Process Calculation	2
CHM 441 Physical Chemistry	3
MTH 243 Calculus and Analytic Geometry of Several Variables	3
PHY 214 Elementary Physics	3
PHY 286 Physics Laboratory	1
General education elective in Division A or C	3
	17

Second Semester

BAC 201 General Microbiology or BIO 102 General Biology	3
CHE 313 Chemical Engineering Thermodynamics	3
CHM 336 Physical Chemistry Laboratory	2
CHM 442 Physical Chemistry	3
ELE 220 Electric Circuits, Measurements and Electronics	3
MTH 244 Differential Equations	3
	17

JUNIOR YEAR

First Semester

CHE 314 Chemical Engineering Thermodynamics	3
CHE 328 Industrial Plants	1
CHE 344 Introduction to Transfer Rates	3
CHM 227 Organic Chemistry Lecture	3
CHM 229 Organic Chemistry Laboratory	1
Approved mathematics elective	3
General education elective in Division A or C	3
	17

Second Semester

CHE 322 Chemical Process Analysis	1
CHE 332 Physical Metallurgy or *Approved professional elective	3
CHE 343 Mass Transfer Operations	3
CHE 425 Process Dynamics and Control	3
CHM 228 Organic Chemistry Lecture	3
CHM 230 Organic Chemistry Laboratory	1
General education elective in Division A or C	3
	17

SENIOR YEAR

First Semester

CHE 345 Chemical Engineering Laboratory or *Approved professional elective	2
CHE 351 Plant Design and Economics	3
CHE 464 Industrial Reaction Kinetics	3
NUE 581 Introduction to Nuclear Engineering or PHY 340 Introduction to Modern Physics	3
General education elective in Division A or C	3
Free elective	3
	17

Second Semester

CHE 346 Chemical Engineering Laboratory	2
CHE 352 Plant Design and Economics	3
CHM 412 Instrumental Methods of Analysis or *Approved professional elective	3
CHM 414 Instrumental Methods of Analysis Laboratory or *Approved professional elective	2
CVE 220 Mechanics of Materials or *Approved professional elective	3
General education elective in Division A or C	3
Free elective	3
	19

Total credits required: 138

CIVIL AND ENVIRONMENTAL ENGINEERING

The civil engineer is responsible for the planning, design, construction, management and research and development of systems which are necessary to satisfy the demands of modern civilization. Water supply and distribution, sewerage, solid waste disposal, air pollution, transportation systems, foundations, dams, and buildings and bridges of many types are among the civil engineer's responsibilities. The curriculum includes both courses of a technical nature and those in the humanities and social sciences to insure that the

* These courses must be chosen with the approval of the adviser designated by the department. Areas of concentration include bio-engineering, chemical reaction engineering, engineering management, materials engineering, nuclear engineering, pollution control, transport phenomena and thermodynamics.

graduating engineer will not only be capable of solving tomorrow's engineering problems but will also be aware of the social implications of his solutions.

This curriculum provides the student with sufficient background to pursue graduate study or to enter directly into professional practice in industry or government after graduation. The first two years are devoted largely to courses in mathematics, chemistry, physics and engineering science which are common to all engineering curriculums. In his last two years the student has a large degree of flexibility in developing his own program through the selection of professional electives in environmental engineering, soil mechanics and foundations, structural engineering, and transportation and construction.

While it is expected that most students will select a broad program with depth in one or two areas, students are encouraged to develop programs which best suit their own professional goals. Each student is required near the completion of both the sophomore and junior years to file a proposed plan of study which has been approved by his faculty adviser and the department.

SOPHOMORE YEAR

First Semester

MTH 243 Calculus and Analytic Geometry	3
ELE 210 Introduction to Electrical Engineering	3
MCE 263 Dynamics	3
CVE 216 Metronics	3
General education elective in Division A or C	3
	15

Second Semester

MTH 244 Differential Equations	3
PHY 340 Modern Physics	3
GEL 302 Engineering Geology	3
CVE 220 Mechanics of Materials	3
General education elective in Division A or C	3
	15

JUNIOR YEAR

First Semester

CVE 322 Civil Engineering Laboratory I	1
MCE 354 Fluid Mechanics	3

Second Semester

CVE 323 Civil Engineering Laboratory II	1

The remaining courses in the junior and senior years shall be selected by the student to satisfy the following requirements:

Core courses. Each student must select at least five of the following:

CVE 315 Survey I
CVE 334 Construction Planning and Specifications
CVE 346 Transportation Engineering
CVE 350 Structural Analysis I
CVE 374 Environmental Engineering I
CVE 380 Soil Mechanics
CVE 396 Civil Engineering Analysis
CPL 410 Fundamentals of Urban Planning

Mathematical science elective. Each student must elect at least one course at the 400 level or above in mathematics, statistics or operations research.

Professional electives. Each student, in consultation with his adviser and with the approval of the department, selects at least 24 credits of professional electives from courses in engineering, computer science, the sciences, social sciences, community planning, or other areas appropriate to a program in civil and environmental engineering.

General education and free electives. An additional 9 credits in Divisions A and C are required to complete the University general education requirements and all students in the University must select 6 credits of free electives.

Total credits required: 125-128

ELECTRICAL ENGINEERING

This curriculum prepares for a professional career in industry or government and for further graduate study in electrical engineering or related fields of physical science. All students take the same basic courses in preparation for work in one of the following areas: communication systems; electronics, including solid state micro-electronics and photo-electronics; automatic control systems; design of digital computer systems; energy conversion; and radio propagation. By carefully selecting elective courses the student should be able to enter graduate study or industry in any of these fields after graduation.

Throughout the entire curriculum the scientific basis of electrical engineering is emphasized and the application of mathematical analysis to engineering problems is stressed. Those aspects of physical science which are of particular importance to electrical engineers are included in the curriculum: thus work is required in atomic physics and the behavior of the solid state, electromagnetic theory and electronics. The viewpoint of the engineer who makes creative use of scientific principles in problems of engineering design is illustrated particularly in the advanced courses of the

senior year. Use of digital computer techniques is required in many electrical engineering courses.

In the laboratory the behavior of electrical and optical devices and systems is studied experimentally. Analytical and design calculations are verified by physical tests and new devices may be built and studied.

SOPHOMORE YEAR

First Semester

ELE 210 Introduction to Electrical Engineering	3
MTH 243 Calculus and Analytic Geometry of Several Variables	3
MCE 263 Dynamics	3
PHY 223 Introduction to Acoustics and Optics	3
General education elective in Division A or C	3
	15

Second Semester

ELE 211 Linear Systems and Circuit Theory I	3
ELE 215 Electrical Measurements	2
MTH 244 Differential Equations	3
PHY 341 Modern Physics I	3
General education electives in Division A or C	6
	17

JUNIOR YEAR

First Semester

ELE 312 Linear Systems and Circuit Theory II	4
ELE 322 Electromagnetic Fields I	3
MTH 462 Functions of a Complex Variable	3
PHY 342 Modern Physics II	3
General education elective in Division A or C	3
	16

Second Semester

ELE 313 Circuit Design	3
ELE 323 Electromagnetic Fields II	3
ELE 342 Electronics I	4
MCE 341 Fundamentals of Thermodynamics or PHY 420 Introduction to Thermodynamics and Statistical Mechanics	3
General education elective in Division A or C	3
	16

SENIOR YEAR

The senior year curriculum provides a large degree of flexibility and many opportunities for choice among individual courses and areas of specialization. Course sequences are available in "emphasis areas" such as microwaves and quantum electronics, communication and control systems, solid state theory and applications, computer technology and biomedical engineering. Students should discuss the senior program with their adviser early in the junior year and if they select an emphasis area, a faculty adviser in that area will be assigned. Whether a student chooses an emphasis area or elects to take a general program which combines basic courses from several areas, he must file with the department before registration in the spring term of the junior year a detailed program of studies which has been approved by the appropriate faculty adviser.

Professional electives must be 400- or 500-level courses in engineering, computer science, mathematics, a physical science or a life science.

Each electrical engineering student who chooses an emphasis area must elect in addition to the emphasis courses at least one emphasis laboratory (ELE 413, 458, 433, 444 or CSC 411).

Emphasis courses and laboratories are:

ELE 411 Microwaves and Quantum Electronics
ELE 413 Microwave and Quantum Electronics Laboratory
ELE 457 Feedback Control Systems
ELE 436 Communication Systems
ELE 458 Systems Laboratory
ELE 431 Electrical Engineering Materials I
ELE 432 Electrical Engineering Materials II
ELE 433 Solid State and Direct Energy Conversion Laboratory
ELE 444 Electronics III, Pulse and Digital Circuits
CSC 410 Introduction to Computer Science and Algorithmic Processes
CSC 411 Computer Organization, Programming and Information Structures (considered as an emphasis laboratory)
*ELE 586, 587 Biomedical Electronics I, II
*ELE 588, 589 Biomedical Engineering I, II
ZOO 345 Basic Animal Physiology I

The general program in electrical engineering must include ELE 443, 444 and four of the following courses: ELE 411, 427, 431, 436, 457 and 417.

First Semester

ELE 443 Electronics II	5
Emphasis course	3
Professional elective or emphasis laboratory	3
Free elective	3
	14

* Undergraduates wishing to take 500-level courses must obtain permission of the department.

Second Semester

Emphasis course	3
Emphasis laboratory or professional elective	3
Professional elective	3
Free electives	6
	15

Total credits required: 124-127

INDUSTRIAL ENGINEERING

This curriculum is designed to provide a solid background in mathematics, basic science, and engineering science, plus a carefully coordinated set of courses that are of particular importance to the professional industrial engineer. Mathematical modeling of physical systems, optimization, probability and random variables, materials processing, and metrology are areas that receive considerable attention. These areas of study are augmented with computer science education and are used by the student in his assignments in a series of problem courses. In addition, professional electives have been carefully located in the curriculum.

Upon completion of the curriculum requirements, the student will be amply prepared to pursue a career in the many engineering opportunities in industry, transportation, government, hospitals, and service organizations. The curriculum also provides an excellent background for further formal study in industrial engineering or related fields of physical science.

SOPHOMORE YEAR

First Semester

CSC 201 Introduction to Computing	3
ELE 210 Introduction to Electrical Engineering	3
IDE 220 Industrial Engineering I	3
MCE 263 Dynamics	3
MTH 215 Introduction to Algebraic Structures	3
	15

Second Semester

ECN 123 Elements of Economics	3
ELE 220 Electric Circuits, Measurements and Electronics	3
IDE 221 Industrial Engineering II	3
MTH 243 Calculus and Analytic Geometry of Several Variables	3
PHY 223 Introduction to Acoustics and Optics	3
	15

JUNIOR YEAR

First Semester

IDE 411 Engineering Statistics I	3
MCE 341 Fundamentals of Thermodynamics	3
MTH 461 Methods of Applied Mathematics	3
PHY 340 Introduction to Modern Physics or PHY 341 Modern Physics I	3
General education elective in Division A or C	3
	15

Second Semester

CVE 220 Mechanics of Materials	3
IDE 412 Engineering Statistics II	3
IDE 432 Operations Research I	3
MCE 354 Fluid Mechanics	3
General education elective in Division A or C	3
Free elective	3
	18

SENIOR YEAR

First Semester

CHE 437 Materials Engineering or CHE 332 Physical Metallurgy	3
IDE 350 Industrial Engineering Systems Design I	3
IDE 433 Operations Research II	3
*Professional elective or *Free elective	3
General education elective in Division A or C	3
	15

Second Semester

ACC 305 Accounting Principles	3
IDE 351 Industrial Engineering Systems Design II	3
IDE 440 Materials Processing and Metrology	3
*Professional elective or *Free elective	3
General education elective in Division A or C	3
	15

Total credits required: 124-127

MECHANICAL ENGINEERING AND APPLIED MECHANICS

This curriculum provides a foundation in basic science, mathematics and engineering sciences to prepare the graduate to enter a professional engineering career in a wide range of industries and

* A professional elective *and* a free elective are required in the senior year.

laboratories in the mechanical field or to prepare him for graduate school.

The work in the first two years consists primarily of courses in mathematics, chemistry, mechanics, electricity, and graphics. The concentration in the last two years is in the areas of mechanical engineering science, including thermodynamics and heat transfer, fluid mechanics, mechanics and properties of materials, and advanced mechanics and machine design. Opportunity is provided in the senior year to take electives in advanced professional subjects or to take advanced mathematics and theoretical subjects in preparation for graduate school.

Starting in the sophomore year and continuing through the senior year, the student takes an integrated series of five laboratory courses, which gives him an introduction to laboratory techniques and actual experience with the physical and engineering phenomena which he is studying in concurrent theoretical courses. In the senior year, the student carries out an individual experimental project and undertakes an individual design project to develop his creative ability and integrate his previous course studies.

The program in mechanical engineering and applied mechanics, including the freshman year, has 30 credits of non-professional electives plus a required course, ECN 123. It is the student's responsibility to select electives to satisfy the general education requirements plus the 6 credits required in free electives.

SOPHOMORE YEAR

First Semester

CVE 220 Mechanics of Materials	3
ELE 210 Introduction to Electrical Engineering	3
MTH 243 Calculus and Analytic Geometry of Several Variables	3
MCE 263 Dynamics	3
General education elective in Division A or C	3
*Free elective	3
	18

Second Semester

ECN 123 Elements of Economics	3
ELE 220 Electric Circuits, Measurements and Electronics	3
IDE 330 Manufacturing Processes	2
MTH 244 Differential Equations	3
MCE 212 Mechanical Engineering Laboratory I	1
PHY 223 Introduction to Acoustics and Optics	3
	15

JUNIOR YEAR

First Semester

CHE 332 Physical Metallurgy	3
MCE 313 Mechanical Engineering Laboratory II	1
MCE 341 Fundamentals of Thermodynamics	3
MCE 372 Engineering Analysis I	3
PHY 341 Modern Physics I	3
General education elective in Division A or C	3
	16

Second Semester

MCE 373 Engineering Analysis II	3
MCE 314 Mechanical Engineering Laboratory III	1
MCE 323 Kinematics	3
MCE 342 Mechanical Engineering Thermodynamics	3
MCE 354 Fluid Mechanics	3
General education elective in Division A or C	3
	16

SENIOR YEAR

First Semester

MCE 315 Mechanical Engineering Laboratory IV	1
MCE 423 Design of Machine Elements	3
MCE 455 Advanced Fluid Mechanics or MCE 463 Intermediate Dynamics	3
MCE 448 Heat and Mass Transfer	3
Professional elective	3
*Free elective	3
	16

Second Semester

CHE 437 Materials Engineering	3
MCE 316 Mechanical Engineering Laboratory V	1
MCE 428 Mechanical Control Systems or MCE 464 Vibration	3
MCE 429 Comprehensive Design	3
Professional elective	3
General education elective in Division A or C	3
	16

Total credits required: 128-131

* Free electives may be taken at any time selected by student.

ENGINEERING SCIENCE

This curriculum is designed to allow more concentration in the basic sciences, engineering sciences, and interdisciplinary areas than is possible in the regular engineering curriculums.

A core of required courses in the basic and engineering sciences provides the necessary foundation for further work in these areas. The 12 to 15 credits of specialized electives plus 6 credits of general electives afford ample opportunity for concentration, which may be in any one of the five undergraduate engineering departments, in mathematics, or in physics; or it may be in some interdisciplinary area cutting across two departments, one of which may not necessarily be in engineering.

With the proper choice of electives, this curriculum would prepare the student for either a professional career in industry or for graduate school.

SOPHOMORE YEAR

First Semester

CHM 227, 229 Organic Chemistry or CHM 331 Physical Chemistry	4
ELE 210 Introduction to Electrical Engineering	3
MTH 243 Calculus and Analytic Geometry of Several Variables	3
MCE 263 Dynamics	3
PHY 223 Introduction to Acoustics and Optics	3
	16

Second Semester

CHM 228, 230 Organic Chemistry or CHM 332 Physical Chemistry	4
CVE 220 Mechanics of Materials	3
ELE 211 Linear Systems and Circuit Theory I	3
MTH 244 Differential Equations	3
PHY 341 Modern Physics I	3
	16

JUNIOR YEAR

First Semester

ELE 312 Linear Systems and Circuit Theory II	4
ELE 322 Electromagnetic Fields I	3
MCE 341 Fundamentals of Thermodynamics	3
PHY 342 Modern Physics II	3
General education elective in Division A or C	3
	16

Second Semester

CHE 344 Introduction to Transfer Rates	3
ELE 323 Electromagnetic Fields II or *Professional elective	3
ELE 342 Electronics I	4
*Professional elective	3
General education elective in Division A or C	3
	16

SENIOR YEAR

First Semester

CHE 332 Physical Metallurgy or ELE 431 Electrical Engineering Materials	3
*Professional electives	9
General education elective in Division A or C	3
Free elective	3
	18

Second Semester

CHE 425 Process Dynamics and Control or ELE 456 Feedback Control Systems or MCE 428 Mechanical Control Systems	3-4
*Professional electives	6
General education electives in Division A or C	6
Free elective	3
	18-19

Total credits required: 132-135

* Professional electives shall include at least 3 credits of mathematics. Students planning to do graduate work in biomedical engineering should take either ZOO 111 or BIO 101 before the senior year.

College of Home Economics

BEVERLY DOWNING CUSACK, Dean

The departments of the College are Child Development and Family Relations, Food and Nutritional Science, Home Management, and Textiles, Clothing and Related Art. The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog, preceded in each case by the name of the chairman and the teaching faculty.

Study in home economics provides professional and pre-professional education as well as opportunity for development of the individual as a person, a citizen and for home and family living.

The program of study includes work in the biological, physical and social sciences, the humanities and home economics. Opportunity for exploration is provided with students choosing their major fields of study at the end of the sophomore year. The degree of Bachelor of Science is awarded upon satisfactory completion of the curriculum. All programs are available to both men and women.

The curriculum requirements listed below are arranged in three groups. Group I includes general education courses, Group II includes home economics courses required of all students in the College, and Group III includes those courses required for the major emphasis.

A total of 128 credits is required for graduation.

CURRICULUM REQUIREMENTS

GROUP I GENERAL EDUCATION, 45 credits

Students are required to select and pass 45 credits of course work from the general education requirements as listed on page 21. Specific requirements of the College in each division are listed below:

Division A (18, 15, or 12 credits)

Home economics students must take one course in art, music or theatre; one course in written or oral communication; one course in literature.

Division B (18, 15, or 12 credits)

Home economics students must take one course in biological sciences and two courses in chemistry (CHM 101 and 102 or 103 and 105 and CHM 124).

Division C (18, 15, or 12 credits)

Home economics students must take one course in economics and two courses in psychology and/or sociology.

GROUP II HOME ECONOMICS CORE, 24 credits

CDF 150 Personal Development	3
CDF 200 Growth and Development of Children or CDF 302 Adolescent Growth and Development or CDF 340 Family and Community Health or CDF 355 Marriage and Family Relationships	3
FNS 101 Introductory Food Study	3
FNS 207 General Nutrition	3

HMG 210 Management in Family Living	3
HMG 320 Family Economics or HMG 340 Family Housing or HMG 370 Home Management Residence	3
HMG 371 Seminar in Home Management	3
TXC 103 Consumer Problems in Textiles and Clothing	3
TXC 205 Introductory Clothing or TXC 224 Clothing and Human Behavior or TXC 238 Textile Design or TXC 303 General Textiles or TXC 340 Historic Costume	3
HEC 001 Survey in Home Economics	0

GENERAL HOME ECONOMICS

This curriculum provides for general education in all areas of home economics and for professional fields such as home economics extension, social work, journalism, radio and other types of work requiring, in addition to a general background in home economics, training which can best be provided by other departments in the University.

Students interested in pre-professional training in social work may enroll in either the general home economics or the child development and family relations curriculum. They should plan to take the following sequence of courses: SWF 311, SWF 313, CDF 375, SWF 317.

Group III

The following courses are required in addition to the courses listed in Groups I and II:

ART 120 Introduction to Art or TXC 406 (HMG 345) House Planning	3
CDF 340 Family and Community Health	3
CDF 270 Introduction to Work with Children	3
TXC 206 (HMG 330) Home Furnishings	3
HMG 350 Household Equipment	3
HMG 370 Home Management Residence	3
HMG 371 Seminar in Home Management	3
Textiles and clothing elective	3

CHILD DEVELOPMENT AND FAMILY RELATIONS

This curriculum provides a general background for work with children and families, building on the Home Economics Core (Group II) and in conjunction with the 26 elective credits necessary to complete the total of 128 credits required for graduation. Courses in Group II not chosen to fulfill the core requirements should be considered for inclusion among the elective credits.

Most professions that deal with children and families require academic work beyond the bachelor's degree for continuing professional work and advancement. Individuals with a baccalaureate degree are employed as pre-professionals, however, in nursery schools, day care centers, institutions and hospitals for children, recreational, child guidance, case work and other community agencies. Similarly, some of the courses in the curriculum plus certain others in education, meet the requirements for the Provisional Nursery-Kindergarten Certificate in Rhode Island. The Professional Certificate requires successful teaching experience for five years and additional academic work.

GROUP III

In addition to the courses listed in Groups I and II, the courses listed below are required:

CDF 270* Introduction to Work with Children	3
CDF 340 Family and Community Health	3
CDF 355 Marriage and Family Relationships	3
CDF 390 Contemporary Philosophies of Guiding Children	3
CDF 400 Child Development: Advanced Course	3
CDF 450 Family Interaction	3
Any courses in the College of Home Economics, except CDF 375, for a total of	15

Students who wish to meet the requirements for the Provisional Nursery-Kindergarten Certificate in Rhode Island should apply at the end of the fourth semester for permission to take EDC 484, and should plan to take the following courses in addition to Group III:

EDC 102 Introduction to American Education	3
EDC 312 The Psychology of Learning	3
CDF 330 Curriculum for Nursery School and Kindergarten	3
CDF 370 Nursery School Practicum	4
EDC 484 Supervised Student Teaching	8
EDC 485 Seminar in Teaching	3

* Since CDF 200 is prerequisite to CDF 270, CDF 200 should be selected as the second course in child development and family relations in Group II.

Students interested in pre-professional training in social work should plan to take the following sequence of courses: SWF 311, SWF 313, CDF 375, and SWF 317. They should apply at the end of the fourth semester for permission to take CDF 375.

FOOD AND NUTRITIONAL SCIENCE, AND FOOD SERVICES

This curriculum, open to both men and women, offers a broad general study program or specific options as follows:

Dietetics. This program of study meets the requirements of American Dietetic Association approved dietetic internships.

Nutritional Science. Individual programs of study can be prescribed to provide both the broad scientific background and the specialized training necessary for a career in modern nutrition research, education or service.

Food Services Administration and Institution Management. Programs in these areas can be arranged in cooperation with the College of Business Administration.

Food Science and Technology. An intercollege and inter-departmental program whereby students follow a course of study meeting the educational standards established by the Institute of Food Technologists.

Programs of study are designed to prepare students as therapeutic or administrative dietitians, food and nutrition research technicians and scientists, quantity food service and institution managers, and test kitchen, taste panel and consumer education specialists. Qualified students can prepare for graduate studies.

GROUP III

In addition to the courses listed in Groups I and II, the following courses are required:

FNS 221 Meal Management	3
FNS 331 Advanced Food Study	3
FNS 337 Introductory Food Science	3
FNS 441 Advanced Human Nutrition	3
FNS 445 Readings in Nutrition	2
or	
FNS 504 Food Science and Nutrition Seminar	3

Students planning to major in food and nutritional science should contact the department as soon as possible in order to plan a curriculum to meet individual professional needs. The require-

ments for a major in the department must include a total of 29-35 credit hours in food and nutritional science and related areas, subject to the approval of the department.

Students who wish to qualify for American Dietetic Association approved internships, or meet the undergraduate curriculum standards established by the Institute of Food Technologists, must meet certain specified requirements.

HOME ECONOMICS EDUCATION

This curriculum meets the state of Rhode Island requirements for certification. Supervised teaching is included in the program during the senior year.

GROUP III

In addition to the courses listed under Groups I and II, the following courses are required:

CDF—Elective	3
EDC 102 Introduction to American Education	3
EDC 312 Psychology of Learning	3
EDC 334 Teaching of Home Economics	3
EDC 337 Teaching of Home Economics	3
EDC 484 Supervised Teaching of Home Economics	8
EDC—Elective	2
FNS 221 Meal Management	3
HMG—Elective	3
TXC 305 Intermediate Clothing	3

Note: To meet Home Economics Education requirements, HMG 370 or 371 (married students only) is required.

TXC 205 is a prerequisite for TXC 305 unless the exemption test is passed.

TEXTILES, CLOTHING AND RELATED ART

This curriculum is planned for students with ability and professional interest in the artistic and technical aspects of textiles, clothing and related art.

GROUP III

In addition to the courses listed under Groups I and II, the courses listed below are required:

TXC 224 Clothing and Human Behavior	3
TXC 303 General Textiles	3
TXC 327 Apparel Design	3
TXC 433 Textiles and Clothing Industry	3
TXC 440 Historic Textiles	3
TXC 390 Senior Seminar	1
Textiles and clothing electives	6

If a student elects TXC 224 or TXC 303 to meet the home economics core requirements, another 3-credit course in textiles and clothing must be substituted above.

An additional 15 credits, with at least nine in any one area, must be selected from the following: art, education, business, chemistry, home management, journalism, and social science.

College of Nursing

BARBARA L. TATE, Dean
ELIZABETH L. HART, Assistant Dean

The program of the College of Nursing is designed for men and women with academic, personal and professional potential. It aims to develop mature, well-informed graduates who will take their places as responsible members of society. The curriculum combines the general and the professional, providing an understanding of the scientific principles fundamental to nursing and preparing graduates who are skilled in the care of the sick and in health teaching. Throughout the curriculum a foundation is laid for a continuing study of nursing through experience and further education.

The program consists of eight semesters and one summer session. Courses in the nursing major which include clinical practice are conducted by the College of Nursing faculty and based in cooperating agencies. These agencies include: Rhode Island Hospital, Providence Lying-In Hospital, Veterans Administration Hospital, Providence District Nursing Association, the Rhode Island Medical Center, Institute of Mental Health, South County Hospital, Westerly Hospital, Kent County East Visiting Nurse Association, and The Miriam Hospital.

Students in the College of Nursing meet all of the general education requirements of the University. A grade of C must be achieved in all nursing courses. The faculty reserves the right to require withdrawal from the College of a student who gives evidence academically and/or personally of being unable to carry out professional responsibility in nursing. The student is limited to 18 credits per semester except by permission of the dean for special program adjustments.

General expenses for the students in the College of Nursing are approximately the same as for all other University students. Special items include uniforms and one summer session.

Upon the successful completion of the program, which is approved by the National League for Nursing and the Rhode Island Board of Nurse Registration and Nursing Education, the graduate receives the Bachelor of Science degree from the University and is eligible for examination for professional registration.

FRESHMAN YEAR

First Semester

CHM 101, 102 General Chemistry	4
Basic communication skills	3
*NUR 100 Professionalism and Nursing	2
SOC 202 General Sociology	3
ZOO 121 Human Anatomy	4
	16

Second Semester

CHM 124 Organic Chemistry	4
Basic communication skills	3
*NUR 110 Health and Illness	2
PSY 113 General Psychology	3
ZOO 142 Introduction to Human Physiology	3
	15

Summer Session

FNS 207 General Nutrition	3
BAC 201 General Microbiology	4
	7

SOPHOMORE YEAR

First Semester

PSY 232 Developmental Psychology or CFD 200 Growth and Development of Children	3
*NUR 220 Fundamentals of Nursing	4
PHY 102 Fundamentals of Physics	3
PCL 225 Pharmaceutical Calculations and Introduction to Pharmacology	2
Elective	3
	15

The following must be completed in the remaining semesters of the program:

PCL 226 Pharmacology and Therapeutics	2
NUR 230 Care of the Adult	6
NUR 240 Care of the Adult	6
NUR 301 Maternal and Child Health Nursing	7
NUR 302 Maternal and Child Health Nursing Practicum	4
NUR 311 Mental Health and Psychiatric Nursing	3
NUR 312 Mental Health and Psychiatric Nursing Practice	3
NUR 320 Public Health and Public Health Nursing	7
NUR 330 Care of the Adult	7
NUR 340 Senior Nursing Practice	7
NUR 350 Conference on Professional Nursing	2
Social science electives (restricted choice)	6
Other electives	21

Total credits required: 134

Registered nurse graduates of hospital or junior college programs in nursing who wish to earn the baccalaureate degree with a major in nursing, are admitted to the basic baccalaureate program. Advanced placement credit for courses taken in an institution other than a college or university may be earned by satisfactory completion of departmental examinations offered by the University. Examinations are available in the sciences and in nursing. Requests for application forms and information should be directed to the Office of Admissions, University of Rhode Island, Kingston, Rhode Island 02881.

* Graduate nurse students will take NUR 200, 210, and 4 credits of electives in lieu of NUR 100, 110, and 220.

College of Pharmacy

HEBER W. YOUNGKEN, JR., Dean
DAVID H. CROMBE, Assistant Dean

The departments of the College are Pharmacy, Medicinal Chemistry, Pharmacognosy, Pharmacology and Toxicology, and Pharmacy Administration. The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog, preceded in each case by the name of the chairman and the teaching faculty.

The College offers a five-year curriculum leading to the Bachelor of Science degree in pharmacy and a four-year program leading to the Bachelor of Science degree in ventilation therapy. Curriculums for both programs include general education courses and certain required and elective courses, and students spend considerable time in laboratories and classes in other colleges of the University.

PHARMACY

The five-year undergraduate curriculum, which leads to a Bachelor of Science degree in pharmacy, is patterned on presently accepted programs of study recommended by the American Association of Colleges of Pharmacy, the American Council on Pharmaceutical Education and other interested organizations.

It provides preparation for community and institutional (clinical) pharmacy practice. In addition, students have opportunities through the selection of professional electives to commence a specialization in one of several other areas of pharmacy. These include hospital pharmacy, manufacturing pharmacy, medical supply servicing, drug analysis, administration and research.

The major portion of the professional program begins in the third year when basic pharmaceutical disciplines are introduced.

Each year the curriculum in pharmacy is supplemented by field trips to selected pharmaceutical industries. Students in hospital pharmacy also make use of selected hospital pharmacies in Rhode Island and elsewhere in New England for field study.

The satisfactory completion of the degree in pharmacy from this or other accredited colleges of pharmacy is one of the prerequisites for a license to practice pharmacy in Rhode Island and other states. Licensure is obtained after graduation by successfully completing the examination given by the Rhode Island State Board of Pharmacy or those of other states.

The College of Pharmacy is accredited by the American Council on Pharmaceutical Education and by the University of the State of New York, Division of Professional Education.

Students in certain other New England states may enroll in pharmacy under the New England interstate cooperation program. (See page 17.)

The five-year program is now mandatory for all accredited colleges of pharmacy in the United States and is intended primarily to provide additional time for study in general education subjects such as the humanities, basic and social sciences.

FIRST YEAR

First Semester

ENG 110 Composition	3
MTH 109 Algebra and Trigonometry	3
BOT 111 General Botany or ZOO 111 General Zoology	4
CHM 101, 102 General Chemistry	4
PEM 101 or PEW 101 Physical Education	1
	15

Second Semester

ENG 120 Literature and Composition	3
BOT 111 General Botany or ZOO 111 General Zoology	4
CHM 112, 114 General Chemistry	4
Elective	3
PEM 102 or PEW 102 Physical Education	1
	15

SECOND YEAR

First Semester

CHM 227, 229 Organic Chemistry	4
PHY 111 General Physics	4
ECN 123 Elements of Economics or ECN 125 Economic Principles	3
Elective	3
PEM 203 or PEW 203 Physical Education	1
	15

Second Semester

CHM 228, 230 Organic Chemistry	4
PHY 112 General Physics	4
BAC 201 General Microbiology	4
Elective	3
PEM 204 or PEW 204 Physical Education	1
	16

THIRD YEAR

First Semester

PHC 333 General Pharmacy	4
MCH 334 Inorganic Medicinal Chemistry	2
PCL 336 Principles in Pharmacology	2
BCH 311 Introductory Biochemistry	3
ZOO 345 Basic Animal Physiology	3
Elective	3
	17

Second Semester

PHC 334 General Pharmacy	4
MCH 339 Drug Analysis	5
ZOO 442 Mammalian Physiology	3
Electives	6
	18

FOURTH YEAR

First Semester

PHC 353 Physical Pharmacy	3
MCH 443 Organic Medicinal Chemistry	3
PCG 445 General Pharmacognosy	4
PCL 441 General Pharmacology	4
Elective	3
	17

Second Semester

PHC 354 Physical Pharmacy	3
MCH 444 Organic Medicinal Chemistry	3
PCG 446 General Pharmacognosy	4
PCL 442 General Pharmacology	4
Elective	3
	17

FIFTH YEAR

First Semester

PHC 383 Dispensing Pharmacy	4
PCG 359 Public Health	3
PAD 351 Pharmaceutical Law and Ethics	3
Electives	6
	16

Second Semester

PHC 384 Dispensing Pharmacy	4
PAD 451 Pharmacy Administration Principles	3
PAD 453 Drug Marketing Principles	2
Electives	6
	15

Total credits required: 161

VENTILATION THERAPY

The four-year program leading to a Bachelor of Science degree in ventilation (inhalation) therapy prepares students for a paramedical specialty related to the management of respiratory disease. The ventilation therapist works with the physi-

cian, pharmacist, nurse, and paramedical specialists in a hospital or institutional environment where multiple responsibilities are necessary in the care of patients.

During the first three years on campus, the emphasis is on general education and basic courses in biology, mathematics, chemistry, pharmacology, and physics as necessary background for this paramedical science. Upon completion of these academic courses, the senior year provides a 52-week course in an approved hospital where didactic and laboratory instruction in a clinical setting is given. After successfully completing the course, the student is eligible for the national examination given by the American Registry of Inhalation Therapists.

FRESHMAN YEAR

First Semester

ENG 110 Composition	3
MTH 109 Algebra and Trigonometry or MTH 141 Introductory Calculus with Analytical Geometry	3
ZOO 111 General Zoology	4
CHM 101, 102 or 103, 105 General Chemistry	4
Elective	1-3
PEM 101 or PEW 101 Physical Education	1
	16-18

Second Semester

ENG 120 Literature and Composition	3
MTH 141 Introductory Calculus with Analytic Geometry or MTH 142 Intermediate Calculus with Analytic Geometry	3
CHM 112, 114 General Chemistry	4
Electives	4-6
PEM 102 or PEW 102 Physical Education	1
	15-17

SOPHOMORE YEAR

First Semester

PHY 111 General Physics	4
ZOO 121 Human Anatomy	4
History elective	3
CHM 124 Organic Chemistry	3
PEM 203 or PEW 203 Physical Education	1
	15

Second Semester

PHY 112 General Physics	4
History elective	3
ZOO 442 Introduction to Human Physiology	3
Electives	6
PEM 204 or PEW 204 Physical Education	1
	17

JUNIOR YEAR

First Semester

PHC 225 Pharmaceutical Calculations and Introduction to Pharmacology	2
BCH 311 Introductory Biochemistry	3
ELE 215 Electrical Measurements or equivalent elective	2
PSY 103 Toward Self Understanding or PSY 113 General Psychology	3
Electives	6
	16

Second Semester

BAC 201 General Microbiology	4
PCL 226 Pharmacology and Therapeutics	3
Electives	9
	16

SENIOR YEAR

The hospital clinical program provides credits.	39

Total credits required: 131-135

College of Resource Development

JAMES W. COBBLE, Dean
ALBERT L. OWENS, Director of Resident Instruction

As the College continues to develop its instructional programs to serve the needs of more students, departmental consolidation and reorientation are occurring. Presently undergraduate and graduate instruction is being offered by the Departments of Animal Pathology, Animal Science, Fisheries and Marine Technology, Food and Resource Chemistry, Forest and Wildlife Management, Plant Pathology-Entomology, Plant and Soil Science, and Resource Economics.

The courses offered by each department are listed alphabetically in the Courses of Instruction section of this catalog, preceded in each case by the names of the chairman and teaching faculty. The listings for the Department of Plant and Soil Science represent a consolidation of those formerly offered by the Departments of Agronomy, Horticulture, and Mechanized Agriculture.

Students concerned with plant and animal science or natural resources with a particular emphasis on their value to mankind will find the programs offered by the College of Resource Development of interest. Agriculture today is based on both the science and art of food and fiber production and the preparation of these commodities for use. Conservation and the wise management of other natural resources also require a strong science background, and an appreciation of the economic and social implications of both agriculture and conservation.

Four-year programs are offered in agricultural science, agricultural technology, natural resources, and a two-year associate degree is offered in commercial fisheries. Students in all programs may select an area of concentration from one of the departments listed above.

Modern, well-equipped laboratories and classrooms are provided in Woodward Hall for the teaching, research, and Cooperative Extension activities of the College. Greenhouses and gardens are maintained for those interested in flowers, ornamentals, and landscape design. Turf-grass, forage, fruit, and vegetable plots are available for research and study. A herd of dairy cattle, a flock of sheep, and several types of poultry are maintained by the Department of Animal Science and there are up-to-date scientific laboratories for the study of soils, food chemistry, plant and animal diseases, and insect pests. Faculty research activities range from consumer motivation to virology, from soil chemistry to teacher education, and from the economics of fisheries to food-intake of older people.

Qualified students may enter the University Honors Program (see page 23). Entering freshmen may also receive credit for certain basic courses through the Advanced Placement Program (see page 16).

The curriculum requirements listed below include provisions for the general education courses now required of all undergraduates as listed on page 21.

AGRICULTURAL SCIENCE

A successful career in scientific agriculture today requires a training balanced between basic sciences and their application to agriculture. Thus, this curriculum includes many science courses. It offers preparation for the options below or graduate study. The student selecting this curriculum should show proficiency in science in high school.

FRESHMAN YEAR

First Semester

ASC 101 Introduction to Animal Science	4
BOT 111 General Botany	4
CHM 101, 102 or 103, 105 General Chemistry	4
ENG 110 Composition	3
Elective	2-3
	17-18

Second Semester

CHM 112, 114 General Chemistry	4
PLS 104 Plants, Man and the Environment	3
MTH 109 Algebra and Trigonometry	3
ZOO 111 General Zoology	4
Electives	5-6
	19-20

SOPHOMORE YEAR

First Semester

CHM 227, 229 Organic Chemistry	4
MTH 141 Introductory Calculus with Analytic Geometry	3
General education electives	6
Electives	5
	18

Second Semester

CHM 228, 230 Organic Chemistry	4
Resource development elective	3
General education electives	6
Electives	5
	18

JUNIOR AND SENIOR YEARS

REN 105 Economics in Food Production and Distribution	3
ASC 352 General Genetics	3
SPE 101 Fundamentals of Oral Communication	3
Elective (not in major field)	3
Resource development electives	25
General education electives	9
Science elective	3
Statistics elective	3
Electives	11-13
	63-65

Total credits required: 136

Minimum resource development credits required: 40

OPTIONS

Pre-veterinary

After the first two years the student could meet the admission requirements in most colleges of veterinary medicine.

Pre-forestry

After the first two years the student could be considered for admission in the Schools of Forestry at the Universities of Maine, Massachusetts, and New Hampshire under the New England Higher Education cooperative agreement. No out-of-state fees are charged to Rhode Island residents.

Agricultural Engineering

After two years, with slight variations to allow for more mathematics, the student could be considered for admission in agricultural engineering at the University of Maine under the same cooperative agreement as indicated above.

Food Science and Technology

Courses are available which meet the Institute of Food Technologists' standards for a food science curriculum.

Teacher Education

For teacher certification, the following requirements constitute a portion of the 136 hours necessary for graduation: Education 103 or 102, 313 or 312, 444, 484, and 485; three of the nine credits required in plant and soil science must be in methods of teaching agricultural mechanics. Refer to courses for education and plant and soil science.

AGRICULTURAL TECHNOLOGY

The purpose of this curriculum is to provide practical training in agriculture combined with an understanding of the supporting basic sciences. Social sciences and liberal studies are included to broaden the student's background and to prepare him for his place in society.

FRESHMAN YEAR

First Semester

ASC 101 Introduction to Animal Science	4
BIO 101 General Biology	3
ENG 110 Composition	3
REN 105 Economics in Food Production and Distribution	3
General education elective	3
Elective	2
	18

Second Semester

BIO 102 General Biology	3
PLS 104 Plants, Man and the Environment	3
MTH 109 Algebra and Trigonometry	3
Elective	3
	12

SOPHOMORE YEAR

First Semester

CHM 101, 102 or 103, 105 General Chemistry	4
SPE 101 Fundamentals of Oral Communication	3
Resource development elective	3
General education elective	3
Electives	5
	18

Second Semester

PLS 212 Soils	3
CHM 104, 106 General Chemistry	4
Resource development elective	3
General education elective	3
Electives	5
	18

JUNIOR AND SENIOR YEARS

ASC 352 General Genetics	3
Elective (not in major field)	3
Resource development electives	19
General education electives	9
Science elective	3
Electives	27
	64

Total credits required: 136

Minimum resource development credits required: 40

During the sophomore, junior and senior years the student may select resource development subjects in the field of particular interest to him; including animal pathology, animal science, food and resource chemistry, forest and wildlife management, plant pathology-entomology, plant and soil science, and resource economics.

OPTION IN TEACHER EDUCATION

For teacher certification, the following requirements constitute a portion of the 136 hours necessary for graduation: Education 103 or 102, 313 or 312, 444, 484, and 485; three of the nine credits required in plant and soil science must be in methods of teaching agricultural mechanics. Refer to courses in education and plant and soil science.

NATURAL RESOURCES

Society's growing concern for our continuing ability to maintain our way of life in a satisfactory environment means that increasing emphasis will be given to solving the complex problems arising from man's use or misuse of the nation's natural resources. The search for solutions offers challenging careers for more and more people trained as resource scientists and technologists.

To these ends, this curriculum embodies the belief that a broad experience in the fundamentals of the biological, physical and social sciences, mathematics, the communicative skills and the humanities is essential to the fundamental competence of all students and should form the basic core of the curriculum. It also permits attainment of some depth in a principal area of professional interest by requiring students to select a major and to support it or other areas with directed electives. With the inclusion of free electives, the exploration of areas of knowledge that may be completely unrelated to career goals is encouraged.

The curriculum requirements that follow are structured in general terms. Students in the curriculum have widely differing aptitudes, experience, capabilities, interests and goals. The responsibility for selection of actual courses used to meet the requirements rests with the student and his adviser.

BASIC CORE

Required Courses 6

RDV 100, Natural Resources Conservation introduces students to the range of man-resource problems and the role of various disciplines in contributing to their solutions.

A seminar (senior level) in the analysis of contemporary resource problems is designed to permit students to use the variety of tools acquired.

*Biological Sciences** 11

One course each in animal biology, plant biology, and ecology.

*Physical Sciences** 18

One course each in general chemistry, organic chemistry, physics, earth science, and soils.

*Mathematics** 3-6

It is desirable that all students secure a mathematics background that includes an introduction to calculus. For those not intending to pursue a graduate program, the need to reach that level may not be as critical.

Social Sciences (refer to general education requirements) 12-15

One course in economic principles, resource economics, political science, and sociology.

Humanities (refer to general education requirements) 12-15

Courses that are applied to division A of the general education requirements may be used here.

Communications 6

One course in writing and one in speech.

MAJOR AREAS OF CONCENTRATION 24

Course selections to develop an area of specialization made by the student in conference with his adviser. These require approval by the academic dean.

Resource Management and Conservation

Selections shall be made from among the advanced undergraduate courses offered by the basic and applied natural science departments directly related to the student's career goals.

Resource Economics

Selections shall be made from among the advanced undergraduate courses offered by the Departments of Resource Economics and Economics.

DIRECTED ELECTIVES 18-21

With adviser approval, students shall use these credits to increase their competence in their major areas or acquire experience in other aspects of resource development.

* Courses used to meet these requirements may also be applied to division B of the general education requirements.

UNDIRECTED ELECTIVES 20

Students may use these credits in any area they choose, with no administrative restraints.

Total credits required: 136

ASSOCIATE DEGREE IN COMMERCIAL FISHERIES

This two-year program has been designed in cooperation with commercial fishermen and federal and state agencies to provide a thorough training for students intending to enter any sphere of commercial fisheries or marine technology. The 72-credit curriculum provides fundamental knowledge of fishing; vessel operation, equipment, handling, and navigation; fishing methods and gear; fishery business, economics, marketing and legislation; fish and their behavior. The degree earned is the Associate in Science.

Work on board ship, in the net loft, seamanship room, engineering laboratory, and vessel technology laboratory will take up a good proportion of credit hours. Formal classes on the campus will provide a background in the social, biological and physical sciences, as well as the professional subjects of navigation, seamanship, fishing gear and methods, engineering, marine electronics and vessel technology. Laboratory work will be conducted on board the training vessel and in the waterfront laboratories.

The program has been approved by the New England Board of Higher Education as regional in nature, and students from other New England states will be admitted for the same fees as those resident in Rhode Island. (See page 17.)

FIRST YEAR

First Semester

ENG 113 Composition	3
FIS 013 Shipboard Work I	2
FIS 118 Introduction to Commercial Fisheries	4
MTH 109A Algebra and Trigonometry	3
PEM 172 First Aid	1
REN 135 Fisheries Economics	5
	18

Second Semester

FIS 014 Shipboard Work II	1
FIS 110 Marine Technology	5
FIS 121 Fishing Gear I	3
FIS 131 Seamanship	3
SPE 101A Fundamentals of Oral Communication	3
General education elective	3
	18

SECOND YEAR

First Semester

FIS 015 Shipboard Work III	1
FIS 135 Fisheries Meteorology	2
FIS 141 Marine Engineering Technology I	4
FIS 151 Fish Technology	4
FIS 161 Marine Electronics	3
FIS 181 Navigation I	4
	18

Second Semester

FIS 122 Fishing Gear II	3
FIS 142 Marine Engineering Technology II	4
FIS 171 Vessel Technology	4
FIS 182 Navigation II	3
FIS 192 Fishing Operations	4
	18

Total credits required: 72

The Graduate School

WILLIAM R. FERRANTE, Dean
ALOYS A. MICHEL, Associate Dean

The Dean of the Graduate School has primary responsibility for administering the policies and procedures relating to advanced study at the University of Rhode Island. Graduate School policy is made by the Graduate Faculty, acting through its delegate body, the Graduate Council. Only the Dean or the Graduate Council may grant exceptions to the regulations governing graduate study.

The University offers programs leading to the master's degree, including professional degrees, in more than 60 areas of study and the doctorate in 25 areas. The programs are listed below:

MASTER OF ARTS

Economics
Education
  Educational Research
  Elementary Education
  Guidance and Counseling
  Reading Education
  Science Education
  Secondary Education
  Youth, Adult and Community Education
English
French
Geography
History
Philosophy
Political Science
  International Relations
Psychology
Sociology
Spanish
Speech Pathology and Audiology

MASTER OF SCIENCE

Accounting
Animal Pathology
Animal Science
Bacteriology
Biochemistry
Biophysics
Botany
Business Education
Chemical Engineering
Chemistry
Child Development and Family Relations
Civil and Environmental Engineering
Computer Science
Electrical Engineering
Environmental Biology
Environmental Health Sciences
Experimental Statistics
Food and Nutritional Science
Food and Resource Chemistry
Geology
Home Economics Education
Industrial Engineering
Mathematics
Mechanical Engineering and Applied Mechanics
Medicinal Chemistry
Nuclear Engineering
Nursing
Ocean Engineering
Oceanography
Pharmacognosy
Pharmacology and Toxicology
Pharmacy
Pharmacy Administration

Physical Education (men and women)
Physics
Plant and Soil Science
Plant Pathology-Entomology
Psychology
Resource Economics
Speech Pathology and Audiology
Textiles and Clothing
Zoology

DOCTOR OF PHILOSOPHY

Biological Sciences
- Animal Pathology
- Bacteriology
- Biochemistry
- Biophysics
- Botany
- Food and Resource Chemistry
- Plant Pathology-Entomology
- Zoology

Chemical Engineering
Chemistry
Economics, Marine Resources Option
Electrical Engineering
- Biomedical Engineering

English
Mathematics
Mechanical Engineering and
- Applied Mechanics

Ocean Engineering
Oceanography
Pharmaceutical Sciences
- Medicinal Chemistry
- Pharmacognosy
- Pharmacology and Toxicology
- Pharmacy

Physics
Psychology

PROFESSIONAL DEGREES

Master of Business Administration (MBA)
Master of Community Planning (MCP)
Master of Library Science (MLS)
Master of Marine Affairs (MMA)
Master of Public Administration (MPA)

ADMISSION REQUIREMENTS

A student holding the baccalaureate degree from this institution or from another having equivalent requirements may be admitted for graduate study providing his credentials meet the standards set by the Graduate School and by the department in which he wishes to study, and that facilities for study are available in his field of interest. Among the standards required for full status admission are an undergraduate average approximating B or better and satisfactory scores

on a nationally administered examination. Applicants with somewhat lower undergraduate averages but high examination scores may be admitted on conditional status. Individual departments may, however, apply admissions standards which are higher than the general standards just described.

A student holding a master's degree from this or another accredited institution may be admitted for doctoral study providing his credentials meet standards set by the Graduate School and by the department in which he wishes to pursue his major work.

The prospective applicant should request application forms and a copy of the *Graduate School Bulletin,* which contains the detailed requirements and descriptions of advanced degree programs, from the Dean of the Graduate School, University of Rhode Island, Kingston, Rhode Island 02881. Zip codes must be included in the applicant's return address. If, after studying the bulletin, the applicant has specific questions concerning particular degree programs or courses of instruction, these should be addressed to the chairman of the appropriate department.

Each applicant must submit: (1) completed application forms in duplicate, with a $10 nonrefundable application fee (check or money order payable to the University of Rhode Island); (2) three letters of recommendation from individuals familiar with the applicant's work, preferably in the field for which he is applying; (3) two copies of an official transcript sent directly from each college or university attended; and (4) scores from the Graduate Record Examination aptitude tests (see the *Graduate School Bulletin* for those departments which require the advanced tests) except as noted below:

Department of Education and Graduate Library School—Miller Analogies Test.

College of Business Administration: for MBA programs and M.S. in Accounting—Admission Test for Graduate Study in Business; for the M.S. in Business Education—Miller Analogies Test.

Departments of History, Languages, Political Science, and Sociology and Anthropology—Graduate Record Examination or Miller Analogies Test.

Department of Psychology—Miller Analogies Test and Graduate Record Examination.

Teachers in service studying to meet the requirements for teacher certification must make full application (1 through 4 above). Students registered for teacher certification cannot become candidates for degrees without formal admission to the Graduate School.

Applicants from foreign countries must complete the Test of English as a Foreign Language (TOEFL) with minimum scores of 500 for science students and 550 for non-science students. All inquiries from international students concerning applications, fees, housing, etc., should be directed to the Director for International Student Affairs, 4 Taft Hall.

The usual deadlines for receipt of applications are April 15 for September and Summer Session admission, and November 15 for February admission. There is no assurance that applications received after these dates will be processed in time to insure enrollment in the desired semester. For programs having earlier application deadlines, and those which do not admit students in February or June, see the *Graduate School Bulletin.*

Only the Dean of the Graduate School is authorized to admit applicants for graduate study, to waive any requirement, and to notify applicants of the disposition of their applications.

A student is expected to assume full responsibility for knowing the calendar, regulations, and pertinent procedures of the Graduate School and for meeting its standards and requirements. After admission to the Graduate School, the student should obtain a copy of the *Graduate Student Manual* from the Graduate School Office. This manual supplements in detail the rules and regulations contained in the *Graduate School Bulletin.* Instructions for the preparation of programs of study and for the preparation of theses and dissertations are also available from the Graduate School Office.

DEGREE REQUIREMENTS

It is the responsibility of the Graduate School to maintain the official records of progress towards the degree. Only the Dean of the Graduate School has the authority to notify students when they have completed all degree requirements and to certify them for the receipt of their degrees. Details relating to examinations, residence, registration for graduate study, including the continuous registration requirement, and administration of advanced degree programs can be found in the *Graduate School Bulletin* and the *Graduate Student Manual.*

Master of Arts, Master of Science

There are no major or minor area requirements for the master's degree. However, no degree can be awarded for the accumulation of credits without a planned program of study. Courses for the degree are expected to be concentrated in the candidate's field of interest and related areas to produce a well developed and cohesive program

which will meet his special objectives. Requirements in addition to the minimum requirements listed below may be imposed by the department.

Requirements for the master's degree must be completed within a period of five calendar years, or seven calendar years with the permission of the department and the Dean of the Graduate School, if the study is done on a part-time basis.

With Thesis

The minimum requirements for a master's degree are: (1) the successful completion of 30 credits, including a thesis allowance of six, (2) the completion of a thesis for which a maximum of six credits will be allowed, (3) at the discretion of the department, the passing of written comprehensive examinations toward the end of the course work, and (4) the passing of a final oral examination on the thesis.

Without Thesis

Depending upon departmental requirements, some master's degrees may be earned without a thesis. The minimum requirements for a nonthesis master's degree are: (1) the successful completion of 30 to 54 credits, (2) registration in advanced seminars, practicums, internships, or other experiences useful to the student's future professional career, (3) one course which requires a substantial paper involving significant independent study, and (4) the passing of a written comprehensive examination toward the end of the course work.

Language

While the Graduate School does not stipulate a language requirement for the master's degree, an academic department may require proficiency of its students in a foreign language.

PROFESSIONAL DEGREES

Students are advised to consult with the chairman, dean or director of the program concerning requirements for professional degrees.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree must be completed within seven years after passing the qualifying examinations or after first registering for work beyond the master's degree.

The requirements for the doctor's degree are: (1) the completion of a minimum of 72 credit hours of graduate study beyond the baccalaureate degree, of which a minimum of 42 must be completed at the University of Rhode Island, including 24 credit hours or two semesters which must be taken in full-time residence on the University of Rhode Island campus; (2) the passing of a qualifying examination; (3) the passing of a comprehensive examination; (4) the completion of a satisfactory dissertation; and (5) the passing of a final oral examination in defense of the dissertation. The department in which the student works for the doctor's degree may or may not require a master's degree preliminary to, or as a part of, the regular course of study. It is also the prerogative of each department to specify any language or research tool requirements for the doctoral degree.

TRANSFER CREDITS

Under certain conditions a candidate for the master's degree may transfer graduate credits from other institutions with the approval of his committee and the Dean of the Graduate School. These may not exceed one fifth of the credits required for his degree. Courses taken at other institutions after matriculation for an advanced degree at this institution must have prior approval of the Dean for transfer to a graduate program at this University. Such requests must also have the approval of the major professor. Consult the *Graduate School Bulletin* for details.

FEES

Charges and fees set forth in this catalog are subject to change without notice.

Tuition and fees vary according to whether or not the student is a legal resident of the state of Rhode Island and according to full-time or part-time enrollment. All charges are payable by the semester on receipt of the bill.

A Rhode Island resident must file with the Bursar a certificate of residence signed by the clerk of the Rhode Island city or town where he claims legal residence.

NEBHE INTERSTATE COOPERATION PROGRAM

Under provisions of an Interstate Cooperation Program, the University charges enrolled students from other New England states in specified programs of study the Rhode Island resident rates. This reciprocal agreement with other New England states applies only for programs which are not available in the student's own state university and which are indicated in the *Graduate School Bulletin*. Specific information on who qualifies for each of the programs may be obtained from department chairmen or from the New England Board of Higher Education, 20 Walnut Street, Wellesley, Massachusetts 02181.

SCHEDULE

This schedule of fees is effective for the 1971-72 academic year. *The University reserves the right to revise its schedule of tuition and fees without notice.*

Full-time, One Academic Year. Students registered for 9 or more credits are considered full-time and are charged the following fees:

Tuition	
Rhode Island residents	$630
Out-of-state residents	750
Graduate student assessment	20
*Medical insurance	13
*Student health fee (optional)	30
Registration fee	10
Admission application fee	10

Part-time, One Semester. Students registered for 8 credits or less are charged the following fees:

Tuition, per credit hour	
Rhode Island residents	$30
Out-of-state residents	35
Graduate student assessment	1
Registration fee	5
Admission application fee	10

Students maintaining continuous registration and registered for no credit are required to pay a registration fee of $30 per semester.

Additional Fees

Students may be asked to make key deposits and to cover laboratory and other incidental expenses for specific courses.

Master's degree candidates must pay a thesis-binding fee of $4 and doctoral candidates must pay a dissertation-binding and microfilming fee of $30. These fees are due before the candidate submits his dissertation for approval by the Graduate School. All degree candidates must pay a diploma fee of $10.

FINANCIAL AID

Students wishing to apply for fellowships, scholarships, and traineeships should apply through the chairmen of the departments in which they intend to enroll. The selection is made by the Dean of the Graduate School from names of nominees submitted by the department chairmen. Fellowships are usually awarded prior to April 15; therefore applications should be made early.

Financial assistance in the following forms is available to qualified graduate students.

Fellowships

Fellowships are awarded to graduate students in recognition of academic achievement and promise. The University of Rhode Island Fellowship provides a stipend of $3000 for the academic year, plus remission of tuition and enrollment fees for doctoral candidates. No work or service of any kind is required of fellows.

Tuition Scholarships

A limited number of tuition scholarships which provide for the remission of tuition and enrollment fees for the academic year are awarded each year by the Dean of the Graduate School.

Graduate Assistantships

Graduate research assistantships and graduate teaching assistantships are available in every department offering graduate work. The stipend for graduate teaching assistantships in the academic year 1971-72 varies from $2500 and $2725, depending upon qualifications and experience, plus remission of tuition and enrollment fees for the academic year and the following Summer Session.

Graduate research assistantships provide a stipend varying between $2700 and $4000 for the academic year. Students are required to pay their own tuition and fees.

Applications for graduate assistantships should be filed with the admission application and as early as possible.

Loans

Graduate students qualify for loans that are available under the National Defense Education Act. These are administered by the Student Aid Office, 11 Davis Hall.

Information concerning veterans' benefits may be obtained from the Dean of Students, Green Hall.

* All full-time students are required to participate in the University's Student Medical Insurance Program unless they can give evidence of comparable coverage in another plan. This hospital plan has a $20 deductible clause. The $30 student health fee covers care in the University infirmary and is optional as this catalog goes to press.

Graduate Library School

EDWARD J. HUMESTON, JR., Dean

Opened officially in Providence in September of 1964, the Graduate Library School is now located on the main campus in Kingston. Instruction is provided primarily for candidates for the Master of Library Science degree (36 hours), for degree-holding librarians taking courses as continuing education for professional advancement, and for persons working for certification as school librarians. Students in undergraduate and other graduate programs at the University may, with the approval of their advisers, enroll in such library science courses as relate to their studies. Candidates for the MLS must hold the four-year bachelor's degree.

Classes in the School's program are conducted for the most part in Kingston, but two or more basic or core courses are regularly offered on a rotating basis in the Providence quarters of the Division of University Extension, 30 miles from Kingston. The program is approved by NEBHE (see page 17) and residents of other New England states pay Rhode Island rather than out-of-state fees.

In the regular academic terms, classes meet once a week in the daytime, late afternoon, and evening. In the summer, students may enroll for courses meeting three times per week, or one evening per week for twelve weeks.

The library science program offers studies which provide a solid foundation in methods and principles required of all candidates for the degree, and a wide range of electives leading to some measure of specialization in various types of libraries and library service.

Inquiries about admission and financial aid may be directed to the Dean of the Graduate Library School, University of Rhode Island, Kingston, Rhode Island 02881, but applications for admission should be addressed to the Dean of the Graduate School, Green Hall.

Graduate School of Oceanography

JOHN A. KNAUSS, Dean
THEODORE A. NAPORA, Assistant Dean for Students

Instruction in oceanography is limited to graduate study, with the exception of a survey course (Oceanography 401). Curriculums are offered leading to the Master of Science and Doctor of Philosophy degrees in oceanography, with options in physical, chemical, geological and biological oceanography. The general objective of these curriculums is to prepare the student for a career in research and teaching. Applicants should preferably have majored in some field of natural science, but no formal knowledge of oceanography is assumed on admission.

Four basic courses, or their equivalents taken elsewhere, are required of all candidates for either the M.S. or the Ph.D. degree: Oceanography 501, 521, 540, and 561. Collectively the purpose of these courses is to introduce the student to the full scope of marine science. Ideally, the new student will take these four courses in his first year. However, their prerequisites are not required for admission to the graduate program, and it is anticipated that some first-year students will have to postpone one of the basic courses to the second year, while making up deficient prerequisites during the first year.

Oceanography 695, Seminar in Oceanography, is required of all degree candidates in each semester of their residence and each candidate of second-year standing or above will be required to present one seminar per year. Although individual exceptions may be made, all degree candidates must participate in a regular oceanic research cruise.

A thesis embodying an original piece of research is required for both the M.S. and the Ph.D. degrees. In practice the normal periods of time required to earn these degrees are two years for the master's and five years beyond the baccalaureate for the doctorate.

Although there is no general requirement for proficiency in foreign languages, the individual student's major professor may require him to demonstrate ability in one or more foreign languages.

Inquiries about admission and financial aid may be directed to the Assistant Dean for Students of the Graduate School of Oceanography, but applications for admission should be addressed to the Dean, the Graduate School, Green Hall, University of Rhode Island, Kingston, Rhode Island 02881. Each applicant must submit the results of the Graduate Record Examination, including an advanced test in the appropriate major field. Applicants from foreign countries must also complete the Test of English as a Foreign Language. Normally students are admitted to the program in September only. Applicants are urged to file early inasmuch as action on applications is begun in February.

Although oceanography is a graduate study, many students wish advice on undergraduate preparation. A student who is interested in oceanography should build his preparation around one of the basic scientific disciplines (biology, chemistry, geology, or physics) or engineering fields with supporting studies. These would include, where

applicable: mathematics through integral calculus and preferably through differential equations; basic college chemistry plus quantitative analysis and, if possible, an introductory course in physical chemistry; basic college physics, preferably including modern physics; a basic course in general biology, botany, or zoology; and a basic course in physical geology and preferably historical geology, too.

Narragansett Bay Campus with Trident *at dock.*

F = Fall 1971
S = Spring 1972

Courses of Instruction

Courses numbered 001 to 099 are prefreshman and special undergraduate courses and do not carry bachelor's degree credit. Those numbered 100 to 299 are lower division undergraduate courses and those numbered 300 to 399 are upper division undergraduate courses. The 400-level courses are generally limited to juniors and seniors majoring in a field, but open to other advanced undergraduates and to graduate students with permission. The 500-level courses are graduate courses with a bachelor's degree usually prerequisite but qualified senior and honors students are admitted with permission. The 600-level courses are advanced graduate courses with no undergraduates admitted except honors students with approval of advisers and the department. The 900-level courses are special types of graduate courses including graduate courses for which no degree credit is given.

Courses with two numbers, e.g. **ACC 201, 202,** indicate a year's sequence and the first course is either a prerequisite for the second or at least the two cannot be taken in reverse order without special permission. If a course is also offered by another department, this information appears following the course number. The Roman numeral indicates the semester the course will be offered; the Arabic numeral indicates the credit hours. Distribution of class hours each week is in parentheses. *S/U credit* signifies a course in which only satisfactory or unsatisfactory grades are given. The instructor's name follows the course description.

ACCOUNTING (ACC)

CHAIRMAN: Associate Professor P. S. Wood. Professors G. W. Lees and Sanderson; Associate Professors Bird, D. E. Lees, and E. P. Smith; Assistant Professors P. A. Jones, Looney, S. Martin, and Vangermeersch; Special Instructor Fradin.

F S **201, 202 Elementary Accounting** *I and II, 3 each*
ACC 201: Basic functions and principles of accounting. *ACC 202:* Partnerships, corporations, manufacturing accounts and specialized areas. *(Lec. 3)* Staff

F **301 Accounting for Business Teachers** *I, 3*
Accounting principles involving assets, liabilities, and owner's equity with emphasis on teaching in high school. *(Lec. 3) Prerequisite: ACC 202. Not open to accounting majors.* Staff

F S **305 Accounting Principles** *I and II, 3*
Survey of basic accounting principles and procedures with emphasis on their application to industrial administration of business enterprises. *(Lec. 3) Open to non-business students only. Not open to students who have taken or are required to take ACC 201.* G. Lees

F S **311, 312 Intermediate Accounting** *I and II, 3 each*
ACC 311: Theoretical aspects of accounting principles are presented with special emphasis on current and fixed assets and the corporate structure. *ACC 312:* Continuation of the study of accounting theory as applied to selected topics including investments, liabilities, financial statements, application of funds, cash flow and price-level impacts. *(Lec. 3) Prerequisite: ACC 202.* Staff

F **314 Analysis of Financial Statements** *I, 3*
Study and interpretation of financial data. Case studies of current accounting theory included in selected annual corporate reports are utilized. *(Lec. 3) Prerequisite: ACC 312 or permission of department.* Staff

F **321 Cost Accounting** *I, 3*
Cost systems including job order, process, and stand-

ard costs with emphasis on the managerial control of costs. *(Lec. 3) Prerequisite: ACC 202.* Staff

324 Industrial Accounting *II, 3*
Survey of job order, process and standard cost accounting principles and procedures as related to the administrative aspects of manufacturing enterprises. *(Lec. 3) Not open to students majoring in accounting. Prerequisite: ACC 202 or 305.* G. Lees

347 Fund Accounting *I and II, 3*
Principles of fund accounting as applied to municipalities, educational institutions, hospitals, and other similar organizations, with particular emphasis upon municipal records and statements. *(Lec. 3) Prerequisite: ACC 312 or permission of department.* Staff

371, 372 Special Problems *I and II, 3 each*
Seminar in current accounting problems, the topics of which may vary from semester to semester. *(Lec. 3) Prerequisite: permission of department.* Staff

422 Advanced Cost Accounting *II, 3*
Extension of managerial cost accounting, budgeting and relationship of accounting to other quantitative fields. *(Lec. 3) Prerequisite: ACC 321.* Staff

431 Advanced Accounting *II, 3*
Accounting theory applicable to partnerships, installment sales, insurance, consignments, receiverships, estates and trusts, consolidated statements, and specialized accounting subjects. *(Lec. 3) Prerequisite: ACC 312.* Staff

443 Federal Tax Accounting *I, 3*
Federal laws, regulations, and other authorities affecting taxation of individuals. *(Lec. 3) Prerequisite: ACC 202.* Staff

461 Auditing *II, 3*
Auditing standards, procedures, programs, working papers and internal control. *(Lec. 3) Prerequisite: ACC 312.* Staff

512 Controllership *I, 3*
Study of controller's functions, techniques and responsibilities for planning with text, problem and case assignments. *(Lec. 3)* Staff

513 (413) Accounting Systems *I, 3*
Principles and problems related to design and installation of accounting control systems with emphasis on automated data processing. *(Lec. 3) Prerequisite: ACC 312 and permission of department.* Staff

535 (435) Advanced Problems in Accounting *II, 3*
General and specialized accounting problems that constitute the subject matter of CPA examinations. *(Lec. 3) Prerequisite: ACC 431.* Staff

544 (444) Topics in Federal Taxation *II, 3*
Special topics in areas of partnerships, corporations, trusts, and estates. *(Lec. 3) Prerequisite: ACC 443 and permission of department.* Staff

611 Managerial Accounting *I and II, 3*
Stewardship responsibilities of management; the functions of accounting in relation to planning and control; income tax planning and quantitative techniques. *(Lec. 3) Prerequisite: ACC 910.* Staff

618 Current Accounting Theory *I, 3*
A critical examination of accounting theory and practice designed to develop research techniques with emphasis on financial accounting. *(Lec. 3) Prerequisite: ACC 312 or 611.* Staff

619 Current Accounting Theory *II, 3*
A critical examination of accounting theory and practice designed to develop research techniques with emphasis on managerial accounting. *(Lec. 3) Prerequisite: ACC 321 or 611.* Staff

910 Financial Accounting *I and II, 3*
Concepts of financial accounting in the analysis and interpretation of financial statements; emphasis on accounting principles. *(Lec. 3) Graduate credit for matriculated MBA students only.* Staff

ANIMAL PATHOLOGY (APA)

CHAIRMAN: Professor Yates. Professor Chang; Assistant Professors Kimball and Wolke; Adjunct Professors Dardiri and O. C. Liu.

331 Anatomy and Physiology *I, 3*
Fundamentals of anatomy and physiology of domesticated animals. *(Lec. 3) Prerequisite: BAC 201, ZOO 111, junior standing. In alternate years, next offered 1972-73.* Kimball

332 Animal Diseases *II, 3*
Specific diseases of domesticated animals. *(Lec. 3) Prerequisite: APA 331. In alternate years, next offered 1972-73.* Kimball

422 Poultry Diseases *II, 3*
Common poultry diseases, their causes, methods of identification, prevention and control. *(Lec. 3) Prerequisite: BAC 201, ZOO 111, junior standing. In alternate years, next offered 1971-72.* Yates

461 Laboratory Animal Technology
See Animal Science 461.

501, 502 Seminar *I and II, 1 each*
Preparation and presentation of scientific papers on selected subjects in animal pathology and virology. Staff

534 Animal Virology *II, 3*
Basic properties, classification and evolution of animal viruses. Individual agents are studied in detail. *(Lec. 3) Prerequisite: BAC 432, 533 and permission of department.* Yates and Chang

536 Virology Laboratory *II, 2*
Methods employed in diagnosis and for the investiga-

tion of the biological, physical, and chemical properties of animal viruses. *(Lab. 6) Prerequisite: APA 534. (May be taken simultaneously.)* Yates and Chang

538 Epidemiology of Viral and Rickettsial Diseases *II, 2*
Principles of epidemiology. Interrelationships of host, environment and agent in viral and rickettsial diseases. *(Lec. 2) Prerequisite: APA 534. (May be taken simultaneously.) In alternate years, next offered 1971-72.* Chang

591, 592 Special Projects *I and II, 1-3 each*
Research projects in animal pathology and virology. *Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

ANIMAL SCIENCE (ASC)

CHAIRMAN: Professor L. T. Smith. Associate Professors Cosgrove, Durfee, Henderson, Hinkson, Kupa, Meade, Ousterhout and Rand; Assistant Professors Gray and Millar.

101 Introduction to Animal Science *I, 4*
Role of the animal industry in world and national economy; general considerations of inheritance, growth, physiology, nutrition and diseases of domestic animals and poultry; geographic distribution and marketing of animal products. *(Lec. 3, Lab. 2)* Ousterhout and Staff

212 Feeds and Feeding *I, 3*
Principles and practices of feeding farm animals, nutrient requirements of animals, physiology of digestion, identification and comparative value of feeds, and calculation of rations for all classes of livestock. *(Lec. 2, Lab. 2)* Ousterhout

222 (122) Commercial Poultry Production *II, 3*
Commercial practices involved in hatchery management and in production of hatching and market eggs, broilers, capons, turkeys, ducks, geese and game birds. Laboratory designed to show practical application of management principles. *(Lec. 2, Lab. 2) Prerequisite: ASC 101 or permission of instructor. In alternate years, next offered 1972-73.* Durfee

223 (123) Poultry and Poultry Products *I, 3*
Evaluation of modern high production egg and meat strains of fowl and selection for exhibition characters. Grading live and dressed poultry and eggs, poultry processing, and laws regulating processing and distribution of poultry products. *(Lec. 1, Lab. 4) In alternate years, next offered in 1971-72.* Durfee

228 Dairy Cattle Selection *II, 3*
Study of breed type and principles of selection and judging of dairy animals. Relationship of type to other economic traits. Trips to breeding establishments. *(Lec. 2, Lab. 2)* Gray

252 The Pleasure Horse *II, 2*
Principles of light horse management and horsemanship, including appreciation and use. *(Lec. 1, Lab. 2) Open to all students interested in the pleasure horse.* Henderson

253 Livestock Science *I, 3*
Problems relating to the scientific production and management of beef cattle, sheep, and swine. *(Lec. 2, Lab. 2)* Henderson

321 Dairy Cattle Management *I, 3*
Care and management of dairy herd. Emphasis on practical aspects of milk production and selection of breeding stock. *(Lec. 2, Lab. 2) In alternate years, next offered 1971-72.* Gray

352 General Genetics
See Genetics 352.

354 Genetics Laboratory
See Genetics 354.

378 (or FNS 378) Sensory Evaluation of Foods *I, 3*
Nature of the sensory response; chemistry of compounds responsible for flavor and odor; measurement of taste, odor, color, and texture; design and methodology of panel testing. *(Lec. 2, Lab. 2)* Cosgrove and Food and Nutritional Science Staff

382 Poultry Business *II, 3*
Poultry and enterprises, methods of organization, financing, and business management, with particular emphasis on current developments within the industry affecting business decisions. *(Lec. 2, Lab. 2) Prerequisite: ASC 122, REN 105 or permission of instructor. In alternate years, next offered 1971-72.* Millar

401, 402 Animal Science Seminar *I and II, 1 each*
Preparation and presentation of papers on recent scientific developments and selected subjects in animal and poultry science and food science. *(Lec. 1) Prerequisite: senior standing.* Staff

412 Animal Nutrition *II, 3*
Principles of animal nutrition, metabolism of carbohydrates, proteins, and fats; mineral and vitamin requirements; nutritive requirements for maintenance, growth reproduction, lactation and work. *(Lec. 3) Prerequisite: ASC 212, organic chemistry, junior standing.* Henderson

414 Advanced Ration Formulation *II, 3*
Ration formulation for livestock and poultry, use of ingredient composition tables, nutrient requirement

handbooks, current literature, electronic computer techniques, and industry practices. *(Lec. 1, Lab. 4) Prerequisite: ASC 111. In alternate years, next offered 1972-73.* Ousterhout

415 Physiology of Lactation *I, 3*
Emphasis on endocrine control, milk precursors, general physiology of milk production and gross anatomy of udder, including vascular, lymphatic and nervous systems in dairy cattle. *(Lec. 3) Prerequisite: junior standing. In alternate years, next offered 1972-73.* Hinkson

432 Biology of the Fowl *II, 3*
Anatomy and physiology of the developing and adult domestic fowl emphasizing character of greatest economic interest, embryology, meat and egg production. Physiological responses to environmental conditions imposed in commercial production practices and their influences on productive performance. *(Lec. 2, Lab. 2) Prerequisite: ZOO 111 or BIO 102, CHM 221 or equivalent, junior standing. In alternate years, next offered 1971-72.* Durfee

441 Food Analysis *I, 3*
Principles and procedures for the chemical and physical analysis of foods. Emphasis on the determination of common food constituents and the instrumentation for their analysis. *(Lec. 1, Lab. 6) Prerequisite: organic chemistry.* Rand

442 Animal Breeding *II, 3*
Consideration of the inheritance of economic and morphological characteristics of domestic animals and poultry. Emphasis on development of criteria for selection and development of genetically sound breeding programs. *(Lec. 3) Prerequisite: GEN 352. In alternate years, next offered 1972-73.* Gray

444 Food Quality *II, 3*
Technological problems dealing with procurement, manufacture, transportation, grading, packaging and storage of food products. Field trips required. *(Lec. 2, Lab. 2) Prerequisite: BAC 101 and CHM 201.* Cosgrove

461 (or APA 461) Laboratory Animal Technology *I, 3*
Selection, breeding, and management of laboratory animals. *(Lec. 2, Lab. 2) Prerequisite: ZOO 111 or BIO 102.* Henderson and Yates

470 Population Genetics
See Genetics 470.

472 Physiology of Reproduction *II, 3*
Anatomical and physiological study of reproduction with emphasis on domestic farm animals and fowl. Endocrine aspect of reproduction. *(Lec. 2, Lab. 2) Prerequisite: ZOO 111 and permission of instructor. In alternate years, next offered 1971-72.* Gray

491, 492 Special Projects *I and II, 1-3 each*
Special work to meet individual needs of students in various fields of animal and poultry science, and food science. *(Lec. and/or Lab. according to nature of project) Prerequisite: permission of department.* Staff

512 Advanced Animal Nutrition *II, 3*
Comparative digestion and metabolism of protein, carbohydrate, and fat by ruminant and nonruminant animals. The role of vitamins and minerals in metabolism. Experimental methods in animal nutrition will be discussed. Emphasis on the ruminant animal. *(Lec. 2, Lab. 2) Prerequisite: ASC 412, CHM 124 or BCH 581 and permission of department. In alternate years, next offered 1971-72.* Hinkson

532 Experimental Design
See Experimental Statistics 532.

591, 592 Research Problems *I and II, 3 each*
Research problems to meet individual needs of graduate and honors students in the fields of animal breeding, nutrition, or physiology and food science. *(Lab. 6, TBA) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

Note: for Biochemistry of Foods, see FRC 431, 432.

ANTHROPOLOGY (APG)

CHAIRMAN: Professor Rosengren (Sociology and Anthropology). Assistant Professors Lynch and Poggie; Instructors Landberg and Senulis.

201 Human Origins *I and II, 3*
Survey of anthropological knowledge of the evolution of man; development of culture to the Iron Age. New World archeology. *(Lec. 3) Prerequisite: sophomore standing.* Staff

203 Cultural Anthropology *I and II, 3*
Introduction to concepts and methods of cultural anthropology and an application of these to contemporary preliterate and peasant societies. *(Lec. 3) Prerequisite: sophomore standing.* Staff

301 Introduction to Physical Anthropology *I and II, 3*
Intensive study of the evolution of man and related species including modern human variation. Anthropometric determination of age, sex, and racial differences. Interpretations will emphasize genetic and ecological models. *(Lec. 3) Prerequisite: APG 201.* Senulis

303 New World Archeology *I, 3*
Survey of the culture history of the American Indians from the earliest times to the period of European discovery and colonization, using archeological evidence and methods. *(Lec. 3) Prerequisite: sophomore standing.* Senulis

305 Peoples of the Far East *I, 3*
Survey of anthropological knowledge of peoples of the Far East from Southeast Asia through Japan and Asiatic Russia. Tribal and folk cultures analyzed as aid to understanding cultural configurations in the region. *(Lec. 3) Prerequisite: SOC 202 or APG 203.* Staff

309 Religions of Non-literate Peoples *II, 3*
Religious systems of select non-literate peoples over the world; examination of theories concerning the origins, functions, and nature of religion. *(Lec. 3) Prerequisite: APG 203.* Staff

311 Indians of North America *II, 3*
North American Indians from prehistoric times to the present. Several representative cultures will be studied in detail. *(Lec. 3) Prerequisite: APG 203.* Lynch

313 The Ethnology of Africa *II, 3*
Ethnological survey of the cultural development of Africa's peoples from prehistoric times to the present, with emphasis on the traditional cultures prior to foreign influences; impact of European cultures. *(Lec. 3) Prerequisite: APG 201 or 203.* Landberg

315 Cultures and Societies of Latin America *II, 3*
Contemporary cultures and societies in Latin America, with emphasis on the adjustment of the people to modern social and economic changes. *(Lec. 3) Prerequisite: APG 203.* Poggie

317 Archeology *II, 3*
Theory and method of archeology, stressing the problems of classification, dating and interpretation of archeological materials. Laboratory exercises and field work will be integral parts of the course. *(Lec. 3, Lab. 2) Prerequisite: APG 201 or 203 and permission of department.* Senulis

319 Cultural Behavior and the Environment *I, 3*
A survey and analysis of the variety of cultural adaptations made by traditional and industrial societies to the surrounding physical environment; the inter-relations between cultural creations, including technologies and belief systems, and the limits and possibilities of the environment. *(Lec. 3)* Lynch

321 Social Anthropology *II, 3*
Social structure and organization in the full range of types of human societies. The structural-functional approach in anthropology. *(Lec. 3) Prerequisite: APG 203.* Staff

322 Anthropology of Modernization *II, 3*
Examination of the patterns and processes of contemporary social and cultural change among traditional people. *(Lec. 3) Prerequisite: APG 203.* Poggie

323 Politics in Small-scale Societies *I and II, 3*
Anthropological approach stresses ethnographic field research. Both a cross-cultural perspective and inductive theory construction are used to examine political behavior among tribal and peasant peoples around the world. *(Lec. 3)* Lynch

325 Language and Culture *I and II, 3*
A cross-cultural survey of the interaction of culture and language. Introduction to the various fields of linguistic research emphasizing descriptive and semantic investigations. Selected linguistic studies used as illustrative material. *(Lec. 3) Prerequisite: APG 203.* Senulis

401 History of Anthropological Theory *II, 3*
Anthropological theory from the sixteenth century to the present; readings from such writers as Tylor, Morgan, Boas, Sapir, Kroeber, Benedict, Malinowski and Radcliffe-Brown. *(Lec. 3) Prerequisite: SOC 202, or 204, APG 203, and 3 additional credits in sociology or permission of department.* Landberg

407 Economic Anthropology *I and II, 3*
Introduction to theoretical concepts and methodologies used in the analysis of tribal and peasant economies, with emphasis on examination of case studies from the anthropological literature. *(Lec. 3) Prerequisite: APG 203.* Landberg

506 Psychological Anthropology *II, 3*
Examination of behavior in different cultures employing psychological concepts and theories. *(Lec. 3) Prerequisite: PSY 234 and 435 or SOC 204 and permission of department.* Poggie

ART (ART)

CHAIRMAN: Professor Fraenkel. Professors J. L. Cain and Eichenberg; Associate Professors Ames, M. R. Cain, Ketner, Klenk, Leete and Rohm; Assistant Professors Calabro, Clapsaddle and Richman; Instructors Kampen, Killen, McDonough and Watts.

101 Two-dimensional Studio I *I and II, 3*
Exploration of principles of visual organization relating primarily to formulations on the two-dimensional surface by means of fundamental studies and assignments in studio techniques. *(Studio 6)* Staff

103 (102) Three-dimensional Studio I *I and II, 3*
Introductory studies emphasizing problems in three-dimensional organization and figure modeling in clay or plaster, observations from the live model with discussion and application of various molds and casting techniques. *(Studio 6) Prerequisite: ART 101 or permission of instructor.* Staff

Introduction to Art *I and II, 3*
Basic course designed to foster and develop an understanding of the fundamental principles of the visual arts, the evolution of styles and conceptions through the ages in different forms of creative expression. *(Lec. 3) May not be taken after ART 251, 252 for credit.* Staff

203 Color *II, 3*
The visual perception of color and the manipulation of light as they pertain to two- or three-dimensional formulations. *(Studio 6) Prerequisite: ART 101 and 103 or permission of instructor.* Leete

207 Drawing I *I and II, 3*
Basic studies in visual perception and observation, using nature structures, drawing from live models, still life and landscape, exercises in basic drawing techniques and principles. *(Studio 6) Prerequisite: ART 102 or permission of department.* Staff

208 Drawing II *I and II, 3*
Advanced studio practice in graphic conceptions; exercises in spatial problems, organizing relationships of abstract forms and structures; advanced studies of drawing media. *(Studio 6) Prerequisite: ART 102 and 207 or permission of department.* Staff

221 Two-dimensional Studio II *I and II, 3*
Studio practice in the techniques of painting, utilizing as reference the natural and man-made environments. Both traditional and contemporary materials will be used. *(Studio 6) Prerequisite: ART 102.* Staff

231 Printmaking I *I and II, 3*
Introduction to printmaking from raised surfaces in wood and metal, cutting and engraving on wood or metal, relief etching and printing from cardboard and collage relief. *(Studio 6) Prerequisite: ART 101 or permission of department.* Clapsaddle

233 Graphic Design I *I and II, 3*
Introduction to the basic elements of graphic design, a study of letter forms, their relationship to the page and to the image. Exploration of various traditional and modern reproduction techniques, workshop practice in type setting and lay-out. *(Studio 6) Prerequisite: ART 101 or permission of department.* Richman

241 Sculpture—Modeling *I and II, 3*
Figure modeling in clay or plaster. Observations from the live model in single and group compositions with discussion and application of various mold and casting techniques. *(Studio 6) Prerequisite: ART 102 or permission of department.* Rohm

243 (241) Three-dimensional Studio II *I and II, 3*
Formation of three-dimensional forms employing basic sculptural materials and techniques. Exploration of the basic media with emphasis on form, material and structural means in studio practice. *(Studio 6) Prerequisite: ART 103 or permission of instructor.* Staff

251, 252 Introduction to History of Art *I and II, 3 each*
ART 251: Survey of the stylistic development of architecture, sculpture and painting from prehistory through the Middle Ages. *(Lec. 3) Prerequisite: sophomore standing.* Staff *ART 252:* Continuation from the early Renaissance to the present. *(Lec. 3)* Staff

260 Short History of Architecture *II, 3*
Building styles on a roughly chronological basis emphasizing structure as an outgrowth of climate, materials and technology. *(Lec. 3) In alternate years, next offered 1972-73.* Ames

263 American Art *I, 3*
Painting, sculpture and architecture from their origins in the seventeenth century to the present, with special emphasis on the nineteenth and twentieth centuries. *(Lec. 3)* Staff

264 History of Decorative Arts *I, 3*
Pottery, textiles, silver and furniture as universal arts, and as seen by consumers. *(Lec. 3) In alternate years, next offered 1971-72.* Ames

265, 266 History of Asian Art *I and II, 3 each*
ART 265: Survey of the art of India, China, Japan, Persia and neighboring centers of Asian culture. *(Lec. 3) ART 266:* Continuation. *(Lec. 3)* Killen

272 Pre-Colombian Art *II, 3*
Introduction to the art of Mexico, Peru, Yucatan, Central America, and the Caribbean, tracing the development of art in middle America from the second millennium to the Spanish Conquest. *(Lec. 3) In alternate years, next offered 1972-73.* Killen

273 African Art *I, 3*
Introduction to the art of the Western Congo, Lower Congo, Bushongo, Eastern Congo, Gabon, Southern Nigeria, the Sudan, Guinea Coast, Nigeria, Benin, Ife, and the Cameroons. *(Lec. 3) In alternate years, next offered 1972-73.* Killen

322 Two-dimensional Studio III *I and II, 3*
Continuation of ART 221. *(Studio 6) Prerequisite: ART 221.* Staff

332 Printmaking II *I and II, 3*
Continuation of ART 231. Introduction to the intaglio print, etching, aquatint, metal engraving, collage and collography, in combination with lithographic printing from stone or zinc plates. *(Studio 6) Prerequisite: ART 231, 233 or permission of department.* Clapsaddle

334 Graphic Design II *I and II, 3*
Continuation of ART 233. Applications of previous studies in graphic design to experimental workshop assignments leading to the production of book pages, folders, posters and other visual material incorporating type and print in a contemporary idiom. *(Studio 6) Prerequisite: ART 233 or permission of department.* Richman

335 Graphic Arts I *I or II, 3*
Introduction to the history of graphic communication, tracing the evolution of a pictorial language from prehistoric images to concepts and techniques of contemporary printmaking. Studio assignments to be carried out in the *Primo* publication, in conjunction with the graphics workshop. *(Lec.-Studio 3)* Eichenberg

336 Graphic Arts II *I or II, 3*
The art of illustration as applied to the book in its various forms. Readings and analyses of texts, problems of research and graphic interpretation. Exploration of graphic media, and reproduction processes relevant to the book page and typographic design. Studio assignments to be carried out in the *Primo* publication, in conjunction with the graphics workshop. *(Lec.-Studio 3) Prerequisite: ART 335.* Eichenberg

337 Printmaking III *II, 3*
Continuation of ART 231, exploring further the medium of relief printing in its various forms, woodcut, collograph and other raised surfaces, with special emphasis on the use of these media in the production of illustrated books. *(Studio 6)* Staff

338 Printmaking IV *II, 3*
Continuation of ART 332, further exploration into the intaglio media, metal engraving, etching and lithographic printing from stone and zinc. *(Studio 6)* Staff

344 Three-dimensional Studio III *I and II, 3*
Continuation of ART 243. *(Studio 6) Prerequisite: ART 243 or permission of instructor.* Staff

353 Art of Egypt and Mesopotamia *I, 3*
Art from 3000 B.C. to Alexander the Great in Egypt and the empires of the Near East. Consideration of archeological work and art historical interpretation. *(Lec. 3) Prerequisite: ART 251 or permission of department.* Kampen

354 The Art of Greece and Rome *II, 3*
Developments in architecture, painting and sculpture in Greece and Rome from 800 B.C. to 400 A.D. This will include a brief analysis of the art of the Aegean from 2500 to 1500 B.C. *(Lec. 3) Prerequisite: ART 251 or permission of department.* Ames

355 Early Christian and Byzantine Art *I, 3*
Transformation of late antique into Judaeo-Christian art, with emphasis on painting and mosaic. Sculpture and architecture will be discussed. Use of pagan styles and motifs in Jewish and Christian religious context. *(Lec. 3) Prerequisite: ART 251 or permission of department. In alternate years, next offered 1971-72.* Kampen

356 Medieval Art *II, 3*
Development of medieval art from the Carolingian Renaissance through the end of the Gothic period (800-1400 A.D.), including an appraisal of painting, sculpture, architecture and the minor arts. *(Lec. 3) Prerequisite: ART 251 or permission of department.* Staff

357 Italian Renaissance *I, 3*
Painting, sculpture and architecture from the fourteenth century to the end of the sixteenth century. *(Lec. 3) Prerequisite: ART 251 or permission of department.* Ames

358 Northern Renaissance Art *I, 3*
Developments in French, Flemish and German art of the fifteenth and sixteenth centuries. *(Lec. 3) Prerequisite: ART 252 or permission of department. In alternate years, next offered 1971-72.* Kampen

359 Baroque Art *II, 3*
Study of the transitional phases of mannerism to the seventeenth century Baroque synthesis in Italy and Northern Europe, and the international Rococo style. *(Lec. 3) Prerequisite: ART 251 and 252 or permission of department.* Ames

361, 362 Modern Art *I and II, 3 each*
Survey of main developments in painting, sculpture and architecture in Europe and America during the nineteenth and twentieth centuries. *(Lec. 3) Prerequisite: ART 252 or permission of department.* Killen

375 Nineteenth Century European Art outside France *I, 3*
Introduction to Scandinavian, German, Austrian, English, Netherlandish, and Italian painting and sculpture from the Nazarenes, Canova and Thorvaldsen through the Chelsea group, Klimt and Meunier. *(Lec. 3) Prerequisite: ART 252 or permission of department. In alternate years, next offered 1972-73.* Ames

376 Drawing and Drawings *II, 3*
The great draftsmen in the Western world from the fourteenth to the twentieth centuries. Emphasis will be put on the interaction of purpose, style, and drawing materials. *(Lec. 3) Prerequisite: ART 252 or permission of department. In alternate years, next offered 1971-72.* Ames

403 Studio—Seminar I *I and II, 3-6*
Problems in visual structures developed by the student in consultation with course instructors. Weekly critiques and discussions related to studio work and assigned topics. Intended for third-year art majors. *(Studio 6-12) Prerequisite: permission of department.* Staff

404 Studio—Seminar II *I and II, 3-6*
Continuation of ART 403. Intended for third-year art majors. *(Studio 6-12) Prerequisite: permission of department.* Staff

405 Studio—Seminar III *I and II, 3-6*
Intensive independent work conducted under the guidance of a project adviser selected by the student. Periodic critiques and discussions related to work of all participants in the course. Intended for fourth-year art majors. *(Studio 6-12) Prerequisite: permission of department.* Staff

406 Studio—Seminar IV *I and II, 3-6*
Continuation of ART 405. Intended for fourth-year art majors. *(Studio 6-12) Prerequisite: permission of department.* Kampen

462 Modern Art Seminar: Art since 1945 *II, 3*
Reports on contemporary work and its relation to earlier movements. *(Lec. 3) Prerequisite: ART 262 or permission of department.* Kampen

469, 470 Art History—Senior Projects *I and II, 3-6 each*
Intensive, independent work on a project to be determined after consultation with the student's project adviser. *(Lec. 3-6) Prerequisite: permission of department.* Staff

501 Graduate Studio—Seminar I *I and II, 3-12*
Intensive independent studio work under the guidance of appropriate advisers. Periodic critiques and discussions related to work of all participants in the course. *(Studio 6-24) Prerequisite: permission of department.* Staff

502 Graduate Studio—Seminar II *I and II, 3-12*
Continuation of ART 501. *(Studio 6-24) Prerequisite: permission of department.* Staff

ASTRONOMY (AST)

108 Introductory Astronomy *I and II, 3*
Introductory course dealing with celestial sphere, earth as an astronomical body, sun, motions and characteristics of members of solar system, constellations, constitution of stars and nebulae. Planetarium will be used freely for lectures and demonstration. *(Lec. 3)* Penhallow

408 Introduction to Astrophysics *II, 3*
The application of photometry and spectroscopy to the study of stellar composition, structure, and evolution. Radio astronomy and the structure of our galaxy. Energy production in stars and galaxies. Observational cosmology. *(Lec. 3) Prerequisite: PHY 112 or 214. AST 108 is recommended but not required.* Penhallow

BACTERIOLOGY (BAC)

CHAIRMAN: Associate Professor N. P. Wood (Bacteriology and Biophysics). Professors P. L. Carpenter and Sieburth; Associate Professors P. S. Cohen and Houston; Adjunct Professor Cabelli; Adjunct Associate Professor Prager.

201 General Microbiology *I and II, 4*
Survey of cultivation and morphology of bacteria, effects of environment on bacteria, and various activities of bacteria. Other microorganisms are also studied briefly. *(Lec. 3, Lab. 3) Prerequisite: 1 semester of biology and 1 year of chemistry.* Staff

361 Soil Bacteriology *I, 3*
Various types of bacteria found in soil which affect its fertility. Decomposition of organic matter, nitrification, denitrification, nitrogen-fixation, soil inoculation, methods of counting and culturing soil bacteria. *(Lec. 2, Lab. 2) Prerequisite: BAC 201 and 1 semester organic chemistry. In alternate years, next offered 1972-73.* Houston

412 Food Microbiology *II, 3*
Lectures and laboratory practice in analysis of water and milk and in the examination of dairy and other food products. *(Lec. 2, Lab. 4) Prerequisite: BAC 201 and 1 semester organic chemistry (may be taken concurrently).* Houston

432 Pathogenic Bacteriology *II, 3*
The more important microbial diseases, their etiology, transmission, diagnosis and control. In laboratory, emphasis is placed on methods of diagnosis. *(Lec. 2, Lab. 3) Prerequisite: BAC 201 and 1 semester organic chemistry.* Carpenter

491, 492 Research in Bacteriology *I and II, 1-6 each*
Special problems in bacteriology. Student required to outline his problem, carry on experimental work and present his conclusions in a report. *(Lab. 2 to 12)* Staff

495, 496 Seminar in Bacteriology *I and II, 1 each*
Preparation and presentation of papers on selected subjects in bacteriology. *(Lec. 1) Prerequisite: permission of department.* Staff

533 Immunity and Serology *I, 3*
Various immune reactions, nature of antigens and antibodies, and formation and action of latter. *(Lec. 2, Lab. 3) Prerequisite: BAC 201 and 1 semester organic chemistry and senior standing.* Carpenter

541 Physiology of Bacteria *I, 3*
Chemical and physical nature of bacteria, phenomena of bacterial growth and multiplication, environmental factors which affect bacteria. *(Lec. 2, Lab. 3) Prerequisite: BAC 201, 2 semesters organic chemistry, and 1 semester biochemistry.* Wood

544 Bacterial Metabolism *II, 2*
Energy-yielding reactions, metabolic pathways in the dissimilation of carbon and nitrogen compounds and the biosynthesis of cellular components. *(Lec. 2) Prerequisite: BCH 311 or equivalent.* Wood

546 Bacterial Metabolism Laboratory *II, 2*
Application of methods used in the study of bacterial metabolism. *(Lab. 6) Prerequisite: permission of department.* Wood

552 Microbial Genetics *II, 3*
Recent research on the mechanisms of mutation and genetic recombination, the process of DNA replication, the genetic code, and regulation of DNA, RNA, and protein synthesis in microorganisms. *(Lec. 2, Lab. 3) Prerequisite: BAC 201, BOT 352, and BCH 311.* Cohen

593, 594 The Literature of Bacteriology *I and II, 3 each*
Thorough study of original literature of some phase of bacteriology. Written abstracts or papers on as-

signed topics are discussed in weekly conferences with instructor. *(Lec. 3)* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

621 Systematic Bacteriology *1, 3*
Conferences, assigned readings, and laboratory work designed to give a knowledge of principles of classification of bacteria as well as methods of identifying and describing unknown species. *(Lab. 6) Prerequisite: BAC 432 and either BAC 412 or 533. In alternate years, next offered 1971-72.* Houston

691, 692 Research in Bacteriology *I and II, 3 each*
Assigned research on an advanced level. Student required to outline problem, conduct the necessary literature survey and experimental work, and present his observations and conclusions in a report. *(Lab. 6) Prerequisite: graduate standing.* Staff

695, 696 Graduate Research Seminar *I and II, 1 each*
Reports of research in progress or completed. *(Lec. 1) Required of all graduate students in bacteriology.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

Note: for Virology, see Animal Pathology and Plant Pathology; for Marine Bacteriology, see Oceanography.

BIOCHEMISTRY (BCH)

CHAIRMAN: Professor Purvis. Associate Professors Constantinides, Dain and Tremblay; Assistant Professor R. G. Bell; Adjunct Professor Hammond.

311 Introductory Biochemistry *I, 3*
Introduction to the chemistry of biological transformations in the cell. The chemistry of carbohydrates, fats, proteins, nucleic acids, enzymes, vitamins, hormones will be integrated into a general discussion of the energy yielding biosynthetic reaction in the cell. Designed as a terminal course in biochemistry. *(Lec. 3) Prerequisite: CHM 124 or equivalent.* Bell

400 Chemistry and Biochemistry of Carbohydrates *II, 3*
Advanced course in the chemistry of carbohydrates and their derivatives and their biological role. *(Lec. 3) Prerequisite: CHM 422 or BCH 582 or permission of department. In alternate years, next offered 1971-72.* Dain

411 Biochemistry Laboratory *II, 3*
Biochemical approach to biological research, guides the student through the study of a biological problem in metabolism at the level of enzymology. The effect of an alteration of the hormonal or nutritional status of an organism on enzyme-systems will be evaluated. Use of instruments and biochemical methods associated with each project. *(Lec. 1, Lab. 4) Prerequisite: BCH 311 or equivalent and permission of department.* Tremblay

531, 532, 533, 534 Seminar in Biochemistry *I and II, 1 each*
Presentation of a seminar on selected topics in contemporary biochemistry. *(Lec. 1) Prerequisite: permission of department.* Staff

541, 542 Laboratory Techniques in Biochemistry *I and II, 3 each*
Study and application of these biochemical techniques: enzyme preparation and purification, cell fractionation, ion-exchange and paper chromatography, manometry, fluorometry, polarography, radioactive tracer techniques as applied to biochemical research problems. Assigned research on advanced level using above techniques. *(Lab. 9) Prerequisite: permission of department.* Purvis and Dain

581, 582 General Biochemistry *I and II, 3 each*
Systematic treatment of the principles of biochemistry. A basic course dealing with the chemistry of biological substances and the transformations in living organisms. *(Lec. 3) Prerequisite: CHM 221, 222.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

601 Enzymes *I, 3*
Factors affecting the rate of catalysis in enzymic reactions. The thermodynamic and kinetic characteristic of enzymes profiles. *(Lec. 1½, Lab. 8) Prerequisite: BCH 581, 582, and/or permission of department. In alternate years, next offered 1971-72.* Purvis and Tremblay

602 The Mitochondrion *II, 3*
Detailed study of the structure, properties and function of the mitochondrion. *(Lec. 3) Prerequisite: BCH 581, 582, and/or permission of department. In alternate years, next offered 1971-72.* Purvis

611 Intermediary Metabolism *I, 3*
Intensive study of the metabolic pathways of carbohydrates, lipids and nitrogenous compounds and their interrelationships. The effects of hormonal and nutritional status on the activity of these pathways. *(Lec. 3) Prerequisite: BCH 581, 582, and/or permission of department. In alternate years, next offered 1972-73.* Purvis and Tremblay

612 Biochemical Regulation of Cellular Metabolism *II, 3*
Biochemical regulatory mechanisms of cellular metabolism in micro-organisms and mammalian systems, at the level of the genome, protein synthesis

and enzyme catalysis. *(Lec. 3) Prerequisite: BCH 581, 582, and/or permission of department. In alternate years, next offered 1972-73.* Tremblay

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

BIOLOGY (BIO)

101, 102 General Biology *I and II, 3 each*
Introduction to biology. Important concepts and scientific methodologies are stressed in developing an understanding of the organic world and man's relationship to it. *BIO 101* utilizes chiefly plant materials as illustrations. *BIO 102* emphasizes animals, with special reference to man as an organism. *(Lec. 2, Lab. 2) May be taken in any sequence.* Botany and Zoology Staffs

Note: students who elect BIO 101 may not enroll in BOT 111, and those who elect BIO 102 may not enroll in ZOO 111.

BIOPHYSICS (BPH)

CHAIRMAN: Associate Professor N. P. Wood (Bacteriology and Biophysics). Professor H. W. Fisher; Associate Professor Hartman; Special Instructor Cece.

302 The Molecular Basis of Life *II, 3*
The molecular basis of life as a key to the origin of life, evolution, expression of genetic information, and biological control. Designed for the non-biology major interested in gaining an overall view of biology at the molecular level. *(Lec. 3) Prerequisite: junior standing.* Fisher, Hartman, Cohen and Tremblay

521 Introductory Biophysics *I, 3*
The use of viscosity, diffusion, ultracentrifugation, light scattering, spectrophotometry and X-ray diffraction to study the size, shape, structure, and molecular weight of biological macromolecules. *(Lec. 3) Prerequisite: CHM 332 and MTH 243.* Hartman

522 Intermediate Biophysics *II, 3*
Molecular structure, physical chemistry and genetics of viruses and nucleic acids. *(Lec. 3) Prerequisite: BPH 521. In alternate years, next offered 1971-72.* Hartman

523, 524 Special Topics in Biophysics
I and II, 1-6 each
Advanced work arranged to suit the individual needs of the student. Lecture and/or laboratory according to the nature of the problem. Credits not to exceed a total of 12. *Prerequisite: permission of department.* Staff

526 Nuclear and Radiation Physics in Biology *II, 4*
Fundamental aspects of radioactivity; alpha and beta particles and gamma rays, radiation detection; application of tracer techniques to biological systems; interaction of high energy radiations with matter and with biological systems; health physics and disposal of radioactive wastes. *(Lec. 2, Lab. 6) Prerequisite: CHM 332 or PHY 340 and BIO 102 or permission of department. In alternate years, next offered 1972-73.* Fisher

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

611 Advanced Biophysics *I, 3*
Physical and chemical properties of macromolecules in solution. *(Lec. 3) Prerequisite: BPH 521 or permission of department. In alternate years, next offered 1972-73.* Fisher

621 Electron Microscopy *I, 4*
Introduction to electron microscopy, electron optics, maintenance and operation; techniques of specimen preparation for particulate materials, spraydrop, suspensions, freeze drying, critical point drying, shadow casting, negative staining, fixation, and ultramicrotomy. *(Lec. 2, Lab. 6) Prerequisite: permission of department.* Fisher and Staff

651, 652 Research in Biophysics *I and II, 3 each*
Student is required to outline a research problem, conduct necessary literature survey and experimental work and present his observations and conclusions in a report. *(Lab. 6) Prerequisite: graduate standing.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

BOTANY (BOT)

ACTING CHAIRMAN: Professor Caroselli. Professors Hauke, Lepper, Palmatier, Smayda and R. D. Wood; Associate Professor Goos; Assistant Professors Halvorson, Mottinger and Swift.

111 General Botany *I and II, 4*
Introductory course dealing primarily with study of structure, physiology, and reproduction of seed plants as a basis for understanding broad principles of biology and relation of plants to human life. Survey of various groups of plant kingdom. *(Lec. 3, Lab. 2) Not open to students who have passed BIO 101.* Palmatier and Staff

221 General Morphology *II, 3*
Representative forms of plant groups with emphasis on heredity, evolution, ecology, and plant geography. *(Lec. 1, Lab. 4) Prerequisite: BOT 111 or BIO 101.* Hauke

262 Introductory Ecology
See Zoology 262.

323 Field Botany *I, 3*
Primarily a field course concerned with collection, identification and study of vascular plants with special emphasis on native flora of Rhode Island. Practice in use of manuals, interpretation of morphological characters, problems in nomenclature and herbarium technique. *(Lec. 1, Lab. 4) Prerequisite: BOT 111 or BIO 101.* Palmatier

332 Plant Pathology: Introduction to Plant Diseases *II, 3*
Covers wide range of plant diseases from standpoints of both host and taxonomy of fungi; the nature, cause and control of disease. As far as possible, types selected for study are taken from most common and serious plant diseases found in the state. *(Lec. 1, Lab. 4) Prerequisite: BOT 111 or BIO 101, or equivalent.* Caroselli

352 General Genetics
See Genetics 352.

354 Genetics Laboratory
See Genetics 354.

402 Systematic Botany *I, 3*
Diversity existing in vascular plants, its origin through evolution, and its organization into a hierarchy of categories. Orders and families of vascular plants. Methods of identification and analysis of variation. Brief consideration of rules of nomenclature and important systematic literature. *(Lec. 2, Lab. 3) Prerequisite: BOT 111 or BIO 101. In alternate years, next offered 1971-72.* Hauke

411 Plant Anatomy *I, 3*
Structure and development of tissues and organs in vascular plants with particular emphasis on ontogenetic approach. Wood identification and phylogeny of vascular tissues are included. *(Lec. 1, Lab. 4) Prerequisite: BOT 111 or BIO 101 and junior standing or permission of department.* Hauke

416 Phycology *II, 3*
Survey of marine and freshwater algae, including planktonic forms, with emphasis on classification and field work. Certain aspects of their physiology, ecology, culture and herbarium techniques, and economic importance. *(Lec. 2, Lab. 3) Prerequisite: BOT 111 or BIO 101.* Wood

417 Aquatic Plant Ecology *I, 3*
Field-laboratory introduction to aquatic communities with emphasis on kinds of plants, habitats, environmental factors, and associations. Community dynamics, succession, seasonal progression, blooms, and control are considered. *(Lec. 1, Lab. 4) Prerequisite: BOT 111 and ZOO 111, or BIO 101 and 102, and junior standing.* Wood

424 Plant Ecology *II, 3*
Principles and problems concerning the composition of plant communities, methods of distinguishing and describing them, with a bearing on the landscape and man's role as an agent for change. Field trips, ecological techniques, literature, special projects and reports. One all-day field trip. *(Lec. 1, Lab. 4) Prerequisite: BOT 402 or 323.* Palmatier

432 Mycology: Introduction to the Fungi *I, 4*
Basic course in the identification, structure, cytology, development and distribution of fungi. Recognition of types important in organic decomposition, disease, medicine, industry, and as food. *(Lec. 2, Lab. 4) Prerequisite: BIO 101 or BOT 111; BOT 211 or 332 recommended.* Goos

442 Plant Physiology *I and II, 3*
Covers major areas of plant physiology. Emphasis on fundamental principles underlying plant processes and plant responses to environmental factors. *(Lec. 2, Lab. 3) Prerequisite: BOT 111 or BIO 101, CHM 104 or 110. Organic chemistry desirable.* Albert

453 Cytology *I, 3*
Structure and development of plant and animal cells with particular reference to nuclear and cell divisions, meiosis and fertilization. Special attention to bearing of cytology on taxonomy, physiological behavior and theories of heredity and evolution. *(Lec. 1, Lab. 4) Prerequisite: BOT 111, BIO 101, or ZOO 111, permission of department.* Lepper

512 Plant Morphology *II, 3*
Comparative survey of development, form and anatomy of extinct and extant vascular plants and a modern interpretation of evidence concerning their interrelationships. *(Lec. 2, Lab. 2) Prerequisite: BOT 411 or equivalent. In alternate years, next offered 1972-73.* Hauke

524 Methods in Plant Ecology *I, 3*
Methods used in the analysis of vegetation and micro environments. Emphasis on quantitative techniques in analysis of vegetation, soil and microclimate, and techniques in physiological ecology. *(Lec. 2, Lab. 2) Prerequisite: BOT 111 and 424 or equivalent; EST 411, 412 desirable. In alternate years, next offered 1972-73.* Halvorson

526 (or GEG 526) Plant Geography *I, 3*
Environmental and non-environmental factors controlling distribution of species and vegetative types; the origin, development and senescence of floras; distribution of modern vegetation-types and theories of modern day species distribution. Several lectures will be presented by a member of the Department of Geography. *(Lec. 2, Lab. 2) Prerequisite: BOT 402, 424, or permission of department. In alternate years, next offered 1971-72.* Halvorson

534 Physiology of the Fungi *I, 3*
Life processes of fungi with particular emphasis on chemical composition, organic and mineral nutrition, toxic and stimulating agencies, and metabolism. Also stresses phenomena of variation of growth and sporulation as affected by various environmental factors. *(Lec. 2, Lab. 2) Prerequisite: BOT 332, or permis-*

sion of department. In alternate years, next offered 1971-72. Caroselli

536 Phytopathological Techniques *I, 3*
Research procedures in plant pathology including isolation and inoculation practices, maintenance of pathogenes, disease diagnosis, use of techniques for determining fungi-toxic and phytotoxic properties of chemicals, use of literature and method of preparing manuscripts. *(Lec. 1, Lab. 4) Prerequisite: BOT 332 or permission of department. In alternate years, next offered 1972-73.* Caroselli

540 Experimental Mycology *I, 4*
Growth and reproduction of fungi as affected by nutritional, environmental and genetic factors, with emphasis on experimental methods. *(Lec. 2, Lab. 4) Prerequisite: BOT 432 and BAC 201, or permission of instructor. In alternate years, next offered 1971-72.* Goos

542 Medical Mycology *II, 3*
Study of fungi pathogenic for man and animals. *(Lec. 2, Lab. 2) Prerequisite: BOT 432 or BAC 201, or permission of instructor.* Goos

545 Environmental Plant Physiology *I, 3*
Responses of plants to environmental factors are considered on the cellular and organismal level in relation to changes which occur in the physiology and metabolism of plants. *(Lec. 2, Lab. 3) Prerequisite: BOT 442 or equivalent, organic chemistry. In alternate years, next offered 1971-72.* Albert

554 Cytogenetics *I, 4*
Comparisons of various types of crossing-over, chromosomal aberrations and their effects, mutation and other cytogenetic phenomena in fungi and higher organisms. Laboratory studies of meiosis in maize, identification of chromosomes and induced rearrangements. *(Lec. 2, Lab. 4) Prerequisite: BOT 352, 453, or permission of instructor.* Mottinger

562 Seminar in Plant Ecology *II, 2*
Discussion of recent topics and investigations pertinent to plant ecology. Involves library research, oral presentation of reports, and group discussions. *(Lec. 2) Prerequisite: BOT 424 or equivalent, and permission of instructor. In alternate years, next offered 1971-72.* Halvorson

579 Advanced Genetics Seminar
See Zoology 579.

581, 582 Botany Seminar *I and II, 1 each*
Preparation and presentation of papers on subjects in selected areas relating to botany. *(Lec. 1) Prerequisite: required of graduate students majoring in botany.* Staff

591, 592 Botanical Problems *I and II, 3 each*
Special botanical work arranged to meet needs of individual students who desire advanced work in botany and who are prepared to undertake special problems. *(Lec. 1, Lab. 4) Prerequisite: permission of department.* Staff

593, 594 Botanical Problems *I and II, 3 each*
Similar to BOT 591, 592 but arranged to meet needs of individual students who desire to take further advanced work in botany. *(Lec. 1, Lab. 4) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

631 to 635 Advanced Mycology Seminars
I and II, 2 each
Specialized and advanced treatment and research in the major groups of fungi: cellular and acellular slime molds; phycomycetes; ascomycetes; basidiomycetes; deuteromycetes. *(Lec. 2) Prerequisite: permission of instructor. BOT 631 Cellular and Acellular Slime Molds, offered in 1971-72.* Goos

661 Phytoplankton Taxonomy
See Oceanography 661.

663 Phytoplankton Physiology
See Oceanography 663.

664 Phytoplankton Ecology
See Oceanography 664.

667, 668, 669 Advanced Phytoplankton Seminars
See Oceanography 667, 668, 669.

691, 692 Botanical Problems *I and II, 1-6 each*
Special work to meet needs of individual students who are prepared to undertake special problems. *(Lec. 3 or Lab. 6) Prerequisite: permission of department.* Staff

693, 694 Research in Botany *I and II, 3 each*
Assigned research, subject matter of which is to be arranged with a member of department and with the approval of the head of the department. *(Lab. 6)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

BUSINESS EDUCATION (BED)

CHAIRMAN: Associate Professor K. F. Smith (Business Education and Office Administration). Assistant Professors Langford and Sink; Instructors Clark and Strickland.

Note: BED 121, 122, 321, 322, 325, 326, 327, or 328 may be elected by students other than those majoring in office administration or business education.

120 Personal Typewriting *II, 1*
Development of basic skill in the operation of the typewriter. *(Lab. 3)* Staff

121 Elementary Typewriting *I, 2*
Development of basic skill in the operation of the typewriter, and an understanding of office procedures using the typewriter. Students are expected to attain a speed of 40 words a minute. *(Lab. 4)* Staff

122 Advanced Typewriting *II, 2*
Continuation of BED 121 with emphasis on business applications for typewriting. A speed of 55 words a minute is required by the end of the semester. *(Lab. 4) Prerequisite: BED 121 or equivalent.* Staff

321 Elementary Shorthand *I, 4*
Fundamental principles of Gregg Shorthand, Diamond Jubilee Series. *(Rec. 4)* Staff

322 Advanced Shorthand *II, 4*
Continuation of BED 321. Development of speed and accuracy in taking dictation. A speed of 80 words a minute is required by the end of semester. *(Rec. 4) Prerequisite: BED 321 or equivalent.* Staff

323 Dictation and Transcription *I, 4*
Synchronization of the three elements of transcription: shorthand, typewriting, and English. *(Rec. 3, Lab. 5) Prerequisite: for other than business education and office administration majors, permission of instructor.* Staff

324 Advanced Dictation and Transcription *II, 2*
Refinement of techniques in dictation and transcription to meet business standards. *(Rec. 1, Lab. 3) Prerequisite: for other than business education and office administration majors, permission of department.* Staff

325 Records Administration *I, 2*
Comprehensive study of the establishment and maintenance of business records, including an analysis of the various filing systems. *(Lab. 4)* Staff

326 Business Machines *I and II, 3*
Operation of business machines, their appropriate use in business and in the business departments of secondary schools. *(Lab. 6) Prerequisite: for other than business education and office administration majors, permission of department.* Staff

327 Business Communications *II, 3*
Study of effective business communication with an interdisciplinary approach. Practice and discussion of the basic types of business messages, written and oral. Developing and presenting effective reports through the use of integrated case problems. *Prerequisite: ENG 120 and junior or senior standing, or written consent of instructor.* Staff

328 Office Procedures and Administration *II, 3*
Seminar in the administrative procedures of the business office. *(Lec. 3)* Staff

421 Directed Study *I and II, 3*
Independent study. Development of an approved project supervised by a member of the department faculty. *Prerequisite: junior standing, permission of department and instructor. Not for graduate degree program credit.* Staff

422 Special Problems *I and II, 3*
Lectures, seminars, and instruction with special emphasis on student research projects. *Prerequisite: junior standing, permission of department and instructor. Not for graduate degree program credit.* Staff

427 Organization, Administration and Methods of Teaching Distributive Education *I, 3*
Background, aims, coordination techniques and administrative policies for organizing and operating distributive education programs in secondary schools, post-secondary schools, and adult education programs. Planning and developing effective techniques in teaching D.E. *(Lec. 3) Prerequisite: senior standing and permission of department. Not for graduate degree program credit.* Staff

428 Coordinating and Developing Curriculum for Cooperative Vocational Business and Distributive Education *I, 3*
Duties of the coordinator: selecting training agencies, developing job analysis, selecting and briefing the training supervisor, selecting and working with advisory committee, utilizing other community resources. Principles and problems in the construction of the high school and post-secondary school cooperative vocational and distributive education curriculums. *(Lec. 3) Prerequisite: senior standing and permission of department.* Staff

520 Research and Methods in Teaching Office Occupations Subjects *I, 3*
Psychological principles of skill building, content, methods of teaching, curriculum materials, current thought, and evaluation in the teaching of office occupations subjects. *(Lec. 3)* Staff

522 Improvement of Instruction in Social Business Subjects *II, 3*
Research, objectives, methods of instruction, curriculum materials, current thought, and evaluation in the teaching of such subjects as economics, consumer economics, economic geography, business law, and general business. *(Lec. 3)* Staff

524 Foundations and Recent Developments in Business Education *II, 3*
Philosophy and objectives of business education, principles of curriculum development and evaluation, supervisory problems, organization and administration of cooperative part-time programs, historical developments, legislation, recent developments, and current status of business education. *(Lec. 3)* Staff

525 Research Seminar in Business Education *I, 3*
Analysis of research studies in the field. Research technique applied to business education. Emphasis on

the reading, interpretation, and application of research findings to business education. Planning research projects. The planning and approval of an outline for a field study project is a requirement of this course. *(Lec. 3) Prerequisite: a basic course in statistics and permission of department.* Staff

526 Field Study and Seminar in Business Education *I and II, 3*
Carrying out of the field study project approved in BED 525 with attendance and participation in seminar meetings. *(Lec. 3) Prerequisite: a basic course in statistics and BED 525.* Staff

BUSINESS LAW (BSL)

Professor Geffner; Associate Professor Hoban; Assistant Professor Peck.

333 Law in a Business Environment *I, 3*
A study of contractual relations prefaced by a survey of origins, framework and concepts of our legal system. *(Lec. 3) Prerequisite: junior standing. Open to non-business students only by permission of department.* Geffner, Peck, and Staff

334 Law in a Business Environment *II, 3*
The operation of the system of jurisprudence as it affects agency, business organizations and the sales of merchandise. *(Lec. 3) Prerequisite: BSL 333. Open to non-business students only by permission of department.* Geffner, Peck, and Staff

342 Property Interests *II, 3*
Creation and transfer of personal and real property interests. The legal protection and security of personal and real property interests is given broad consideration. *(Lec. 3) Prerequisite: BSL 333 and senior standing.* Geffner

900 Law of Business *I and II, 3*
Outline of American legal system; substantive rules of law in contemporary business environment; legal aspects of business transactions. *(Lec. 3) Graduate credit for matriculated MBA students only.* Geffner

BUSINESS STATISTICS (BST)

CHAIRMAN: Professor Vollmann (Management Science). Associate Professors Jarrett, Shen and Sternbach; Assistant Professors Armstrong, Budnick, Della Bitta, Gross, Mojena, Shih and Zartler.

124 Statistical Drafting *II, 2*
Graphic methods for presenting statistical data. Preparation of charts and illustrations including practice in using lettering guides, drawing instruments, and other devices and materials currently utilized by visual information specialists. *(Lec. 2, Lab. 4-6)* Sternbach

201, 202 Business Statistics *I and II, 3 each*
BST 201: General statistical methods used in collection, presentation, analysis and interpretation of statistical data. Includes frequency distribution, measures of central tendency and dispersion, probability theory, sampling distribution, central limit theorem, law of large numbers, estimation and tests of hypothesis. *BST 202:* Additional data analysis techniques including tests of independence and goodness of fit, regression, correlation, analysis of variance, time series, and index numebrs. *(Lec. 3)* Armstrong, Budnick, Della Bitta, Mojena, Shen and Shih

375 Bayesian Statistics in Business *I, 3*
Bayesian decision theory as based on the concept of utility and personalistic interpretation of probability. Application of Bayesian inference to decision-making under uncertainty in business. *(Lec. 3) Prerequisite: MGS 366 or permission of instructor.* Jarrett, Mojena and Shih

501, 502 Advanced Business Statistics *I and II, 3 each*
BST 501: Application to scientific research of statistical techniques of simple and multiple regression and correlation, orthogonal polynomials, analysis of variance and experimental design. Packaged computer programs extensively used. *BST 502:* Continuation of BST 501. *(Lec. 3) Prerequisite: permission of instructor.* Armstrong, Jarrett and Shen

981 Fundamental Business Statistics *I and II, 3*
Statistical methods as tools of management; the collection and interpretation of data; statistical inference and decision-making; regression and correlation. *(Lec. 3) Graduate credit for matriculated MBA students only.* Gross, Shen and Shih

CHEMICAL ENGINEERING (CHE)

CHAIRMAN: Professor Thompson. Professors Gielisse, A. F. Mohrnheim and Shilling; Associate Professors Madsen, Mairs, Rockett, Rose and F. Votta; Assistant Professors Barnett, Knickle and Soltz; Adjunct Associate Professor DiMeglio; Adjunct Assistant Professors Doyle, Sahagian and Spano.

211 Introduction to Chemical Engineering *I, 2*
Orientation in chemical engineering followed by an introduction to the use of computers and numerical methods. *(Lec. 1, Lab. 3) Prerequisite: credit or registration in MTH 142.* Votta

212 Chemical Process Calculations *I, 2*
Material balance computations on chemical processes, use of gas laws, vapor pressure, humidity, solubility and crystallization. *(Lec. 1, Lab. 3) Prerequisite: CHM 192 and registration in CHE 211.* Shilling

313 Chemical Eugineering Thermodynamics *II, 3*
Applications of the first, second and third laws of thermodynamics involving thermophysics, thermochemistry, energy balances, combustion and proper-

ties of fluids. *(Lec. 2, Lab. 3) Prerequisite: CHE 212 or CHM 441 and MTH 243.* Votta

314 Chemical Engineering Thermodynamics *I, 3*
Continuation of CHE 313 with applications to compression, refrigeration and chemical equilibrium. *(Lec. 3) Prerequisite: CHE 313.* Votta

322 Chemical Process Analysis *II, 1*
Quantitative experimental studies of selected unit chemical processes. *(Lab. 3) Prerequisite: CHE 344.* Staff

328 Industrial Plants *I, 1*
Field trips to nearby plants demonstrating various phases of chemical engineering. Written reports are required. *(Lab. 3) Prerequisite: credit or registration in CHE 344.* Staff

332 Physical Metallurgy *I and II, 3*
Lectures and laboratory experiments teach the fundamentals of physical metallurgy as they apply particularly to the engineering metals and their alloys. Properties, characteristics and structure of metals, theory of alloys, thermal processing, and studies in corrosion. *(Lec. 2, Lab. 3) Prerequisite: CHM 191 and junior standing.* Mairs

341 Thermodynamics and Transfer Rates *I, 4*
Principles and applications of the first and second laws of thermodynamics involving energy balances, properties of fluids, compression and power cycles. An introduction to heat and mass transfer. *(Lec. 4) Prerequisite: credit or registration in MCE 354.* Knickle or Votta

342 Introduction to Transport Phenomena *I, 4*
Theory and basic principles underlying the unit operations of chemical engineering: flow of fluids, flow of heat, evaporation, diffusion, humidification, and drying. Solution of problems based on actual operating data from industrial process equipment. *(Lec. 3, Lab. 3) Prerequisite: CHE 212.* Barnett

343 Mass Transfer Operations *II, 3*
Continuation of CHE 342 including distillation, gas absorption, extraction, crystallization. *(Lec. 2, Lab. 3) Prerequisite: CHE 344.* Knickle

344 Introduction to Transfer Rates *I and II, 3*
Introduction to fluid mechanics, heat transfer and mass diffusional processes. *(Lec. 3) Prerequisite: credit or registration in MCE 341.* Madsen

345, 346 Chemical Engineering Laboratory *I and II, 2 each*
Quantitative studies illustrating chemical engineering principles. Emphasis on report writing and the interpretation of experimental data. *(Lab. 6) Prerequisite: CHE 345.* Staff

351, 352 Plant Design and Economics *I and II, 3 each*
Elements of plant design integrating the principles learned in previous courses. Emphasis is on optimum economic design and the writing of reports. *(Lec. 1, Lab. 6) Prerequisite: CHE 314 and 343.* Madsen

391, 392 Honors Work *I and II, 1-3 each*
Independent study under close faculty supervision. Discussion of advanced topics in chemical engineering in preparation for graduate work. *Prerequisite: junior standing or permission of department.* Staff

425 Process Dynamics and Control *II, 3*
Principles involved in the automatic control of processing plants. Modeling and responses of dynamic systems, feedback control. *(Lec. 3) Prerequisite: MTH 244 and ELE 211 or ELE 220 and credit or registration in CHE 341, 342, 344 or MCE 354.* Shilling

437 Materials Engineering *I and II, 3*
Introduction to engineering aspects of the chemical and physical properties and fundamentals of the solid state. Structure and properties of engineering materials with emphasis on ceramics, polymeric and composite materials. *(Lec. 3) Prerequisite: CHM 110 or permission of department.* Gielisse

464 Industrial Reaction Kinetics *I, 2*
Introduction to the design of chemical reactors. *(Lec. 2) Prerequisite: CHE 314.* Shilling

501, 502 Graduate Seminar *I and II, 1 each*
Seminar discussions including the presentation of papers based on research or detailed literature surveys. *(Lec. 1) Attendance is required of all students in graduate residence, but a maximum of 1 credit per year is allowed and no more than 2 credits are allowed for the entire period of residence.* Staff

530 Polymer Chemistry *I, 3*
Polymer structure, molecular forces, glass and crystalline transitions, solution properties, polymerization kinetics, molecular weight distribution, fractionation, viscoelastic properties and transport processes. *(Lec. 3) Prerequisite: CHM 222 and 332 or permission of instructor.* Barnett

531 Polymer Engineering *II, 3*
Polymer processing and mechanical properties of polymers. *(Lec. 3) Prerequisite: CHE 342 or 344 and 530, or permission of instructor.* Barnett

533 Engineering Metallurgy *II, 3*
Application of metallurgy in engineering. Design and production of sound castings and ingots, the metallurgy of welding and brazing, the shaping of metals and alloys by plastic deformation and the development of special properties. *(Lec. 2, Lab. 3) Prerequisite: CHE 332.* Mairs

534 (or OCE 534) Corrosion and Corrosion Control *I, 3*
Chemical nature of metals, electrochemical nature of corrosion. Types of corrosion, influence of environment, methods of corrosion control, behavior of engineering materials, all with special emphasis on the

ocean environment. *(Lec. 3) Prerequisite: permission of instructor.* Soltz

535 (or OCE 535) Advanced Course in Corrosion *II, 3*
The various types of corrosion problems occurring in modern industry. In-depth comparison of the various methods available to avoid, reduce, or eliminate corrosion. Continuation of CHE 534 *(Lec. 3) Prerequisite: CHE 534 or permission of instructor.* Soltz

537 Advanced Materials Engineering *II, 3*
Engineering properties, molecular design and applications of materials. Synthesis, fabrication and processing of materials. Effects of environment on materials, materials products devices and systems. *(Lec. 3) Prerequisite: CHE 437 and PHY 340 or 341.* Gielisse

538 Nuclear Metallurgy
See Nuclear Engineering 538.

571 Analysis of Engineering Data *II, 3*
Application of some of the modern mathematical techniques to the analysis of engineering data. *(Lec. 3) In alternate years, next offered 1971-72.* Votta

572 X-ray Diffraction and Fluorescence *I, 3*
Fundamentals, properties, and applications of X-rays for identification and chemical analysis of materials, determination of lattice parameters, phase transformations, textures, residual stresses, grain and particle sizes, film and plate thicknesses. *(Lec. 2, Lab. 3) Prerequisite: PHY 340 or 341.* Mohrnheim

574 Biochemical Engineering *I, 3*
Introduction to biotechnology. Includes properties of biological materials, dynamics, control and operation of biological systems and processing of biological materials. *(Lec. 3) Prerequisite: permission of instructor. In alternate years, next offered 1972-73.* Thompson

581 Introduction to Nuclear Engineering
See Nuclear Engineering 581.

582 Radiological Health Physics
See Nuclear Engineering 582.

583 Nuclear Reactor Theory
See Nuclear Engineering 583.

585 Measurements in Nuclear Engineering
See Nuclear Engineering 585.

586 Nuclear Reactor Laboratory
See Nuclear Engineering 586.

591, 592 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem. Credits not to exceed a total of 12). Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

613 Advanced Chemical Engineering Thermodynamics *I, 2*
Applications of the first, second and third laws of thermodynamics and their relation to chemical engineering processes. Emphasis on properties of fluids, chemical and physical equilibria and refrigeration. *(Lec. 2) In alternate years, next offered 1972-73.* Votta

614 Advanced Chemical Engineering Thermodynamics *II, 2*
Continuation of CHE 613. *(Lec. 2) Prerequisite: CHE 613. In alternate years, next offered 1972-73.* Votta

625 Automatic Process Control *II, 3*
Theory of automatic control is applied to industrial processing systems. *(Lec. 3) In alternate years, next offered 1971-72.* Shilling

637 (or IDE 641) Molecular Aspects of Materials Processing *I or II, 3*
Detailed analysis of the fundamental physical and chemical aspects of generation, fabrication and application of materials in processing. Includes major material groups, the molecular nature of material interaction, and the mechanical, chemical, and thermal theories of specific processing modes. *(Lec. 3) Prerequisite: CHE 437 or permission of instructor.* Gielisse

640 Transport Phenomena I *I, 3*
Analysis of transport processes in fluids with emphasis on diffusion of matter. *(Lec. 3) Prerequisite: MTH 244 and CHE 343 or permission of instructor.* Barnett

641 Transport Phenomena II *II, 3*
Interphase transfer, turbulent transport processes and boundary layer theory, with application to fixed and fluid bed processes, biochemical, biomedical and electrochemical systems. *(Lec. 3) Prerequisite: CHE 640.* Barnett

643 Fluid Dynamics *II, 3*
Advanced problem course dealing with isothermal and nonisothermal flow of compressible and incompressible fluids. *(Lec. 3) In alternate years, next offered 1972-73.* Madsen

644 Process Heat Transfer *II, 3*
Advanced study of heat transfer by conduction in the steady and unsteady state, radiation and convection. *(Lec. 3) In alternate years, next offered 1971-72.* Madsen

645 (or MCE 645) Boiling Heat Transfer and Two-phase Flow *I, 3*
Nucleation and bubble growth, pool boiling, and flow boiling. Hydrodynamics of two-phase flow, the boiling

crisis, and instabilities in boiling systems. *(Lec. 3) Prerequisite: MCE 546, CHE 644 or permission of instructor. In alternate years, next offered 1971-72.* Madsen and Test

646 Radiation Heat Transfer
See Mechanical Engineering 646.

647 Mass Transfer I *I, 3*
Advanced course dealing with the application of mass transfer theory in the distillation of binary, multicomponent, and complex mixtures. *(Lec. 3) In alternate years, next offered 1971-72.* Thompson

648 Mass Transfer II *II, 3*
Advanced study of mass transfer theory applied to gas-liquid, liquid-liquid and solid-liquid systems. *(Lec. 3) In alternate years, next offered 1971-72.* Barnett

651, 652 Advanced Design *I and II, 3 each*
Advanced course in the coordination of chemical or nuclear engineering principles and economics to the design of complete industrial plants. Students work design problems on an individual basis, with the guidance of one or more instructors. Staff

664 Applied Reaction Kinetics *II, 3*
Application of principles of chemical reaction kinetics to industrial processes. *(Lec. 3) In alternate years, next offered 1972-73.* Shilling

682 Radiation Shielding
See Nuclear Engineering 682.

683 Advanced Nuclear Reactor Theory
See Nuclear Engineering 683.

687 Nuclear Chemical Engineering
See Nuclear Engineering 687.

691, 692 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem. Credits not to exceed a total of 12.) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

CHEMISTRY (CHM)

CHAIRMAN: Professor Goodman. Professors Abell, Cruickshank, Kraus, S. MacKenzie and Vittimberga; Associate Professors Gonzalez, Nelson and Rosie; Assistant Professors C. W. Brown, Cheer, Fasching, Hamlet, Kirschenbaum, Petersen and Rosen.

101 (101) General Chemistry Lecture I *I and II, 3*
Good foundation through fundamental treatments of concepts and principles in atomic structure, energy relationships, and reaction mechanisms balanced with applied and descriptive material. *(Lec. 3)* Cruickshank

102 (101) General Chemistry Laboratory I *I and II, 1*
Experimental work illustrating certain concepts and principles now a part of general chemistry. Experiments in solution, reaction rates, enthalpy, molar heat capacity, and electro-chemistry. *(Lab. 3) Prerequisite: prior or concurrent registration in CHM 101.* Staff

103 (103) General Chemistry Lecture I *I, 3*
Introductory course similar to CHM 101 for students without prior chemical training. *(Lec. 3)* Staff

104 (104) General Chemistry Lecture II *II, 3*
Continuation of CHM 101 or CHM 103 for students who plan no further training in chemistry and wish to complete a year's study in general chemistry. *(Lec. 3) Prerequisite: CHM 101 or 103.* Cruickshank

105 (103) General Chemistry Laboratory I *I, 1*
Designed to fit the course content of CHM 103. *(Lab. 3) Prerequisite: prior or concurrent registration in CHM 103.* Staff

106 (104) General Chemistry Laboratory II *II, 1*
Designed to fit the course content of CHM 104. *(Lab. 3) Prerequisite: prior or concurrent registration in CHM 104.* Staff

107 (109) Chemistry of Our Environment *I and II, 3*
Elementary chemistry for non-science majors, emphasizing the chemical aspects of the human environment. Chemistry of the biosphere, chemistry of pollution and aspects of industrial chemistry. *(Lec. 3) Not open to students who have passed CHM 109.* Staff

108 (109) General Chemistry Laboratory *I and II, 1*
General principles of chemistry to accompany CHM 107 for those who want a laboratory as part of their chemistry course. *(Lab. 3) Prerequisite: prior or concurrent registration in CHM 107. Not open to students who have passed CHM 109.* Staff

112 (110) General Chemistry Lecture II *I and II, 3*
Elementary thermodynamics, chemical equilibria in aqueous solutions, properties and reactions of inorganic species, and practical applications of chemical principles. *(Lec. 3) Prerequisite: CHM 101 or 103. Not open to students who have passed CHM 110.* Staff

114 (110) General Chemistry Laboratory II *I and II, 1*
Semi-micro-qualitative analysis and its applications. *(Lab. 3) Prerequisite: prior or concurrent enrollment in CHM 112. Not open to students who have passed CHM 110.* Staff

124 Organic Chemistry *II, 4*
Elementary principles of organic chemistry with emphasis on aliphatic compounds, including especially those of physiological significance such as amino acids

and proteins, carbohydrates, fats and waxes. *(Lec. 3, Lab. 3) Prerequisite: CHM 101 or 103. Not open to students in chemistry or chemical engineering.* Staff

191 General Chemistry *I, 5*
Descriptive inorganic chemistry, qualitative analysis and an introduction to quantitative analysis. Required for students in the chemistry curriculum who have had a year of high school chemistry. *(Lec. 4, Lab. 3)* Staff

192 General Chemistry *II, 5*
Continuation of CHM 191. *(Lec. 4, Lab. 3)* Staff

212 Quantitative Analysis *I, 4*
Principles of gravimetric and volumetric analysis with detailed attention to solution of stoichiometric problems. Laboratory analysis of representative substances by gravimetric or volumetric procedures. *(Lec. 3, Lab. 3) Prerequisite: CHM 110.* Rosie, Fasching

225 Organic Chemistry *I, 3*
Continuation of CHM 124 with emphasis on aromatic chemistry but including additional aspects of aliphatic chemistry. Includes a discussion of dyes, plastics, petroleum technology and other topics of current interest. *(Lec. 2, Lab. 3) Prerequisite: CHM 124.* Staff

227 (221) Organic Chemistry Lecture I *I and II, 3*
General principles and theories with emphasis on classification, nomenclature, methods of preparation and characteristic reactions of organic compounds in aliphatic series. *(Lec. 3) Prerequisite: CHM 104, 110 or 192. Not open to students who have passed CHM 221.* Staff

228 (222) Organic Chemistry Lecture II *II, 3*
Continuation of CHM 227 with emphasis on the aromatic series. *(Lec. 3) Prerequisite: CHM 227. Not open to students who have passed CHM 222.* Staff

229 (221) Organic Chemistry Laboratory I *I, 1*
Common techniques and typical preparative methods in aliphatic series. *(Lab. 3) Prerequisite: prior or concurrent registration in CHM 227. Not open to students who have passed CHM 221.* Staff

230 (222) Organic Chemistry Laboratory II *II, 1*
Continuation of CHM 229 with emphasis on the aromatic series. *(Lab. 3) Prerequisite: CHM 229 and prior or concurrent registration in CHM 228. Not open to students who have passed CHM 222.* Staff

331, 332 Physical Chemistry *I and II, 4 each*
Introductory courses. *CHM 331:* fundamental laws, theories and methods of physical chemistry. Consideration of gases, liquids, crystals and properties of solutions. *CHM 332:* principles of chemical equilibrium are developed and applied to problems in solutions of electrolytes, electrochemical cells, osmotic phenomena and conductance. Designed for chemical engineers. *(Lec. 3, Lab. 3) Prerequisite: CHM 192 or 212.* Kraus

335, 336 Physical Chemistry Laboratory *I and II, 2 each*
Physical chemical properties of gasses, liquids and solutions; electrochemical cells; phase diagrams of binary and ternary systems; and chemical kinetics are studied in the laboratory. Designed for chemistry majors. *(Lab. 4) Prerequisite: CHM 441 for CHM 335 and CHM 442 for CHM 336. May be taken concurrently with CHM 441, 442.* Kraus

353, 354, 355, 356 Undergraduate Research *I and II, 3 each*
Methods of approach to a research problem. Use of the literature, laboratory work, and a report on an original problem or problems. Seniors may elect maximum of 6 credits with permission of advisers and approval of research faculty concerned. Honors students may elect 12 credits. *(Lab. 9) Prerequisite: CHM 222, 332 and permission of department.* Staff

391 The Literature of Chemistry *I, 1*
Survey of publications in field including primary literature sources, abstracting serials, monographs, patents, government publications. Reports on assigned topics required. For seniors and graduate students in chemistry. *(Lec. 1) Prerequisite: elementary courses in physical and organic chemistry.* Staff

392 Seminar in Chemistry *II, 1*
Preparation and presentation of papers on selected topics in chemistry. Required of seniors in chemistry. *(Lec. 1) Undergraduate credit only. Prerequisite: CHM 222, 332.* Gonzalez

401 Intermediate Inorganic Chemistry *I, 3*
Nucleus of the atom, isolated atom, chemical bond, magnetic effects in chemistry, complexions, hydrides, rare-earths, inorganic polymers, inorganic reaction mechanisms, thermodynamics. *(Lec. 3) Prerequisite: CHM 332.* Nelson

412 Instrumental Methods of Analysis *II, 3*
Theory and application of optical and electrical instruments to solution of chemical problems: flame photometry, emission spectroscopy, ultraviolet, visible, and infrared spectrophotometry, colorimetry, turbidimetry, nephelometry, fluorometry, potentiometry, voltammetric titration methods. *(Lec. 3) Prerequisite: CHM 222, 332.* Rosie

414 Instrumental Methods of Analysis Laboratory *II, 2*
Application of the methods of analysis covered in CHM 412 to physical-chemical separations are studied in the laboratory. *(Lab. 6) Prerequisite: CHM 412. May be taken concurrently with CHM 412.* Rosie

421 (422) Advanced Organic Chemistry *I, 3*
Emphasis on fundamental organic structure theory and reaction mechanisms. *(Lec. 3) Prerequisite: CHM 228 and 230.* Vittimberga

425 Qualitative Organic Analysis *I, 4*
Methods of identification of typical organic com-

pounds. Consideration given to separation and identification of components of mixtures. Use of infrared and nuclear magnetic resonance spectra is emphasized. *(Lec. 2, Lab. 6) Prerequisite: CHM 222.* Abell

434 Applications of Chemical Data Processing *II, 3*
Chemical calculations considered in detail followed by individual program construction and execution. Topics include inter-atomic repulsions, dipole moments, interaction of bond orbitals fitting ORD curves, calculations of spectra, and quantum mechanical approximations. *(Lec. 2, Lab. 3) Prerequisite: CHM 222, 332, and a one-semester course in Fortran programming or equivalent experience. In alternate years, next offered 1972-73.* MacKenzie

435 Advanced Physical Chemistry *I, 3*
Special emphasis on quantum theory and structure of matter. Topics include: development of the Schrodinger equation, potential barrier problems, harmonic oscillator, hydrogen atom, variational principle, perturbation theory, helium atom and hydrogen molecule. Designed for chemistry majors and chemical engineers. *(Lec. 3) Prerequisite: CHM 332, MTH 244.* Gonzalez

441, 442 Physical Chemistry *I and II, 3 each*
See CHM 331, 332 for description. Designed for chemistry majors. *(Lec. 3) Prerequisite: CHM 192 or 212. May be taken for graduate credit only by students in M.S. programs whose disciplines do not require physical chemistry as part of their undergraduate programs.* Brown

501 Molecular Structure in Inorganic Chemistry *I or II, 3*
Systematic analysis of bonding schemes and structural aspects of molecular systems encountered in inorganic chemistry. Special emphasis on electron density distributions, physical methods of analysis, and practical applications of quantum mechanics. *(Lec. 3) Prerequisite: CHM 401.* Petersen

503 Chemistry of the Representative Elements *I, 3*
Guided literature study. Special emphasis placed on compounds of boron, silicon, phosphorus, sulfur, fluorine and related elements in Groups III-VII. *(Lec. 3) Prerequisite: CHM 401.* Nelson

504 (402) Physical Methods of Inorganic Chemistry *II, 3*
Theory and application of principal physical methods used in the preparation, analysis, and investigation of properties of inorganic chemicals, with emphasis on investigations concerning molecular structure and electron density distributions in molecular systems. *(Lec. 2, Lab. 3) Prerequisite: CHM 332.* Petersen

508 Inorganic Reaction Mechanisms *II, 3*
Kinetics and mechanisms of reactions in aqueous solution treated with regard to techniques, results, and theoretical interpretation. Instrumentation for studying rapid reactions in solution, relaxation methods, electron transfer rates, hydrolytic and solvolytic reactions, metal ion complexation, and reactions of biochemical significance. *(Lec. 3) Prerequisite: CHM 332 or equivalent.* Kirschenbaum

511 Chemical Spectroscopy *I, 3*
Principles and equipment used in modern spectrochemical analysis with emphasis on emission spectroscopy. Discussion and spectroscopy of infrared and ultraviolet regions, absorption and Raman spectroscopy. *(Lec. 3)* Staff

512 Advanced Instrumental Analysis *II, 3*
Continuation of CHM 412 with emphasis on principles and recent developments in application of physico-chemical phenomena to solution of chemical problems. *(Lec. 3) Prerequisite: CHM 412, PHY 340, and MTH 243.* Staff

513 Advanced Analytical Laboratory *I, 3*
Projects designed to acquaint student with newer and more advanced techniques of classical and instrumental analytical methods. Literature searches, conferences and a written report required. Course normally required of all first year graduate students in analytical chemistry. *(Lab. 9) Prerequisite: CHM 212, 222, and 332 and permission of department.* Fasching and Rosie

514 Thermal Methods of Analysis *II, 3*
Theory and applications of the principles of thermodynamics to the solution of analytical problems. Quantitative treatment will be given to techniques such as differential scanning calorimetry, precision calorimetry and miscellaneous thermal methods of analysis. Particular emphasis on the evaluation of thermodynamic data obtained from these techniques and its application to the solution of analytical problems. *(Lec. 3) Prerequisite: CHM 331.* Staff

516 Ion Exchange and Gas Chromatography *II, 3*
Principles of ion exchange separations including equilibria, kinetics, column operation and applications of ion exchangers. Principles of gas chromatography including theory of column efficiency, equipment design, column selection, qualitative and quantitative calibration. *(Lec. 2, Lab. 3) Prerequisite: CHM 332.* Rosie and Fasching

518 Radiochemistry *II, 3*
Theory and principles of nuclear science as applied to the various fields of chemistry. Radioactivity, radiation detection and measurement, preparation and separation of radionuclides, emphasis on solution of chemical and environmental research problems with the techniques of nuclear chemistry. *(Lec. 3) Prerequisite: CHM 332, PHY 214 or permission of instructor.* Fasching

520 Radiochemistry Laboratory *II, 1*
Laboratory studies of the theory and principles of nuclear science as applied to various fields of chemistry. Radioactivity, radiation detection and measurement, preparation and separation of radionuclides,

instrumental neutron activation analysis, fission process, and uses of radioactive tracers. *(Lab. 3) Prerequisite: CHM 518 concurrently, CHM 332 and PHY 214, or permission of instructor.* Fasching

522 Advanced Organic Chemistry *II, 3*
Modern synthetic reactions and their applicability to such areas as natural products and heterocyclic chemistry. *(Lec. 3) Prerequisite: CHM 421 or permission of instructor.* Abell

528 Organo-inorganic Chemistry *II, 3*
Interaction of organic and inorganic molecules. Uniqueness of carbon and the effects that inorganic moieties have on bonded organic fragments described. Organometallic chemistry, the transition metal chelate complexes and carbon in combination with the representative elements considered. Model biochemical systems analyzed. *(Lec. 3) Prerequisite: CHM 401 and 422 or equivalent.* Rosen

531 (631) Chemical Kinetics *I, 3*
Topics include transition state theory, unimolecular decompositions, kinetics of fast reactions, reactions in molecular beams, shock waves, theoretical studies of potential energy surfaces and kinetic isotope effects. *(Lec. 3) Prerequisite: CHM 634 or permission of instructor. In alternate years, next offered 1971-72.* Gonzalez and Brown

533 (433) Elementary Chemical Thermodynamics *I, 3*
Laws of chemical thermodynamics and their application to homogeneous and heterogeneous systems. The classical development of this subject is followed. *(Lec. 3) Prerequisite: CHM 332.* Kraus

535 Chemical Applications of Group Theory *I, 2*
Fundamental principles of group theory will be developed insofar as they are used in simplifying problems of a chemical nature. Group theoretical approach to several typical problems such as hybrid orbitals, molecular orbitals, and molecular vibrations. *(Lec. 2) Prerequisite: CHM 332.* Brown

536 Molecular Spectroscopy and Structure *II, 3*
Theory of molecular dynamics and the interaction of electromagnetic radiation with matter. Absorption and emission spectra in the infrared, far-infrared, and microwave regions will be considered along with Raman scattering in the visible region. Use of spectral results in determining physical properties and elucidating molecular structures will be emphasized. *(Lec. 3) Prerequisite: CHM 535 or permission of instructor.* Brown

537 Quantum Chemistry I *I, 3*
Quantum theory of matter. Topics include: development of the Schrodinger equations, potential barrier problems, the harmonic oscillator and the hydrogen atom. *(Lec. 3) Prerequisite: CHM 442, MTH 244.* Gonzalez

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

602 The Transition Metals *II, 3*
Structure, bonding and reaction mechanisms of transition metals and their compounds. Applications of Ligand field theory. *(Lec. 3) Prerequisite: CHM 401.* Nelson

604 Semiempirical Molecular Orbital Theory *I or II, 2*
Description of semiempirical molecular orbital calculations and applications to problems of current interest. Use of the computer will be emphasized. *(Lec. 2) Prerequisite: permission of instructor. In alternate years, next offered 1971-72.* Petersen

606 Light Scattering, Applications to Research *I or II, 2*
Thermodynamical and quantum mechanical treatment of radiation scattering from pure liquids and solutions. Emphasis on the application related to molecular structural analysis. *(Lec. 2) Prerequisite: permission of instructor. In alternate years, next offered 1971-72.* Nelson

621 (521) Carbanion Theory *I, 3*
Modern theories of organic chemistry pertaining to carbanion reactions such as hydrogen transfer, displacement, additions to multiple bonds, eliminations, and condensations. *(Lec. 3) Prerequisite: CHM 522 or permission of instructor. In alternate years, next offered 1972-73.* MacKenzie

622 (522) Carbonium Ion Theory *II, 3*
Modern theories of organic chemistry pertaining to carbonium ion formation, stabilization, solvolysis and rearrangement. Material on other acid-catalzyed reactions such as ester and ether hydrolysis and electrophilic aromatic substitutions. *(Lec. 3) Prerequisite: CHM 221, 222.* Abell

623 Free Radical Reactions *I, 3*
Bond homolysis, polymerization, oxidation processes, rearrangements and use of radical intermediates in synthesis. *(Lec. 3) Prerequisite: CHM 222 and 332. In alternate years, next offered 1972-73.* Abell

624 Organic Photochemistry *II, 3*
Theory and mechanisms of organic photochemistry. Excitation, intersystem crossings and photosensitization will be discussed. Essentials of the interaction of light with matter will be reviewed, including selection rules, group theory, the Franck-Condon principle. Mechanisms of reaction and rearrangement are emphasized. *(Lec. 3) Prerequisite: CHM 627. In alternate years, next offered 1972-73.* Vittimberga

625 Advanced Theoretical Chemistry *I, 3*
Theoretical approach to electron interaction in organic molecules. Quantum mechanics and bond orbital theories. *(Lec. 3) Prerequisite: CHM 422.* Vittimberga

627 Physical Methods in Organic Chemistry *I, 3*
Theory and application of some physical methods in organic chemistry, including X-ray diffraction, mass spectrometry and optical rotatory dispersion. *(Lec. 3) Prerequisite: permission of instructor. In alternate years, next offered 1971-72.* Cheer

634 Advanced Chemical Thermodynamics *II, 3*
Statistical thermodynamics is developed and applied to the calculation of thermodynamic properties. *(Lec. 3) Prerequisite: CHM 433 or permission of department. In alternate years, next offered 1971-72.* Kraus

638 Quantum Chemistry II *II, 3*
Continuation of CHM 537. Includes perturbation theory, the variational principle, time dependent perturbation theory, the helium atom, the hydrogen molecule, Hartree Foch calculations, pi electron systems and the development of the Huckel molecular orbital method. *(Lec. 3) Prerequisite: CHM 537 or equivalent.* Gonzalez

639 Surface Chemistry *I, 3*
Emphasis on contact catalysis. Topics include physical and chemical adsorption, measurement of surface areas, heterogeneous kinetics, physical methods for studying absorbed molecules and the mechanisms of selected catalytic reactions. *(Lec. 3) Prerequisite: CHM 442 and MTH 244.* Gonzalez

641, 642, 643, 644 Graduate Seminar *I and II, 1 each*
Results of detailed literature surveys are presented orally and in writing. Required for candidates for advanced degrees in chemistry. *(Lec. 1)* Staff

651, 652, 653, 654 Research *I and II, 3 each*
Research on an original problem in organic, inorganic, analytical or physical chemistry. A complete literature survey, laboratory work and a detailed report in thesis form to be submitted at conclusion of work. *(Lab. 9) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

CHILD DEVELOPMENT AND FAMILY RELATIONS (CDF)

CHAIRMAN: Professor R. C. Smart. Professor Fitzelle; Associate Professor M. S. Smart; Assistant Professors Blood, Conforti, Kohut, Lapin, Sethi and L. S. Votta; Instructors P. Jones and K. Schroeder; Clinical Instructor Hallett; Clinical Lecturer L. Harris.

150 Personal Development *I and II, 3*
Emphasis on self-understanding and human relationships in general. Influence of societal roles, group interaction, and contemporary cultural issues on individual development. *(Lec. 3)* Staff

200 Growth and Development of Children *I and II, 3*
Planned for students who intend to enter a profession dealing with children. Physical, social, mental, emotional growth and development and interrelations among them from birth to puberty. *(Lec. 3)* Staff

270 Introduction to Work with Children *I and II, 3*
Theory and practice in care, teaching and guidance of preschool children. Lectures, discussion and participation in nursery school. *Students should have two free hours between 9 and 11:30 and 1 and 3:30 one day per week. (Lec. 2, Lab. 2) Prerequisite: CDF 200.* Nursery School Staff

290 Fundamentals of Preschool Education *I and II, 2*
Philosophy and theory basic to teaching and guiding the young child. This course is restricted to professional and semi-professional persons with experience in the field. *Prerequisite: permission of instructor. (Lec. 2)* Staff

302 Adolescent Growth and Development *I, 3*
Physical, psychological, social and emotional growth and development of individual during adolescent years. *(Lec. 3) Prerequisite: sophomore standing.* Staff

320 Human Relations Laboratory *I and II, 1*
Understanding individual behavior in the context of a social group; discussion and selected group dynamics techniques. *(Lab. 2) Open only to students concurrently enrolled in HMG 370. S/U credit.* Fitzelle

330 Curriculum for Nursery School and Kindergarten *I and II, 3*
Program planning for nursery school and kindergarten. Theory and teaching techniques that foster full development of the young child through language, arts, creative activities, science and mathematics. *(Lec. 3) Prerequisite: CDF 270.* Staff

331 Literature for Children *I and II, 3*
Consideration of the literary heritage of American children and criteria for the selection and presentation of literature to children. *(Lec. 3) Prerequisite: junior standing.* Staff

340 Family and Community Health *I and II, 3*
Health maintenance throughout life. Specific health concerns of various age groups. Study of community and world health needs and agencies concerned with meeting these needs. Home nursing demonstration and practice. *(Lec. 3) Prerequisite: junior standing.* Votta

355 Marriage and Family Relationships *I and II, 2-3*
Emphasis on relationships between men and women in courtship, engagement and first years of marriage. These are seen as influenced by development and functioning of the individuals' personalities which in turn are influenced by cultural factors. *(Lec. 2 or 3) Prerequisite: junior standing.* Staff

370 Nursery School Practicum *I and II, 4*
Supervised participation in the nursery school. Dis-

cussion and conferences. *(Lec. 2, Lab. 4) Prerequisite: prior or concurrent registration in CDF 330 and permission of department.* Nursery School Staff

375 Supervised Practice *I and II, 4-8*
One quarter of the senior year spent in full-time practice in an agency for children or families. Students work under properly qualified persons, supervised by the staff. Application for permission to take this course should be made by beginning of junior year. *(Lab. arranged) Prerequisite: permission of department. S/U credit.* Staff

390 Contemporary Philosophies of Guiding Children *I and II, 3*
Emphasis on factors involved in developing a philosophy of guidance of children and adolescents. The evolution of present-day theory. Contemporary writers are read and discussed. *(Lec. 3) Prerequisite: CDF 200 or permission of department.* Staff

400 Child Development: Advanced Course *I, 3*
Presentation of theory of human development and consideration of some of the classical and current investigations in the field. *(Lec. 3) Prerequisite: CDF 200 or equivalent.* Staff

403 Human Development During Adulthood *II, 2-3*
Major social and psychological factors influencing development after attainment of physiological maturity and prior to senescence. Study of family relationships and relevant aspects of the contributions of a number of theorists including the following: Erikson, Maslow, Peck, Riesman and Selye. *(Lec. 2 or 3) Prerequisite: CDF 200, 302 or equivalent.* Staff

450 Family Interaction *I, 3*
Interdisciplinary approach to the dynamics of intrafamily relationships, interactions of family units and family members with elements of the socio-cultural environment. *(Lec. 3) Prerequisite: SOC 202 or CDF 355.* Schroeder

460 Family Life Education *II, 3*
Interdisciplinary consideration of relationships between the sexes during childhood and adolescence, including the following topics of interest to school personnel: family health, normal psychosexual development, marriage, ethics, sex education, teaching of family relations. *(Lec. 3) Prerequisite: CDF 355 or permission of department.* Staff

480 Children and Families in Poverty *I or II, 3*
Interdisciplinary approach to understanding culturally and economically deprived people. Some experience working with such individuals or groups. *(Lec. 2, Lab. 1) Prerequisite: permission of department.* Staff

497, 498 Special Problems *I and II, 2-4 each*
Open to qualified seniors or graduate students who wish to do advanced work. *(Lec. or Lab. according to nature of problem.) Prerequisite: senior standing and permission of department.* Staff

500 Child Development Seminar *I, 3*
Intensive study of selected topics, such as development of cognitive processes, individual and group differences in the development of language, hereditary factors in physical growth. Review papers prepared by students presented to the class. *(Lec. 3) Prerequisite: CDF 400 or permission of department.* Staff

550 Family Relations Seminar *II, 3*
Intensive study of selected topics, such as maternal, deprivation, child rearing practices and attitudes, homogamy and complementary needs in marital choice. Review papers prepared by students presented to the class. *(Lec. 3) Prerequisite: CDF 355 or permission of department.* Staff

570 Field Experience with Exceptional Children *I and II, 3*
Interdisciplinary seminar and laboratory with observation and supervised projects with exceptional children. Concerned with psychological, physical and social factors pertinent to teaching in child development centers. *(Lec. 1, Lab. 4) Prerequisite: CDF 370 or equivalent and permission of department.* Staff

595, 596 Special Problems *I and II, 3 each*
Intensive reading and research which serves as a basis for a comprehensive report. *Prerequisite: permission of department.* Staff

597, 598 Advanced Study *I and II, 3 each*
Survey of important research contributions significant to understanding of human development and relationships. *(Lec. 3)* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

CIVIL AND ENVIRONMENTAL ENGINEERING (CVE)

CHAIRMAN: Associate Professor McEwen. Professors Campbell and Nacci; Associate Professors Gentile, Lavelle, Moultrop and Poon; Assistant Professors Fang, Marcus, Sussman, Wang and Zamost.

216 Metronics *I, 3*
Applications of numerical analysis and computer programming to traverse, coordinate geometry, curves, and earth work computations. *(Lec. 2, Lab. 3) Prerequisite: MTH 141.* Gentile

220 Mechanics of Materials *I and II, 3*
Theory of stresses and strains, thin-walled cylinders, beam deflections, columns, combined bending and direct stresses, joints, indeterminate beams. *(Lec. 3) Prerequisite: MCE 162.* Staff

315 Surveying I *I, 3*
Theory and practice of plane surveying including use, care and adjustment of surveying instruments,

boundary surveys, horizontal and vertical curves, earthwork and topography. *(Lec. 2, Lab. 3) Prerequisite: MTH 141.* Gentile

322, 323 Civil Engineering Laboratory I and II *I and II, 2 each*
Sequence of laboratory courses investigating the properties and behavior of engineering materials. Includes directed work in concrete, soils and bituminous materials and experimental stress analysis. Independent student projects. *(Lec. 1, Lab. 3) Prerequisite: CVE 220.* Staff

334 Construction Planning and Specifications *II, 3*
Introduction to construction planning; procedures involved in construction activities with major emphasis on heavy construction. *(Lec. 3) Prerequisite: CVE 220.* Gentile

346 Transportation Engineering *I, 3*
Development, planning, location and design aspects of the major transportation systems. *(Lec. 3)* Moultrop

350 Structural Analysis I *I and II, 3*
Structural systems: beams, frames, arches, plates, shells. Analysis of determinate and indeterminate structures. Virtual work, conjugate beam, general method for indeterminate structures. *(Lec. 3) Prerequisite: CVE 220.* Staff

351 Structural Analysis II *II, 3*
Advanced topics in truss and frame analysis: energy methods, slope deflection, moment distribution, matrix methods, influence lines, stability, approximate methods. *(Lec. 3) Prerequisite: CVE 350.* Staff

374 Environmental Engineering I *II, 3*
Systems concerned with urban environmental problems of water supply and treatment, sewerage treatment of municipal and industrial waste waters, stream pollution, air pollution, and disposal of solid waste materials. *(Lec. 3) Prerequisite: MCE 354.* Staff

377 Biological Aspects of Water Quality
See Plant Pathology 377.

380 Soil Mechanics *I, 3*
Engineering properties of soils. Seepage, drainage, and frost action investigation. Theory of earth pressures, slope stability, and consolidation. *(Lec. 3) Prerequisite: credit or registration in CVE 220.* Nacci or Wang

391 Honors Work *I and II, 3*
Independent study under close faculty supervision. Discussion of advanced topics in civil engineering in preparation for graduate work. *Prerequisite: junior standing or permission of department.* Staff

393 Senior Seminar *II, 1*
Participation in seminar discussions with members of the faculty and visiting engineers on the broad aspects of the practice of civil engineering. *(Lab. 3) S/U credit.* Staff

396 Civil Engineering Analysis *II, 3*
Problems from several fields of civil and environmental engineering solved by numerical methods with particular emphasis on use of electronic digital computers. Special problems requiring use of the University computer will be assigned in the area of each student's interest. *(Lec. 2, Lab. 3) Prerequisite: CVE 216.* Lavelle or Marcus

442 Traffic Engineering *I, 3*
Highway traffic characteristics and methods of providing for an effective, free and rapid flow of traffic. Types of studies, regulations, control devices and aids, planning and administration. *(Lec. 2, Lab. 3) Prerequisite: CVE 346.* Moultrop

447 Highway Engineering *II, 3*
Principles of design of modern highways and streets including economic consideration, capacity, geometric layout, drainage, pavements and construction. *(Lec. 2, Lab. 3) Prerequisite: CVE 346.* Moultrop

453 Computer Analysis of Structures *II, 3*
Introduction to matrix methods of structural analysis. Solutions of planar structures using a digital computer. *(Lec. 3) Prerequisite: CVE 351 and 396.*
Lavelle

460 Analysis and Design of Metal Structures *I, 3*
Properties of metals. Current design criteria and practice for the design of steel elements. Elastic and inelastic behavior and design of tension, compression, flexural, and beam-column members. Design of connections. Comprehensive design problems. *(Lec. 2, Lab. 3) Prerequisite: CVE 350. Not for graduate degree program credit.* Staff

465 Analysis and Design of Concrete Structures *II, 3*
Current criteria and practice for design of reinforced and prestressed concrete structures. Elastic and ultimate strength analysis of beams, slabs, columns and frames. Comprehensive design problems. *(Lec. 2, Lab. 3) Prerequisite: CVE 350. Not for graduate degree program credit.* Staff

470 Water Supply and Treatment *II, 3*
Development of surface and ground water supplies, water transportation and distribution systems. Water treatment processes including chemical coagulation and precipitation, water softening, iron and manganese removal, disinfection, corrosion control, and saline water conversion. *(Lec. 2, Lab. 3) Prerequisite: CVE 374 or permission of instructor. Not for graduate degree program credit.* Campbell

471 Municipal Waste Water Systems *I, 3*
Development of systems for the collection and conveyance of municipal waste waters. Treatment of waste waters by physical, chemical, and biological systems. Reuse of waste waters. Regional systems development and financing. *(Lec. 2, Lab. 3) Prerequisite: CVE 374 or permission of instructor. Not for graduate degree program credit.* Campbell

472 Industrial Air Pollution *I or II, 3*
Sources and characteristics of urban-industrial air pollution, allowable concentrations and control, stack sampling, chemical supplements in air pollution control, diffusion of pollutants, site selection and abatement programs. Air resources management programs. *(Lec. 3) Prerequisite: permission of department.* Staff

473 Analysis of Air Pollutants *I or II, 3*
Pollutants in the atmosphere. Methods of sampling and interpretation, and methods of analysis of pollutants in gases, vapors, mists, dusts and fumes. Laboratory includes methods of sampling and analysis of air pollutants. *(Lec. 2, Lab. 3) Prerequisite: CHM 110 or permission of department.* Staff

478 Solid Waste Disposal and Management *I or II, 3*
Sources, collection and treatment methods for the removal of solid wastes from the environment. Recovery and reuse of waste materials. Economics of solid wastes and by-products. Interrelation between solid wastes, air and water pollution. *(Lec. 3) Prerequisite: permission of department.* Sussman and Poon

481 Soil Behavior *I, 3*
Behavior of granular and cohesive soils with experimental determinations of soil properties. Emphasis on shearing strength and seepage studies. *(Lec. 2, Lab. 3) Prerequisite: CVE 380.* Nacci or Wang

482 Soil Engineering *II, 3*
Strength, stability, and settlement considerations in the design of foundation, retaining wall, and earth dam structures. Sub-surface investigations and economic factors involved in the selection of suitable foundations. *(Lec. 2, Lab. 3) Prerequisite: CVE 380.* Nacci or Wang

483 Foundation Engineering *I or II, 3*
Application of the principles of soil mechanics to the design of sheet piling, cofferdams, and wharves. Advanced problems in the selection and design of foundations for major structures including buildings, bridges, walls, dams, etc.; case studies of actual engineering problems. *(Lec. 2, Lab. 3) Prerequisite: CVE 380 and 482.* Nacci

491, 492 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problems. Credits not to exceed a total of 12.) Prerequisite: permission of department.* Staff

521 Advanced Strength of Materials *I or II, 3*
Relations between stresses at a point on different planes passing through the point. Stress concentrations and localized stress. Introduction to the analysis of statically indeterminate stresses in which methods involving elastic strain energy are used. Consideration of the plastic analysis of structures. *(Lec. 3)* Staff

524 (or OCE 524) Marine Structural Design *I or II, 3*
Includes the design of marine structures, consideration of marine construction materials, water front structures, ocean towers and underwater structures. *(Lec. 2, Lab. 3) Prerequisite: CVE 351.* McEwen

551 Advanced Structural Analysis *I or II, 3*
Deflections of planar structures using energy concepts and elastic curve principles. Analysis of indeterminate planar structures using advanced techniques. Flexibility and stiffness matrices. *(Lec. 3) Prerequisite: permission of department.* Staff

565 Response of Structures to Dynamic Loads *I or II, 3*
Behavior of materials and components in civil engineering structures. Numerical and exact methods applied to response in the elastic and inelastic range. Matrix analysis. *(Lec. 3) Prerequisite: permission of department.* Staff

570 Sanitary Chemistry *I, 3*
Application of analytical chemistry to analysis of natural waters; physical chemistry and organic chemistry of aqueous media; chemical principles applicable to operations of sanitary engineering. *(Lec. 3) Prerequisite: permission of instructor.* Sussman

571 Sanitary Chemistry Laboratory *II, 3*
Applications of chemical laboratory procedures to control of water and waste water treatment processes. *(Lec. 2, Lab. 3) Prerequisite: CVE 570.* Sussman

572 Biosystems in Sanitary Engineering *I, 3*
Study of the microorganisms which constitute the biological systems in water pollution, water purification and waste water treatment. Application of principles of microbiology and biochemistry to analysis and design in the fields of sanitary engineering and water resources. *(Lec. 2, Lab. 3) Prerequisite: permission of instructor.* Poon

575 Open Channel Hydraulics *I or II, 3*
Analysis of uniform, critical, varied flow, and unsteady flow in open channels. Principles will be applied to open channel design. *(Lec. 3) Prerequisite: MCE 354.* Poon

584 Principles of Pavement Design *I or II, 3*
Design of flexible and rigid type pavements. Design and control of concrete paving mixes, bituminous concrete paving mixes and current research on pavement design. Emphasis on soil engineering including stabilization, moisture movement and frost considerations. *(Lec. 2, Lab. 3) Prerequisite: CVE 380.* Moultrop and Nacci

585 Soil Stabilization *I or II, 3*
Factors that affect soil stability. Mechanisms of soil stabilization. Design and analysis of stabilized soils. *(Lec. 2, Lab. 3) Prerequisite: CVE 380.* Staff

586 Physico-chemical Properties of Soils *I, 3*
Influence of physico-chemical properties of soils on

engineering characteristics and performance. Application of mineralogy, ion exchange and colloidal theory; effect of marine environment; and the nature of soil water. *Prerequisite: CVE 380 or permission of instructor.* Staff

587 Ground Water Flow and Seepage Pressures *I, 3*
Hydrodynamics of fluid flow through porous media. Analytical methods for steady and unsteady seepage in aquifers; theoretical analysis with practical modification of seepage problems involving foundations, drainage structures, earth dams and wells. *(Lec. 2, Lab. 3) Prerequisite: permission of instructor.* Nacci and Wang

596 Numerical Methods in Structural Engineering *I or II, 3*
Methods of successive approximations and numerical procedures in the solution of stress, vibration and stability problems in structural members. Nonuniform members, elastic supports, plates, torsion. *(Lec. 3) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

601, 602 Graduate Seminar *I and II, 1 each*
Discussions and presentation of papers based on research or detailed literature surveys. *(Lec. 1) Required of all students in graduate residence, but a maximum of 1 credit per year is allowed and no more than 2 credits are allowed for the entire period of residence.* Staff

650 Advanced Structural Analysis *I or II, 3*
Continuation of CVE 551. Analysis of indeterminate trusses, structures with nonprismatic members, and shell and folded plate structures. Investigation of secondary stresses. *(Lec. 3) Prerequisite: permission of department.* Staff

651 Plate Structures *I or II, 3*
Fundamental theories of bending and buckling of plates with practical application to the design of structural plate components of metal and reinforced concrete. *(Lec. 3) Prerequisite: permission of instructor.* Staff

652 Shell Structures *I or II, 3*
Membrane and bending theories of thin shells and their practical application to the design of shell and folded-plate structures of metal and reinforced concrete. *(Lec. 3) Prerequisite: CVE 651 or permission of instructor.* Staff

653 Analysis of Space Structures *I or II, 3*
Analysis of three-dimensional determinate and indeterminate beams, frames, and trusses, by matrix methods. Deflections and indeterminate analysis using virtual work, conjugate structure, and slope deflection procedures. Emphasis is on numerical solutions using the University's digital computer. *(Lec. 3) Prerequisite: CVE 396, 551.* Lavelle

655 Matrix Methods in Structural Analysis *I or II, 3*
Development of finite-element methods of structural analysis. Application to stress problems and to plate and shell structures. *(Lec. 3) Prerequisite: permission of instructor.* Staff

673 Theory of Water Purification and Treatment *I, 3*
Principles of modern water purification and engineering practices. Aeration, deodorization, sterilization, coagulation, filtration, water softening, iron removal, disinfection and corrosion control. *(Lec. 3)* Campbell

674 Sanitary Engineering Laboratory *II, 3*
Advanced phases of sewage treatment and purification including sludge digestion, sludge gas analysis, biochemical oxygen demand, conditioning of sludge, activated sludge, sewage trickling filters and chemical precipitation. *(Lec. 2, Lab. 3)* Poon

675 Sanitary Engineering Design *I, 3*
Functional design of modern water treatment plant providing treatment of water for domestic and industrial consumption. *(Lec. 1, Lab. 6)* Poon

676 Sanitary Engineering Design *II, 3*
Functional design of modern sewage treatment works providing treatment of sewage. *(Lec. 1, Lab. 6)* Campbell

677 Stream and Estuarine Analysis *I or II, 3*
Functionals and mathematical concepts of physical and biological factors applied to the evaluation of the pollution capacity of streams and estuaries. *(Lec. 3) Prerequisite: MTH 244.* Campbell

678 Industrial Waste Water Treatment *I or II, 3*
Advanced considerations of industrial waste disposal problems of major waste producing industries, including the study of waste producing processes, composition of waste waters, treatment methods, and in-plant abatement techniques. *(Lec. 3) Prerequisite: permission of instructor.* Poon and Sussman

679 Treatment of Municipal Wastes *I or II, 3*
Theory and mathematical concepts of physical, chemical, and biological oxidation processes applied to the clarification and purification of municipal waste waters. *(Lec. 3) Prerequisite: permission of instructor.* Poon

681 Advanced Soil Mechanics *I, 3*
Index properties and physical properties of soils. Laboratory and field procedures for soil identification. Permeability and flow of water through soils. Compressibility characteristics of soils and consolidation theories as applied to settlement analysis. *(Lec. 2, Lab. 3) Prerequisite: CVE 521.* Nacci or Wang

682 Advanced Soil Mechanics *II, 3*
Stress analysis. Elastic theory of stress distribution in

soils. Application of consolidation theory. Shearing phenomena in soils with application to bearing capacity, earth pressure and slope stability. Pile foundation analysis. Special topics. *(Lec. 3)* Nacci or Wang

691, 692 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problems. Credits not to exceed a total of 12.) Prerequisite: permission of department.* Staff

696 Numerical Methods in Structural Engineering *I or II, 3*
Continuation of CVE 596. Applications of relaxation, finite differences, ordinary and partial differential equations to blast loads on structures, bending of plates, and buckling of beams. *(Lec. 3) Prerequisite: CVE 596 or permission of instructor.* Staff

CLASSICS (CLA)

CHAIRMAN: Associate Professor Kossoff (Languages). Assistant Professor Cashdollar; Instructor Campbell.

391 Masterpieces of Greek Literature *I, 3*
Representative genres of the Greek classics in translation. *(Lec. 3)* Cashdollar

392 Masterpieces of Roman Literature *II, 3*
Representative genres of the Roman classics in translation. *(Lec. 3)* Campbell

393 Literature of Greek Mythology *I and II, 3*
Myths, folk-tales and legends of ancient Greece. Readings from Greek and Roman literature in translation. Emphasis on literary, historical and religious aspects of mythology. *(Lec. 3)* Cashdollar

COMMUNITY PLANNING (CPL)

DIRECTOR: Assistant Professor Foster. Professors Jeffrey and Schenck; Associate Professors Downe and Hammerschlag; Assistant Professors Brooks and Nadler; Instructor Johnson; Adjunct Professors Duncan and Kumekawa.

410 Fundamentals of Urban Planning *II, 3*
Survey of urban planning principles, methods and techniques pertinent to contemporary urban problems. History of city forms and functions and development of urban planning as a profession. Problems and priorities in shaping the future urban environment. *(Lec. 3) Primarily for students not enrolled in the Graduate Curriculum in Community Planning and Area Development.* Foster

411 Introduction to Community Planning *I, 1*
Introduction to the evolution of community planning as a discipline and profession. Historical development of cities and urban planning concepts as related to city form and function. Scope and objectives of physical planning and its effects on communities. *(Sem. 2) Not open to students who have received credit for CPL 410.* Staff

503 Urban Planning and Politics in the Metropolis *I, 3*
Significance and impact of urban planning on growth and betterment of cities and metropolitan areas. The planning process as it relates to the formulation of community development policies and the institutional framework from which they are produced. *(Lec. 3) Prerequisite: PSC 422 or 460, or equivalent.* Foster

506 Market and Non-market Decision Making *I, 3*
Interdisciplinary approach to the determination of human needs and wants as they relate to planning goals and objectives. A framework for the prediction of behavior using the value structure of a culture or subculture; appropriate tools of measurement for qualitative data. *(Lec. 3) Prerequisite: permission of instructor.* Jeffrey

531 (or REN 531) Land Economics *II, 3*
Land as a factor of production, its uses for economic and social purposes, including urban and recreational uses. Property and water rights, zoning, tenure. *(Lec. 3) Prerequisite: REN 105, or ECN 125, or permission of instructor.* Jeffrey

551, 552 Problems in Planning Practice *I and II, 3 each*
Individual research, study, and reporting on a phase of planning practice to be chosen in consultation with instructor. Familiarizes students with the field operation of planning and introduces them to the practical difficulties of research, community involvement, and final reporting. Problems of planning with inner-city communities. *(Lab. 6) Prerequisite: permission of instructor.* Johnson

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

603, 604 Seminar in Contemporary U.S. Environment *I and II, 8 each*
Comprehensive survey of structural change in American society and its environmental settings, as well as the universal perspectives in terms of which technical planning skills must be developed and employed. Seminars, tutorials, and assigned research topics. *(Lec. 6, Tut. 2)* Brooks, Foster, Hammerschlag, Jeffrey and Schenck

611 Studio A, the Comprehensive Planning Process I *I, 4*
Understanding of the physical environment and application of analytical planning studies. Topics include the planning process, planning tools and techniques, and inventory procedures: population estimation and forecasting, economic analysis, topography, soils and climate, land use analysis, transportation analysis, operations and facilities in the public sector. Methods

of analysis applied in a laboratory problem involving a specified urban area. *(Lec. 3, Lab. 3)* Staff

612 Studio B, the Comprehensive Planning Process II *II, 4*
The community plan: community facilities, future land use plan, economic development plan and general plan implementation. Functional requirements of physical elements and their relationships in space including comprehensive policies development plan. *(Lec. 3, Lab. 3)* Downe and Nadler

621 Studio C, Problems in Planning Use Requirements *I, 6*
Kinds of activities in urban areas and their land use requirements. Industrial and commercial activities, housing requirements and neighborhood design, public facilities, utilities and site development. Special emphasis on urban planning and design for one or more elements in detail within a general plan framework. *(Lec. 3, Lab. 6)* Staff and visiting critics

622 Studio D, Problems in Planning Programming *II, 4*
Development of a project plan and the various tools for effectuating planning proposals. Lecture and discussion includes consideration of urban renewal, community action programs, capital budgeting, federal, state and local legal requirements, and preparation of an appropriate planning report. *(Lec. 3, Lab. 3)* Brooks and Hammerschlag

631 Planning Law Seminar *I, 3*
General review and discussion of legal principles and thought concerned with property rights, political power, and the legal aspects pertinent to the planning and development of public and private activities. *(Lec. 3)* Brooks

633 Advocacy Planning *I or II, 3*
Relationships between residents of an urban slum and public officials in governmental agencies; "citizen participation" in urban renewal areas, enforcement of housing laws, selected problems of city schools, public assistance, and civil disobedience. Relationships in each of these areas will be reviewed on the basis of statutory, administrative, or contractual material. *(Lec. 3)* Staff

636 Planning Seminar in Urban Design *I, 3*
Significant concepts of historical and contemporary urban form ranging in scale from the city as a whole to architectural detail of public projects. Use of slides and films to illustrate the visual impact and importance of excellence in design. *(Lec. 3)* Hammerschlag

641 Research Methodology *I, 2*
Lectures and seminars on the philosophy, conduct, and reporting of research, and types of design and methodology appropriate to a variety of planning problems. Recent research techniques, including computer mapping. Selection and critique of problem and design in preparation for thesis. Lectures and seminars to meet the needs of individual students in planning. *(Lec. 2) Prerequisite: an elementary statistics course.* Nadler

642 Plan Implementation *I or II, 3*
Survey of the tools of plan implementation, including public tools such as zoning, subdivision control, capital budgets, renewal, taxation, other federal and state programs, and private tools such as mortgaging and easements. Readings, discussion, and special problems in the application of the tools. *(Lec. 3) Prerequisite: CPL 631.* Brooks

651, 652 Planning Seminar *I and II, 3 each*
Group and/or individual investigation of special problems in city and regional planning. Staff

661 Seminar in Planning Theory *I, 3*
Critical survey of current theories and contemporary planning concepts. The logic of the process of city and regional planning, its basic axioms and postulates, focusing on such elements as value, fact, opinion, bias, goal, symbol, dogma, and intuition. Models for choice-making and resource-allocation as contributions to systematic planning theory. *(Lec. 3)* Staff

691, 692 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *Prerequisite: permission of instructor.* Staff

COMPUTER SCIENCE (CSC)

CHAIRMAN: Professor Hemmerle (Computer Science and Experimental Statistics). Associate Professor Carney; Assistant Professors Bass, Carrano, Tetreault and Weiderman.

201 Introduction to Computing *I and II, 3*
Algorithms, programs, and computers. Basic programming and program structure. Programming and computing systems. Debugging and verification of programs. Data representation. Organization and characteristics of computers. Survey of computers, languages, systems, and application. Computer solution of several numerical and non-numerical problems using one or more programming languages. *(Lec. 3) Not open to students who have received credit for CSC 101.* Staff

410 Introduction to Computer Science and Algorithmic Processes *I and II, 3*
Concepts and properties of algorithms, language and notations for describing algorithms, analysis of computational problems and the development of algorithms for their solution, application of a specific procedure oriented language to solve simple numerical and non-numerical problems using a computer. *(Lec. 3) Prerequisite: MTH 142 and CSC 201.* Staff

411 Computer Organization and Programming *I, 3*
Logical structure of computer systems, information

representation, instruction codes, arithmetic and logical operations, flow of control. Assembly language programming, input-output, sub-routines, linkages, macros, conditional assemblers. *(Lec. 3) Prerequisite: CSC 410 or equivalent.* Tetreault and Carrano

412 Programming Systems *II, 3*
Structure of monitor and executive systems, time-sharing systems, real-time systems, input-output systems, file organization and manipulations, command languages. *(Lec. 3) Prerequisite: CSC 411.* Tetreault

413 Data Structures *I, 3*
Formal data structures. Algorithms for handling such common structures as arrays, linear lists, trees and multi-linked lists. Searching and ordering techniques. Data management systems. Data structures in programming languages. *(Lec. 3) Prerequisite: CSC 410, MTH 215.* Staff

491, 492 Problems in Computer Science *I and II, 1-3 each*
Advanced work in computer science. Courses will be conducted as seminars or as supervised individual projects. *(Lec. or Lab. arranged)* Staff

500 Scientific Applications of Digital Computers I *I, 3*
Algorithms, techniques, and practical procedures for digital computers related to well-known applications of numerical methods. Approximation methods, numerical quadrature, solution of differential equations, zero's of functions, error analysis. Examples, using the University computer. *(Lec. 3) Prerequisite: MTH 243, CSC 410 and permission of instructor.* Carrano

502 Theory of Algorithmic Languages and Compilers *II, 3*
Formal description of procedure-oriented languages and the techniques used in translating algorithms written in these languages into computer programs. *(Lec. 3) Prerequisite: credit or concurrent registration in CSC 413.* Bass

505 Design of Digital Circuits
See Electrical Engineering 505.

512 Advanced Programming Systems *I, 3*
Advanced analysis of monitor and executive systems. Several topics from CSC 412 will be studied in greater depth, along with recent developments in the field. *(Lec. 3) Prerequisite: CSC 412 and 413.* Bass and Tetreault

515 Theory of Computation *II, 3*
Turing machines, recursive functions, Shepardson-Sturgis machines, Universal Turing machines, Church's thesis, standard indexing, decision and halting problems, recursive sets, recursively enumerable sets, automata, computational complexity, Post productions. *(Lec. 3) Prerequisite: CSC 412 and permission of instructor.* Bass

525 (or IDE 525) Simulation *II, 3*
Introduction to simulation. Discrete simulation models. Comparison of discrete change simulation languages. Simulation methodology including generation of random variates, design of simulation experiments for optimization, analysis of generated data, and validation of models and results. Selected applications of simulation. *Prerequisite: CSC 410 and 6 credits in statistics. In alternate years, next offered 1971-72.* Carney

551 Scientific Applications of Digital Computers II *II, 3*
Algorithms, techniques and practical procedures for digital computers emphasizing linear computations and statistical applications. Monte Carlo methods. Matrix calculations, simultaneous linear equations, matrix inversion. Least square analysis, multiple regression. Characteristic value problems. *(Lec. 3) Prerequisite: MTH 215 and CSC 410 or equivalent and permission of instructor.* Hemmerle

591, 592 Problems in Computer Science *I and II, 1-3 each*
Advanced work in computer science. Courses will be conducted as seminars or as supervised individual projects. *(Lec. or Lab. arranged)* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

DENTAL HYGIENE (DHY)

CHAIRMAN: Associate Professor B. Wilson. Special Instructor E. Ladd; and visiting lecturers.

101 Orientation to Dental Hygiene *I, 1*
Philosophies, concepts, and procedures needed before beginning experience in dental hygiene clinic. Factors which contribute to healthful conditions of the mouth, study of toothbrush and methods of toothbrushing, and chair instruction in dental health of patient. *(Lec. 1)* Wilson

125 Oral Anatomy *I, 3*
Morphology of tooth structure, laboratory instruction in drawing, carving, and identifying tooth forms. *(Lec. 2, Lab. 4)* Bliss

126 General and Oral Histology and Embryology *II, 3*
Consideration of cytology, development and microscopic anatomy of oral cavity. *(Lec. 2, Lab. 2) Prerequisite: DHY 125.* Persechino

128 Periodontics *II, 1*
Classification of periodontal disease, clinical picture, causative factors, and types of treatment. *(Lec. 2)* DeCesare

135 Prophylactic Technique Laboratory *I, 1*
Dental prophylaxis as a treatment in preventive and corrective dentistry. Instruction on mannikin heads to

develop operative technique in removing deposits and stains from exposed surfaces of teeth. *(Practicum 6) Prerequisite: permission of department chairman.* Ladd

136 Dental Hygiene Clinic *II, 2*
Clinical training in dental prophylaxis on children and adult patients. Clinical experience in mouth examination and charting, dental X-ray exposure and development, tooth decay preventive treatments for children, and patient education in dental health. *(Practicum 9)* Staff

141 Dental Assisting *I, 1*
Lectures, clinical observations, and practice devoted to methods of assisting dentists. *(Practicum 4)* Pfaffmann and Staff, Dental Clinic, NAS, Quonset Point

227 General and Oral Pathology *I, 3*
Study of disease with emphasis on relationship of general disease to diseases of teeth and supporting tissues. Specific study of oral diseases and importance of recognition of abnormal conditions in mouth by dental hygienist. *(Lec. 2, Lab. 2)* England and Singer

231 Roentgenology *I, 2*
Lecture, demonstration, and practice course covering elementary electricity, theory and development of X-ray and X-ray apparatus, and technique for taking and processing dental X-ray films with practice in operating X-ray equipment. *(Lec. 1, Practicum 3)* Wilson

237 Dental Hygiene Clinic *I, 2*
Continuation of DHY 136. *(Practicum 12)* Staff

238 Dental Hygiene Clinic *II, 2*
Continuation of DHY 237. *(Practicum 12)* Staff

244 Dental Materials and Operative Technique *II, 1*
Lectures and demonstrations, including laboratory exercises, in preparation and manipulation of materials used in restorative dentistry. Visual aids used to demonstrate construction of restorations and correct identification and use of dental instruments. *(Practicum 2)* Mazzuchelli

246 Ethics, Jurisprudence, and Office Management *II, 1*
Dental office procedures with emphasis on patient recall programs. Laws and ethics relating to practice of dentistry and dental hygiene. *(Lec. 2)* Kershaw

250 Dental Health Education *II, 2*
Methods and materials used in teaching dental health to patients in private dental practice and in schools. *(Lec. 2)* Wilson

252 Public Health *II, 2*
Philosophy and background of public health practice. Observation and patient counseling in maternal and child health programs and prenatal clinics, and surveys to determine existing dental needs in community. *(Lec. 2)* Wilson

254 Survey of Dental Specialties *II, 1*
Survey of major specialties in dentistry: endodontics, pedodontics, orthodontics, and oral surgery. *(Lec. 2)* Holton, Mehlman, Nelson and Schwab

260 Preventive Dentistry *II, 2*
Measures employed to arrest dental caries including bacteriology of dental caries, fluoridation, and diet therapy, and a review of current literature in preventive dentistry. *(Lec. 1, Lab. 2)* Yacovone

EARTH SCIENCE (ESC)

101 Principles of Earth Science *I and II, 4*
The earth as a globe; introduction to the atmosphere: its weather and climate; vegetation; soils, and land use. *(Lec. 3, Lab. 2) Not open to students who have passed GEG 101.* Havens and Higbee

105 (102) (or GEL 105) Geological Earth Science *I and II, 3*
Introductory study of the earth for nongeology majors. Includes volcanism, earthquakes, mountain-building, Ice Ages, history of the earth, evolution of life. Current topics such as continental drift, sea-floor spreading, environmental geology and lunar geology are introduced. *(Lec. 3) Not open to students who have passed GEL 103 or 104.* Staff

106 (102) (or GEL 106) Geological Earth Science Laboratory *I and II, 1*
Investigative problems in geological earth science emphasizing both collection of field data and the experimental approach. Several afternoon field trips. *(Lab. 2) Prerequisite: prior or concurrent registration in ESC 105.* Staff

ECONOMICS (ECN)

CHAIRMAN: Professor Sabatino. Professors Dirlam, Haller, Hellman, Norton, Rayack and Schurman; Associate Professor Brown; Assistant Professors Hume, Labys, Paulaha, Prakash and Starkey; Instructor Barnett.

123 Elements of Economics *I and II, 3*
Survey of principles and institutions underlying the production and distribution of goods and services and the determination of income, employment and the general level of prices. *(Lec. 3)* Staff

125, 126 Economic Principles *I and II, 3 each*
Principles underlying the organization and functioning of the economic system. Description and analysis of institutions and market forces affecting the production and distribution of goods and services, business fluctuations, and international trade. *(Lec. 3) Prereq-*

uisite: for ECN 126, ECN 123, 125 or permission of department. Staff

302 (102) Economic Development of the United States *I or II, 3*
Developmental factors in American economic life are discussed with the object of introducing students to the past and present business environment. *(Lec. 3) Prerequisite: ECN 123 or 126 or permission of department.* Staff

333 Transportation Principles *I, 3*
Role of transportation agencies in the American economy. Organization, management and operation of agencies. Pattern of regulations, state and federal. Relation of regulation to current transportation problems. *(Lec. 3) Prerequisite: ECN 123 or 126 or permission of department.* Staff

334 Money and Banking *I or II, 3*
Structure and functioning of monetary institutions. Analyses of monetary theories. The role of monetary policy. U.S. banking structure: its operations and functioning. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor.* Barnett and Staff

337 Business and Government *I or II, 3*
Historical and present attitudes and policies of the various levels of government toward the changing structure of American business. Emphasis upon the legal and economic concepts of business activity. *(Lec. 3) Prerequisite: ECN 123 or 126 or permission of instructor.* Dirlam

342 Public Finance *I or II, 3*
Examination of the theory and practice of public expenditures, revenues, debt and fiscal policy, with major emphasis on federal fiscal affairs. *(Lec. 3) Prerequisite: ECN 123 or 126 or permission of instructor.* Starkey

361 A Survey of Economic Thought *I or II, 3*
Economic thought from ancient times to present; characteristics of classical, neo-classical and contemporary development. *(Lec. 3) Prerequisite: ECN 123, 126 or permission of instructor.* Schurman

400 Economics Seminar *I or II, 3*
Training in the application of economic theory and measurement to specific economic problems of local, national, or international significance and in the preparation of research papers. Class discussion of student reports and assigned readings dealing with issues of economic theory and policy. *(Lec. 3) Prerequisite: ECN 123, 126 or permission of instructor.* Sabatino

427 Intermediate Economic Theory: Income and Employment *I or II, 3*
Measurement of national income. Theory of the determination of the general level of income, employment, and prices. Business fluctuations. *(Lec. 3) Prerequisite: ECN 126, 990 or permission of instructor.* Prakash

428 Intermediate Economic Theory: Pricing and Distribution *I or II, 3*
Market conditions and forces affecting the pricing and production of goods and services, the allocation of resources and the distribution of income. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor.* Rayack

438 International Trade and Policy *I or II, 3*
Basic theory and major institutions of international economic relations. Analysis includes determinants of foreign trade, the balance of payments, foreign exchange, foreign investment, protectionism, free trade and aid to underdeveloped countries. *(Lec. 3) Prerequisite: ECN 123, 126 or permission of instructor.* Farrell

451, 452 Assigned Work *I and II, 3 each*
Special work in economics when it can be arranged to meet the needs of individual students who desire independent work. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor. S/U credit.* Staff

463 Economic Growth and Development *I or II, 3*
Basic problems in economic growth and development of so-called backward or pre-industrial countries of world. Emphasis on population trends, agrarian reforms, capital formation, international aid programs and respective roles of private and public enterprise. *(Lec. 3) Prerequisite: ECN 123, 126 or permission of instructor.* Prakash

464 Comparative Economic Systems *I or II, 3*
Economic organization in capitalist and non-capitalist nations with particular emphasis on Soviet-U.S. comparisons. Market and planning mechanisms, industrial structure, growth rates, and allocation of economic resources. *(Lec. 3) Prerequisite: ECN 123, 126 or permission of instructor.* Schurman

475 Introduction to Quantitative Economic Analysis *I or II, 3*
Introduction of the application of quantitative methods to economic problems. Mathematical tools introduced and applied to economic problems such as income and employment, behavior of firms and consumers, capital theory, market structure and economic growth. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor.* Hume

503 Development of the United States Economy *I, 3*
The process of economic development, as illustrated by the economy of the United States. *(Lec. 3) Prerequisite: ECN 126, and either HIS 141, 142 or ECN 302, or permission of instructor.* Haller

512 History of Economic Analysis *II, 3*
Advanced work which examines formative developments in economic thought from classical political economy to modern welfare economics. Emphasis will be placed on relationships between doctrines and their institutional setting. *(Lec. 3) Prerequisite: permission of instructor.* Schurman

515, 516 Economic Research *I and II, 3 each*
Independent research. Staff

527 (or REN 527) Macroeconomic Models *I, 3*
Economic relationships expressed using mathematical concepts, static and dynamic models of aggregate economic behavior will be developed and analyzed. *(Lec. 3) Prerequisite: ECN 427 and 475, or equivalent or permission of instructor.* Paulaha

528 (or REN 528) Microeconomic Models *I, 3*
Microeconomic concepts such as demand, production, and cost functions will be expressed in a mathematical framework. Theories of consumer, firm and industry economic behavior will be discussed and analyzed. *(Lec. 3) Prerequisite: ECN 428 and 475, or equivalent or permission of instructor.* Labys

532 Industrial Organization and Public Policy *II, 3*
Theoretical and empirical analysis of the structure of industrial markets; the behavior and performance of business firms in the American economy; the government-business relationship and its effect on the formulation of public economic policy. *(Lec. 3) Prerequisite: ECN 337 or permission of instructor.* Dirlam

543 Public Finance and Fiscal Policy *I, 3*
Analysis of private wants and public needs and the economic share of each serves as an introduction to a searching examination of such selected federal and federal-state fiscal problems as budgetary theory and procedures, tax theory and reform, debt and debt management policy. *(Lec. 3) Prerequisite: ECN 342 or permission of instructor.* Starkey

552 Monetary Theory and Policy *II, 3*
Analysis of structure and functioning of monetary and banking systems; discussion of contemporary monetary theories; evaluation of monetary policies. *(Lec. 3) Prerequisite: ECN 334 or permission of instructor.* Barnett

566 Economic Planning and Public Policy in Developing Nations *II, 3*
Resource and financial planning in public and private sectors of developing nations with emphasis on planning tools, allocation of domestic and foreign resources, and on national economic policies. *(Lec. 3) Prerequisite: ECN 427 and 463 or 464, or equivalent, or permission of instructor.* Prakash

576 Econometrics I *II, 3*
Application of statistics and mathematics to economic analysis. Implications of assumptions required by statistical methods for testing economic hypotheses will be fully explored. Current research applications of econometric methods will be examined and discussed. *(Lec. 3) Prerequisite: ECN 126 or 475 and 6 credit hours of statistics, or permission of instructor.* Labys

577 Econometrics II *II, 3*
Continuation of Econometrics I. *(Lec. 3) Prerequisite: ECN 576 or permission of instructor.* Lampe

595 (or PSC 595, GEG 595, SOC 595 or REN 595) Problems of Modernization in Developing Nations *II, 3*
Varying regional emphasis. Selected problems in the environmental complex, agricultural systems, population dynamics, distribution systems, political integration, urbanization-industrialization, popular participation, integrated theories of modernization. *(Lec. 3) Prerequisite: permission of instructors.* Brand (Geography), Lampe (Resource Economics), Landberg (Sociology and Anthropology), Milburn (Political Science), Prakash (Economics), and Suzawa (Economics)

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

627 Advanced Macroeconomic Theory *II, 3*
Post-Keynesian macroeconomic theory, growth and cyclical models, current development in national income analysis. *(Lec. 3) Prerequisite: ECN 427 and 428 or permission of instructor.* Paulaha

628 Advanced Microeconomic Theory *II, 3*
Neoclassical value and distribution theory. Theories of imperfect competition, general equilibrium theory and dynamic analysis. *(Lec. 3) Prerequisite: ECN 427 and 428 or permission of instructor.* Labys

675 Mathematical Economics II
See Resource Economics 675.

690 National Income *I, 3*
Advanced macroeconomic theory. *(Lec. 3) Prerequisite: ECN 126 or 990 or permission of instructor.* Latos

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

990 Principles of Economics *I and II, 3*
Survey of micro- and macroeconomic theory. *(Lec. 3) Graduate credit for matriculated MBA students only.* Staff

EDUCATION (EDC)

CHAIRMAN: Associate Professor R. MacMillan. Professors Aukerman, J. E. Casey, Nally, Quinn and Rife; Associate Professors Croasdale, Heisler, P. Kelly, Pascale, Purnell, Russo and Shontz; Assistant Professors Allen, Bumpus, Calabro, Cresser, DiBiasio, Goldman, Gunning, Hagey, McCreight, McGuire, Nagel, Pezzullo, Soderberg and Whitcomb; Instructors Caranci, Jarman, Kellogg and Vigneau.

102 Introduction to American Education *I and II, 3*
The school as an agency of modern society with emphasis on role of teacher in school and community. *(Lec. 3) Prerequisite: sophomore standing.* Staff

103 Introduction to Education *I and II, 3*
Parallels EDC 102. Integrated series of professional laboratory experiences. Required for students in the general teacher education curriculum. *(Lec. 3, Lab. 1) Prerequisite: sophomore standing. Open only to students admitted into the general teacher education curriculum.* Staff

305 Fundamentals of Theatre Practice
See Theatre 305.

312 The Psychology of Learning *I and II, 3*
Principles of psychology as related to learning and teaching processes. *(Lec. 3) Prerequisite: PSY 113.* Staff

313 The Psychology of Learning *I and II, 3*
Parallels EDC 312. Integrated series of professional laboratory experiences. Required for students in the general teacher education curriculum. *(Lec. 3, Lab. 1) Prerequisite: EDC 103 and PSY 113. Open only to students admitted into the general teacher education curriculum.* Staff

329 Music for the Elementary School Teacher *II, 3*
Fundamentals of music and methods employed in teaching music and making it a more meaningful and an integral part of the curriculum in the elementary school. *(Lec. 3)* Abusamra

334 Teaching of Home Economics *I and II, 3*
Selection, organization and use of instructional materials, study of methods and techniques. *(Lec. 3)* May and MacKenzie

337 Teaching of Home Economics *I and II, 3*
Evaluation of existing homemaking programs in public schools and development of curriculum materials for beginning teachers. Observation in nearby schools. *(Lec. 2, Lab. 3) Prerequisite: EDC 334.* May and P. Kelly

367 School Health Program
See Physical Education for Men 367.

368 Methods and Materials in Physical Education
See Physical Education for Men 368.

371 Educational Measurements *I and II, 3*
Aptitude, achievement tests, and other measuring instruments used in classification and guidance of pupils, improvements of instruction and other activities of the teacher. Principles applied in construction and use of tests and to interpretation and evaluation of scores. General course for elementary and secondary school teachers. *(Lec. 3) Prerequisite: EDC 312 or 313.* Staff

372 Educational Measurements *I and II, 3*
Parallels EDC 371. Integrated series of professional laboratory experiences. Required for students in the general teacher education curriculum. *(Lec. 3, Lab. 1) Prerequisite: EDC 103, concurrent registration in EDC 313, and enrollment in general teacher education curriculum.* Staff

401 Development and Utilization of Instructional Materials *I and II, 3*
Methods of developing and making classroom application of selected materials: non-projected, projected, and audio. Specific attention to utilization in the social sciences, English, reading, the natural sciences, the humanities, arithmetic and mathematics. *(Lec. 1, Lab. 4) Prerequisite: permission of department.* Cresser

403 History of Education *I, 3*
Historical growth of educational theories, institutions and practices for purpose of introducing student to problems of democratic education of present. *(Lec. 3) Prerequisite: junior standing.* Calabro

407 Philosophy of Education *II, 3*
Philosophies underlying modern education; relates education to contemporary society. *(Lec. 3) Prerequisite: junor standing.* Staff

409 Health Aspects of Aging *I and II, 3*
Seminar approach in dealing with health problems of aging, maintenance of optimal physical and mental health, and health programs and facilities for the elderly. Field trips to selected health programs or health care facilities. *(Lec. 3) Prerequisite: EDC 505 or permission of department.* Staff

410, 411 Seminar and Supervised Field Practicum in Education of the Aging *I and II, 3 each*
Adult educational methods as applied to older adults, including preretirement education, current education programs for the elderly, and evaluation of educational activities with the aging. Supervised field practicum of 150 hours. *(Lec. 2, Lab. 3) Prerequisite: EDC 581 or permission of the department.* Staff

424 Teaching of Reading *I and II, 3*
Philosophy, materials and methods underlying the teaching of reading with special emphasis upon development understanding. *(Lec. 3) Prerequisite: EDC 427 or 430 or permission of department.* Aukerman and Bumpus

427, 428 Child and Curriculum I and II *I and II, 3 each*
Principles and practices of guiding children in skillful use of basic means of communication (speaking, writing, listening and reading), and with materials in social studies, science and mathematics in their applications for educating elementary school children. *(Lec. 3) Prerequisite: PSY 113 and 232, EDC 313, concurrent registration in both courses, and permission of department. Open only to students admitted into the elementary education curriculum. Not for graduate degree program credit.* Nagel, Nally, Barden and Whitcomb

430 Methods and Materials in Secondary Teaching *I and II, 3*
Principles of education and human sciences as related

to curricular materials and classroom situations. *(Lec. 3) Prerequisite: EDC 103 and 313, senior standing and permission of instructor. Open only to students admitted into the secondary education curriculum. Sectioned in accordance with the student's academic major: business, English, mathematics, modern language, science, social studies. Sem. II: Business Administration students only. Not for graduate degree program credit.* Staff

441 Methods and Materials of Teaching Business Subjects *I, 4*
Current trends in teaching office occupations and social business subjects. *(Lec. 4) Not for graduate degree program credit.* Staff

444 Teaching of Agriculture *I, 3*
Organization of instructional programs; development of resource units, teaching plans, methods, techniques, and occupational experience programs. *(Lec. 3) Prerequisite: EDC 103 and 313. Not for graduate degree program credit.* Shontz

450 Introduction to Guidance *I and II, 3*
Principles and techniques of guidance, study of philosophies of guidance, history and development of guidance movement, counseling methods and general organization of student personnel facilities. *(Lec. 3) Prerequisite: graduate standing or permission of department.* Staff

478, 479 Problems in Education *I and II, 1-3 each*
Advanced work in education. Conducted as seminars or as supervised individual projects. *(Lec. or Lab.) Prerequisite: permission of department.* MacKenzie

484 Supervised Student Teaching *I and II*
Under selected and approved critic teachers, students participate in classroom teaching and other school activities for a period determined by credit to be earned. Areas for student teaching are: 484a—Secondary non-vocation, *S/U credit;* 484b—Elementary Education, *S/U credit;* 484c—Home Economics, *S/U credit;* 484d—Resource Development; 484e—Business; 484f—Music; 484g—Physical Education. *Not for graduate degree program credit.* Staff

485 Seminar in Teaching *I and II, 3*
Practicum for teachers, their immediate problems, the use of resource materials and cooperative help of other members of seminar. Areas for seminar are: 485a—Secondary non-vocational, *S/U credit;* 485b—Elementary Education, *S/U credit;* 485c—Home Economics, *S/U credit;* 485d—Resource Development; 485e—Business; 485f—Music; 485g—Physical Education. *(Lec. 3) Prerequisite: concurrently with EDC 484, permission of department. Not for graduate degree program credit.* Staff

503 Education in Contemporary Society *I and II, 3*
Analysis of contemporary social and economic characteristics of society that affect education. Evaluation of school as a social institution, with emphasis on the role education plays in progressive development of democratic society. *(Lec. 3)* Hagey

505 Principles and Practices of Leadership Development for Youth and Community Programs *I or II, 3*
Philosophy and interrelationships of vocational-technical and general education with extension education and other community educational agencies; leadership concepts and implications; methods and techniques for increasing the effectiveness of organizations. *(Lec. 3) Prerequisite: permission of instructor.* McCreight

506 Methods of Teaching Home Economics *I or II, 3*
Selection, organization and use of instructional materials, methods and techniques of teaching home economics. *(Lec. 3)* P. Kelly

507 Curriculum Study in Home Economics *I or II, 3*
Developing a philosophy and acquiring findings about students, school programs, communities, and current trends as a basis for constructing a scope and sequence plan for a homemaking program. Units of work developed for various age groups. *(Lec. 3)* P. Kelly, May, MacKenzie

508 Supervision of Home Economics *I or II, 3*
Primarily for homemaking teachers who wish to become supervising teachers and work with college student teachers majoring in home economics teacher education. *(Lec. 3)* P. Kelly, MacKenzie

509 Seminar in Home Economics Education *I or II, 3*
Critical study of research literature and research techniques appropriate to solution of problems in home economics. *(Lec. 1-3)* Cusack, P. Kelly

514 Current Trends in Elementary Education *I and II, 3*
For teachers and administrators, the most effective use of instructional materials, media of communication, and personnel in elementary school. *(Lec. 3) Prerequisite: EDC 529 or permission of department.* Nally

520 Teaching of Arithmetic *I, 3*
Designed for the experienced teacher, examination of the principles underlying the teaching of arithmetic in the elementary school, together with the comprehensive survey of materials and methods available for the classroom teacher of arithmetic. *(Lec. 3) Prerequisite: senior or graduate standing.* Nally

523 Physical Factors Related to Reading Disability *I and II, 3*
Investigation and evaluation of various physical factors contributing to reading disability, such as visual, hearing, and speech deficiencies, motor adjustments, glandular deficiencies, general health, brain damage and congenital word-blindness, and lateral dominance. Screening tests and instructional procedures for use in various areas. *(Lec. 3) Prerequisite: EDC 561, 562 and permission of department.* Staff

526 Teaching the New Grammars *I, 3*
Implications of the newer grammars for the teaching of English, including a review of the history of grammar, traditional grammar, and as needed, the linguistic theory necessary to an understanding of the newer grammars. *(Lec. 3) Prerequisite: graduate standing and/or certification to teach English.* DiBiasio

528 Teaching Language Arts *II, 3*
Phonics, grammar, lexicography, and usage in American English for the elementary school classroom teacher. Presentation, use, evaluation, and development of methods and materials for students in the classroom. *(Lec. 3)* DiBiasio

529 Foundations of Educational Research *I and II, 3*
Analysis of the current major research approaches to educational problems with emphasis on interpreting published research involving the language of statistics. Functional skills in basic descriptive statistics needed prior to enrolling. *(Lec. 3)* MacMillan and Soderberg

531 (or FNS 531) Teaching of Nutrition *I or II, 3*
Development of curriculums in nutrition education for teachers in grades K through 12 and appropriate programs for community nutrition educators. Emphasis on innovative teaching techniques using latest nutrition knowledge. *(Lec. 3) Prerequisite: graduate standing and permission of department.* Dymsza and MacKenzie

534 Mathematics in the Secondary School *II, 3*
Deals with the implementation of a modern mathematics program in the secondary school through a study of modern mathematics concepts, experimental programs, and instructional planning. *(Lec. 3) Prerequisite: 15 credits in mathematics.* Croasdale

541 Reading in Secondary School Content Subjects *II, 3*
Designed especially to help junior and senior high school teachers to cope with the problems of the teaching of reading in their subject areas. *(Lec. 3) Prerequisite: EDC 430 or permission of department.* Staff

550 Educational and Vocational Information *I and II, 3*
Classification and description of jobs and industries, occupational trends in relation to socio-economic changes. Experience in use of occupational information in counseling groups and individuals. Field trips to industries. *(Lec. 3) Prerequisite: EDC 450 and graduate standing.* Staff

551 Counseling Techniques *I and II, 3*
Foundations of theory and practice, with special emphasis upon approaches to counseling with children and youth in educational settings, primarily designed for the preparation of the school counselor. *(Lec. 3) Prerequisite: EDC 550 and graduate standing.* Gunning

552 Group Procedures in Guidance *I and II, 3*
Basic principles and techniques in human behavior in groups with emphasis on a fundamental approach in guidance, counseling, and education. How group approaches based on scientific research and study can be applied to guidance and personnel programs with particular reference to articulation and orientation, educational and occupational planning and group counseling. *(Lec. 3) Prerequisite: EDC 551.* Pascale

553 Counseling Practicum *I and II, 3*
Advanced course in counseling. Multiple counseling sessions using tapes and supervised observation will be included to help measure individual assessment of growth and competence. *(Lec. 1, Lab. 5) Prerequisite: EDC 551 and permission of department.* Staff

554 Individual Appraisal in Guidance *II, 3*
Nature of the appraisal process and data essential to understanding the educational, vocational and social needs of persons. Emphasis is upon the team approach in pupil personnel services and the use of the case materials. *(Lec. 3) Prerequisite: EDC 553 and PSY 434.* Gunning

555, 556 Supervised Field Work and Seminar in Guidance and Counseling *I and II, 3 each*
Clinically oriented to give students an opportunity in selected school systems to apply and integrate guidance and counseling theories and skills. 200 clock hours of laboratory experience required in addition to the seminar for the total of two semesters' work. *(Lec. 2, Lab. 3) Prerequisite: EDC 554 and permission of department.* Gunning and Pascale

557 Principles and Practices of Student Personnel Services in Higher Education *I and II, 3*
Survey of the historical, psychological, organizational, and educational factors which have evolved and combined to form student personnel work. *(Lec. 3) Prerequisite: EDC 553 and 554.* Quinn

558 Organization and Administration of Student Personnel Services in Higher Education *II, 3*
Systematic analysis of current practices in the alignment and operation of student personnel services, with continuing review of their interrelationships to the total educational program. *(Lec. 3) Prerequisite: EDC 553, 554 and 557.* Quinn

561 Analysis of Reading Disabilities *I and II, 3*
Causes of reading difficulties and the administration of diagnostic reading tests. Emphasis on construction and use of informal tests and standardized measures. Practice in analyzing data from case histories and in making individual case studies. *(Lec. 3, Lab. 2) Prerequisite: PSY 434, EDC 424 or 541, and permission of department.* McGuire

562 Techniques in Remedial Reading *I and II, 3*
Specific practices effective in teaching of remedial reading in both the regular classroom and remedial reading clinics. Analysis of published materials. Methods of building new materials with discussion

and demonstration of their practical application. *(Lec. 3, Lab. 2) Prerequisite: EDC 561 and permission of department.* McGuire

563 Reading Programs for the Disadvantaged *I and II, 3*
Impact of the culture of the disadvantaged upon the child and his response to learning and the school, with special emphasis on reading and the adjustment of reading materials and methods to individual socio-economic-cultural differences. *(Lec. 3)* Bumpus

564 Beginning Reading Programs *I and II, 3*
Analysis of various approaches to reading instruction (other than the basal method) including phonetic, linguistic, language arts, programmed, and other experimental systems. Currently available materials will be analyzed and classified. *(Lec. 3) Prerequisite: EDC 424.* Aukerman

565 Analysis and Evaluation of Current Research in Reading *I, 3*
Concise analysis of the latest research in reading. Criteria for the evaluation of reading research data as it applies to both teacher and learner. Location and application of current research to reading programs. *(Lec. 3) Prerequisite: EDC 562, 529 and permission of department.* Aukerman

566, 567 Practicum in Reading *I and II, 3 each*
Supervised case studies, practicum and seminar reports on an individual reading project at either elementary or secondary level. Lecture and/or laboratory. 120 hours plus seminar. *Prerequisite: permission of department.* McGuire

570 Elementary School Curriculum *II, 3*
Modern curriculum in the elementary school with emphasis on the needs of children. The course covers language, arts, social studies, science, arithmetic and special subjects. *(Lec. 3) Prerequisite: EDC 503, 529 or equivalent.* Kelly

571 The Secondary School Curriculum *II, 3*
Intensive study of basic principles and procedures utilized in developing curriculum materials. Emphasis given to content of all curriculum areas in junior and senior high schools. *(Lec. 3) Prerequisite: EDC 503, 529.* Whitcomb

572 Cooperative Supervision *I and II, 3*
Analysis of function, principles and techniques of democratic cooperative supervision of teachers and other school officials. Application of these principles to supervisory problems of principals, heads of departments, special supervisors and critic teachers. *(Lec. 3) This course meets certification requirements for Critic Teacher Certificate.* Heisler

573 Seminar—Educational Research *I and II, 1*
For master's degree candidates developing a thesis. Student presentations of thesis topics, research designs, and research findings. Attention given to the orderly development of research studies. Graduate students who require assistance with their theses problems must enroll for this course unless they are enrolled for thesis credit. *Prerequisite: registration for thesis.* Staff

574 Current Trends in Secondary Education *I and II, 3*
Effective use of instructional materials, media of communication, and organization of personnel and current research. *Prerequisite: EDC 529, 571 or permission of department.* Staff

575, 576 Supervised Field Study and Seminar in Elementary or Secondary Education *I and II, 3 each*
Two semester sequence for non-thesis candidates, composed of lectures, seminars and field work. Candidates plan and carry out a field study project approved by the instructor. The completed field study project report must be successfully defended during seminar. *Prerequisite: EDC 503, 570, or 529 and 571, or permission of instructor.* Kelly and Staff

577 Organization and Administration in Elementary School *I, 3*
The functions and duties of elementary school principals. *(Lec. 3) Alternate years, next offered 1971-72.* Kelly

580 Organizing and Administering Youth Programs *I or II, 3*
Planning, organization, instruction and supervision of youth programs. Includes vocational-technical and general education in their relationship to extension education and other community agencies. Youth guidance and psychological development emphasized. *(Lec. 3) Prerequisite: EDC 505 or permission of instructor.* McCreight

581 Organizing and Administering Programs of Continuing Education for Adults *I or II, 3*
Planning, organization, instruction and supervision of continuing education for adults in both vocational-technical and general education as conducted by extension education and other community agencies. *(Lec. 3) Prerequisite: EDC 505 or permission of instructor.* McCreight

582 Curriculum Development in Vocational-Technical and Extension Education *I, 3*
Principles and processes involved in the basic concepts effecting vocational-technical and extension education programs. Emphasis is given to planning, execution and evaluation. *(Lec. 3) Prerequisite: EDC 580 or 581 or permission of instructor.* McCreight

583 Analyzing Community Needs and Resources for Youth and Adult Programs *I, 3*
Designed to help the student function effectively in the role of change-agent in a community setting. Concepts of goals, change, power and community will be considered in relation to the student's community experiences. *(Lec. 3) Prerequisite: permission of instructor.* Bromley

584 The Adult and the Learning Process *I and II, 3*
Examination of the adult as a learner with emphasis on the factors that affect adult learning. *(Lec. 3) Prerequisite: EDC 581 or permission of instructor.* Bromley

585 Seminar on Leadership Development for Youth and Community Programs *II, 3*
Students will participate in a non-structured group to observe the emergence of leadership and the effects of individual behavior on self and others. *(Lec. 3) Prerequisite: permission of instructor.* Bromley

586, 587 Problems in Education *I and II, 3 each*
Advanced work for graduate students in education. Courses conducted as seminars or as supervised individual projects. *(Lec. or Lab.) Prerequisite: permission of department.* Staff

588, 589 Supervised Field Practicum and Seminar in Youth, Adult, and Community Education *I and II, 3 each*
Designed to provide students an opportunity in selected clinic systems to apply leadership principles and practices. 200 clock hours of practicum are required in addition to the seminar. *(Lec. 2, Lab. 3) Prerequisite: EDC 582, 583, or 584 and 529, or permission of instructor.* Bromley, McCreight

590 Social Issues in Urban Education *II, 3*
Current social problems with which teachers are confronted in urban education. Emphasis is placed upon current problems from the perspective of sociology, social welfare, psychology and education. Field trips, visiting lecturers and sensitivity training will all be utilized in the development of issues. *(Lec. 3) Prerequisite: EDC 102.* Staff

594 Organization and Supervision of Reading Programs *II, 3*
The various roles of the reading specialist in relation to the other line-staff personnel will be discussed. Problems concerning the orientation of new teachers, reading research and development, inservice programs, and community support will be explored. *(Lec. 3) Prerequisite: EDC 561, 562.*

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

ELECTRICAL ENGINEERING (ELE)

CHAIRMAN: Professor Polk. Professors Grove, Lengyel, Lindgren, Mitra, Nudelman, Tufts and Zirkind; Associate Professors Etzold, Haas, Poularikas, Prince, Sadasiv and Spence; Assistant Professors Birk, Daly, Hubbell and Kelley; Adjunct Professors Biberman, Galejs, Goetze, Kazan, D. Middleton and Stuermer.

210 Introduction to Electrical Engineering *I, 3*
Static electric and magnetic fields; Gauss's and Coulomb's laws; capacitance and inductance. Behavior of electric charges in stationary and moving fields. Lumped vs. distributed parameters, electric and mechanical circuit concepts, topological circuit principles and circuit theorems. *(Lec. 3) Prerequisite: MTH 141 and 142.* Staff

211 Linear Systems and Circuit Theory I *II, 3*
Further study of circuit theorems; mesh and nodal electrical and mechanical system equations, matrix applications; power and energy in resistive networks. Energy storage elements, singularity functions, differential equations of systems, time domain behavior of systems, convolution integral. *(Lec. 3) Prerequisite: ELE 210.* Staff

215 Electrical Measurements *II, 2*
Methods of measurement, theory of operation and proper use of certain electrical instruments, nature and theory of errors of measurement, and treatment of data. *(Lec. 1, Lab. 3) Prerequisite: ELE 210.* Staff

220 Electric Circuits, Measurements, and Electronics *II, 3*
Passive and active electric circuits; introduction to electronic devices; theory of electrical measurements. *(Lec. 3) Prerequisite: ELE 210. Open only to students not majoring in electrical engineering or engineering science.* Staff

312 Linear Systems and Circuit Theory II *I, 4*
Frequency domain concepts, magnetic coupling; complex frequency, poles and zeros; power and energy in steady state AC circuits; Fourier series, Fourier integral, introduction and application of Laplace transforms; additional applications of matrix operations. *(Lec. 3, Lab. 3) Prerequisite: ELE 211.* Staff

313 Circuit Design *II, 3*
Classical filter theory, fundamentals of system synthesis; image parameters, network matching, network cascading, physical realizability, frequency and impedance scaling, reactance functions. AC polyphase mesh simplifications. *(Lec. 3) Prerequisite: ELE 312.* Staff

322 Electromagnetic Fields I *I, 3*
Electrostatics and magnetostatics, forces on charged particles. Analysis employs vector algebra and vector calculus in orthogonal coordinates. Simple applications to engineering problems. *(Lec. 3) Prerequisite: MTH 244.* Staff

323 Electromagnetic Fields II *II, 3*
Magnetostatics continued. Introduction to electrodynamics. Maxwell's equations, wave equation, plane wave propagation, reflection and refraction phenomena. *(Lec. 3) Prerequisite: ELE 322.* Staff

342 Electronics I *II, 4*
Introduction to electronic devices and circuits. Equivalent circuits, amplification, coupling, cascading and feedback, large-signal behavior. *(Lec. 3, Lab. 3) Prerequisite: ELE 210 and 215.* Staff

391, 392 Honors Work *I and II, 1-3 each*
Independent study and seminar-type work under close faculty supervision. Discussion of advanced topics in electrical engineering in preparation for graduate work. *Prerequisite: junior standing and permission of department.* Staff

Prerequisites for all 400, 500, and 600 level electrical engineering courses: mathematics through differential equations (MTH 244) and at least 6 credits in circuit theory and 3 credits in electromagnetic fields. Additional prerequisites as indicated with each course. Some circuits and fields prerequisites may be waived for ELE 481, 482, 505, 537, 588, and 589 for students with suitable backgrounds.

411 Microwave and Quantum Electronics *I, 3*
Impedance transformation and matching on transmission lines and wave guides. Solution of wave equation for wave guides and resonant cavities. Modes in laser resonators. Refraction and diffraction phenomena, holography. Introduction to generation of electromagnetic energy at microwave and optical frequencies. *(Lec. 3) Prerequisite: ELE 323.* Staff

413 Microwave and Quantum Electronics Laboratory *I, 3*
Measurements on distributed parameter systems such as transmission lines, wave guides and cavity resonators. Experimental study of tube and solid state microwave and optical generators (lasers), antenna systems, diffraction, refraction, imaging properties of lenses, spatial filtering, optical information processing and holography. *(Lec. 1, Lab. 4) Prerequisite: ELE 411, which may be taken concurrently.* Staff

417 Direct Energy Conversion
See Mechanical Engineering 417.

427 Electromechanical Devices and Systems *I, 3*
Principles of electromechanics. Development of models for transducers, rotating electrical devices, inertial sensors, and other components used in energy conversion and electronic instrumentation systems. Dynamics of electromechanical systems. *(Lec. 2, Lab. 3) Prerequisite: ELE 313, 322.* Staff

431 Electrical Engineering Materials I *I, 3*
Introduction to the physical interpretation of the dielectric, magnetic and conductive properties of materials. *(Lec. 3) Prerequisite: ELE 322, PHY 342, MCE 341, or PHY 420.* Staff

432 Electrical Engineering Materials II *II, 3*
Extension of ELE 431, directed toward the understanding of engineering concepts utilized in the development and application of solid state devices. Quantum electronics, optoelectronics, various photoelectric effects, thermoelectricity, magneto-optics, superconductivity, and systems of solid state devices. *(Lec. 3) Prerequisite: ELE 431 or equivalent.* Staff

433 Electrical Engineering Materials and Direct Energy Conversion Laboratory *II, 3*
Experimental course to supplement lecture courses ELE 431 and 432. Student projects involving film deposition, determination of electrical and optical properties, fabrication of elemental solid state devices and determination of their characteristics. Experimental study of thermo-electric, photoelectric and thermionic energy conversion devices. *(Lec. 1, Lab. 4) Prerequisite: credit or registration in ELE 431 and 432.* Staff

436 Communication Systems *II, 3*
Introduction to probability concepts. Quantitative description of information. Application of Fourier integral to linear networks. Modulation systems. *(Lec. 3) Prerequisite: ELE 443, ELE 444 concurrently.* Staff

437 Introduction to Photo-electronic Devices *I and II, 3*
Elemental solid state sensors, scanners, remote and direct viewing image tubes and solid state devices, electron optics. *(Lec. 3) Prerequisite: ELE 431, which may be taken concurrently, or equivalent.* Staff

443 Electronics II *I, 5*
Continuation of ELE 342 with major emphasis placed on semiconductor devices. *(Lec. 3, Lab. 6) Prerequisite: ELE 342.* Staff

444 Electronics III, Pulse and Digital Circuits *II, 4*
Extension of the fundamental ideas of ELE 342 and 443 to the analysis and design of pulse forming and switching circuits. Piece-wise linear approach to the non-linear behavior of electronic devices. *(Lec. 3, Lab. 3) Prerequisite: ELE 443.* Staff

457 Feedback Control Systems *I, 3*
Classical design and analysis techniques for linear feedback systems. Sensitivity, stability, root locus techniques. Design and compensation of systems to meet various performance criteria. *(Lec. 3) Prerequisite: ELE 313.* Staff

458 Systems Laboratory *II, 3*
Analytical, experimental, and computer simulation studies of typical control, communication, and biosystems problems. *(Lec. 1, Lab. 4) Prerequisite: ELE 456 or equivalent.*

481, 482 Biomedical Engineering Seminar *I and II, 1 each*
Discussion, analysis and presentation of biomedical engineering topics related to current literature in field of student's interest. *Prerequisite: permission of department.* Staff

484 Modeling of Physiological Systems
See Zoology 484.

491, 492, 493 Special Problems *I and II, 1 each*
Special engineering problems assigned to student according to his interests and capabilities. *(Lec. or Lab.) Prerequisite: permission of instructor.* Staff

501 Linear Circuit Theory *I, 3*
Transform analysis of discrete and distributed systems, functions of a complex variable, state variable

description of systems and time domain analysis, matrices and linear spaces, feedback concepts. *(Lec. 3)* Staff

505 (or CSC 505) Design of Digital Circuits *I, 3*
Analytical development of methods for digital circuit design. Computer arithmetic, control, and memory elements. Design of sequence generators. Special purpose digital circuits for performing numerical operations such as integration, smoothing and filtering. *(Lec. 3)* Tufts

506 Digital Signal Processing *II, 3*
Digital representations of signals and noise, digital filtering and spectral analysis, design of digital circuits for signal parameter estimation and signal detection. *(Lec. 3)* Tufts

509 Systems with Random Inputs *I or II, 3*
Discrete and continuous linear systems with random inputs. Introduction to random processes in the context of linear systems. Applications to detection, smoothing and prediction. *(Lec. 3) Prerequisite: knowledge of differential equations, linear systems and transform methods.* Staff

511 Electromagnetic Fields *I, 3*
Review of electrostatics and magnetostatics. Maxwell's equations, wave propagation in dielectric and conducting media. Boundary phenomena. Radiation from simple structures. Relations between circuit and field theory. *(Lec. 3)* Staff

514 Microwave Electronics *I or II, 3*
Electronic engineering at microwave frequencies, microwave circuit theory, impedance transformation and matching, passive microwave devices, microwave tubes, semiconductor microwave electronics, microwave masers, parametric amplifiers. *(Lec. 3) Prerequisite: ELE 411 concurrently or permission of instructor.* Daly

515 Quantum Electronics *I or II, 3*
Laser engineering and applications, interaction of radiation with atoms, optical resonators, electro-optic modulation, harmonic generation, parametric oscillation and frequency conversion, noise in laser amplifiers and oscillators. *(Lec. 3) Prerequisite: PHY 341 or permission of instructor.* Daly

516 Planetary Electrodynamics *I or II, 3*
An introduction to the description and theory of natural electric and magnetic phenomena on the earth and in the solar system such as lightning, natural geomagnetic and interplanetary magnetic fields, origin and properties of ionospheres, the "solar wind" and natural radio noise. *(Lec. 3) Prerequisite: permission of instructor.* Polk

517 Magnetofluidmechanics
See Mechanical Engineering 517.

531 Solid State Engineering I *I and II, 3*
Periodicity of solids; dielectric, thermal, optical and electro-magnetic properties of electronically interesting solids. *(Lec. 3) Prerequisite: ELE 431 or equivalent.* Staff

532 Solid State Engineering II *I and II, 3*
Semiconductor physics, transport properties. Applications including solid state lasers, piezoelectric, ferroelectric and magnetic devices. *(Lec. 3) Prerequisite: ELE 531 or equivalent.* Staff

535 Transistor Circuits *I and II, 3*
Semiconductors, characteristics of junction transistors. Analysis and design of single and multistage amplifiers including feedback. High frequency considerations, applications to systems. *(Lec. 3)* Staff

536 Semiconductor Electronics *I or II, 3*
Theory and technology of semiconductor devices. Junction, field effect, optoelectronic and microwave devices. Integrated circuits. *(Lec. 3) Prerequisite: ELE 431 or equivalent.* Sadasiv

537 Electronic Instrumentation and Control Circuits *I and II, 3*
Analysis and design of special amplifiers, operational circuitry, measurement of non-electrical quantities, transducers. *(Lec. 3)* Staff

538 Principles of Remote Sensing *I or II, 3*
The theory and techniques of remote sensing including spaceborne photometry and radiometry. Applications will be selected from the following topics: planetary atmospheres, geology and earth resources, and environmental problems. *(Lec. 3) Prerequisite: ELE 323, PHY 406, or permission of instructor.* Zirkind

539 Infrared Imaging Techniques *I or II, 3*
Elemental detectors and their application in radiometers and scanners. Principles of infrared imaging devices. Thermal radiation and its propagation through the atmosphere. *(Lec. 3) Prerequisite: ELE 437 or equivalent.* Zirkind

545 Optimization and Variational Problems in Electrical Engineering *I or II, 3*
Application of variational and approximation techniques to boundary value field problems, extremal control of dynamic systems, and optimization in communication theory. Performance criteria, Hamilton-Jacobi theory; Ritz and Galerkin methods; Weinstein and Bazly methods for determining the upper and lower bounds of eigenvalues in engineering problems; optimal filter theory. *(Lec. 3) Prerequisite: ELE 501 or 511 or permission of instructor.* Poularikas

561 Information Transmission *I or II, 3*
Introduction to information theory. Discrete and continuous communications channels. Techniques for coding and decoding information. *(Lec. 3) Prerequisite: ELE 509 or equivalent.* Kelley and Spence

565 Fundamentals of Signal Theory *I and II, 3*
Concepts of signal expansions in sets of orthogonal functions other than Fourier, classification of signal

types. Optimum representation vocabulary, matrix analysis. *(Lec. 3) Prerequisite: ELE 501 or equivalent.*

571 (or OCE 571) Underwater Acoustics I *I, 3*
Wave equation, stress-strain relations, energy, pressure and particle velocity. Ray theory, normal modes, refraction, reflection, layered media, scattering, with particular emphasis on sound propagation in the ocean. Acoustic properties of the sea, properties of solids. *(Lec. 3)* F. Middleton

575 Electroacoustical Engineering I *I and II, 3*
Theory and design of electroacoustic transmission channels and the psychoacoustic aspects of their use for high-quality music transmission. *(Lec. 2, Lab. 3) Prerequisite: permission of instructor.* Etzold

576 Electroacoustical Engineering II *I and II, 3*
Storage of sound, studio-design and acoustical measurements. *(Lec. 2, Lab. 3) Prerequisite: ELE 575.* Etzold

586 Biomedical Electronics I *I and II, 3*
Design and analysis of biomedical instrumentation and transducers for both implantation and external use. Direct current and wide band amplifiers, counter, trigger and timing circuits. *(Lec. 3) Prerequisite: ELE 342 or equivalent.* Hubbell

587 Biomedical Electronics II *I and II, 3*
Principles of bio-telemetry. Measurement of cardiovascular, metabolic and respiratory activity under dynamic conditions. Use of ultrasonics and microwaves in measuring properties of physiological tissue. *(Lec. 3) Prerequisite: permission of department.* Hubbell

588 Biomedical Engineering I *I and II, 3*
Origin and characteristics of electrical potentials, transport and diffusion phenomena, dielectric and thermal properties of physiological material. Principles of electromyography, electrocardiography, and electroencephalography. Neural pathways and synaptic transmissions. *(Lec. 3) Prerequisite: permission of department. Taught in cooperation with zoology and pharmacology departments.* Staff

589 Biomedical Engineering II *I and II, 3*
Study and analysis of cardiovascular, respiratory, neurological, muscular, gastrointestinal and urinary systems using mathematical tools, electronic and analog models. Use of computers for biomedical data analysis and processing. Correlation and auto correlation techniques. *(Lec. 3) Prerequisite: permission of department. Taught in cooperation with zoology and pharmacology departments.* Staff

591, 592 Special Problems *I and II, 1-3 each*
Advanced work under supervision of a staff member. Arranged to suit individual requirements of student. Credits not to exceed a total of 6. *Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

601, 602 Graduate Seminar *I and II, 1 each*
Seminar discussions including the presentation of papers based on research or detailed literature surveys. *(Lec. 1) Attendance is required of all students in graduate residence, but a maximum of 1 credit per year is allowed and no more than 2 credits are allowed for the entire period of residence.* Staff

605 Non-linear System Analysis *I and II, 3*
Iteration and perturbation techniques, phase plane and state space concepts, Liapunov's direct method, stability criteria for non-linear systems. *(Lec. 3) Prerequisite: ELE 501 or equivalent.* Lindgren

613 Waveguides and Resonators *II, 3*
Theory of homogeneous isotropic waveguides and cavity resonators. *(Lec. 3) Prerequisite: ELE 511 or equivalent.* Daly or Poularikas

615 Antennas and Radio Propagation *I and II, 3*
Analysis of simple linear and area antennas. Antennas arrays. Diffraction theory. Introduction to radio propagation. *(Lec. 3) Prerequisite: ELE 511 or equivalent.* Spence or Polk

616 Advanced Topics in Electromagnetic Theory *II, 3*
Electromagnetic theory of inhomogeneous and anisotropic media. Ferrite devices. Introduction to the theory of plasmas. Ionospheric radio propagation. *(Lec. 3) Prerequisite: ELE 511, 613, 615 or equivalent.* Daly or Polk

631 Electronics of Solids I *I and II, 3*
Properties of conductors, semiconductors, and insulators from quantum mechanical principles. Band theory of solids, superconductivity, thermoelectricity. *(Lec. 3) Prerequisite: PHY 570 or equivalent.* Mitra

632 Electronics of Solids II *I and II, 3*
Extension of ELE 631, directed toward the examination of theoretical concepts fundamental to solid state electronics. Topics oriented toward current research programs and selected from areas such as quantum electronics, transport properties in strong electric and magnetic fields, and superconductivity. *(Lec. 3) Prerequisite: ELE 631 or equivalent.* Mitra

636 Solid State Electronic Devices *I or II, 3*
Selected topics of current research interest. Materials will be drawn from recent literature on solid state electronic devices. *(Lec. 3) Prerequisite: ELE 536.* Sadasiv

637 Photo-electronics I *I, 3*
Optics, including photometry, radiometry, natural illumination, irradiance, luminance, radiance, temperature. Theory, analysis and specifications of photodetectors, scanners and associated systems. Direct viewing image tubes, their components and electron optics. *(Lec. 3) Prerequisite: ELE 437 or equivalent.* Nudelman and Sadasiv

638 Photo-electronics II *II, 3*
Continuation of ELE 637: theory, analysis, specifications of signal generating (remote) tubes and solid state devices, including transfer characteristics, spectral responses, limiting resolution, modulation transfer function, quantum detective efficiency. Applications to medicine, space, night vision. *(Lec. 3) Prerequisite: ELE 637.* Nudelman and Sadasiv

641 Advanced Engineering Analysis I *I, 3*
Analytical techniques for the solution of problems involving a finite number of degrees of freedom with applications to linear and non-linear systems. *(Lec. 3) Prerequisite: advanced graduate standing and permission of instructor.* Staff

642 Advanced Engineering Analysis II *II, 3*
Continuation of ELE 641. Techniques for the analysis of distributed parameter systems. Applications to diffusion problems and wave propagation. *(Lec. 3) Prerequisite: ELE 605.* Staff

651 Feedback Control Systems I *I, 3*
Analysis of synthesis of complex control systems. Extension of feedback control theory to handle random disturbances, sampled data, and non-linearities. System optimization. *(Lec. 3) Prerequisite: ELE 457 or equivalent and ELE 605.* Lindgren

652 Feedback Control Systems II *II, 3*
Continuation of ELE 651. Topics from current research such as stability of non-linear and time-varying systems, optimal control, self-optimizing systems and learning systems. *(Lec. 3) Prerequisite: ELE 651.* Staff

660 Advanced Topics in System Theory *I or II, 3*
Seminar for advanced students. Selected topics of current research interest. Material will be drawn primarily from recent literature. *(Lec. 3) Prerequisite: permission of instructor.* Staff

665 Detection, Estimation and Modulation Theory *I or II, 3*
Advanced treatment of statistical detection, estimation and modulation theory. Applications to communication systems and radar and sonar systems. *(Lec. 3) Prerequisite: ELE 509 or equivalent and competence in probability and statistics.* Staff

672 (or OCE 672) Underwater Acoustics II *II, 3*
Transducers, radiators and receivers, directivity (array structures), equivalent circuits, efficiency; piezoelectricity, magnetostriction, sonar principles, measurements and calibration. *(Lec. 3)* F. Middleton

691, 692 Special Problems *I and II, 1-3 each*
Advanced work under supervision of a staff member. Arranged to suit individual requirements of student. Credits not to exceed a total of 6. *Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

ENGINEERING (EGR)

101 Introduction to Engineering *I and II, 1*
A survey of the field of engineering, and a study of the different branches in particular. An introduction to methods and means of computation for solving engineering problems. *(Lec. 1)* Goodwin

102 Basic Graphics *I and II, 1*
Theory of orthographic projection and principles of descriptive geometry, construction of exact drawings of three-dimensional objects including auxiliary views, pictorial drawings, cross-sections and dimensioning, free-hand sketching. *(Lab. 3)* Bachelder and Staff

203 Engineering Graphics *I and II, 1*
Advanced theory of descriptive geometry with applications to engineering problems, including line and plane problems, plane curves, ruled, warped and double-curved surfaces, intersections and developments, axonometric and perspective projections. *(Lab. 3) Prerequisite: EGR 102.* Bachelder and Staff

304 Technology and Society *I and II, 3*
Development of technology and its interrelationship with social conditions from the historical point of view, including a survey of the technological basis of modern society. A background in technology and its importance for non-engineers and for engineers an appreciation of the historical development of their profession. No prior engineering or science required. *(Lec. 3)* Bradbury

ENGLISH (ENG)

CHAIRMAN: Professor J. Y. Miller. Professors Goldman, Gullason, Hoffmann, A. MacLaine, Neuse, Petrie, Potter, E. A. Robinson, W. D. Smith and Sorlien; Associate Professors J. M. Marshall, Mathews, Seigel, Sharpe, Steeves, R. H. Tutt and White; Assistant Professors Barker, Cane, B. Collins, Donnelly, M. Hills, Jacobs, Joel, Kunz, Malina, McCabe, Moreau, C. M. Murphy, Reaves, Ryan, Schoonover, Towers and R. M. Tutt; Instructors S. Adams, S. Beckman, Boyd, S. F. Burke, Dvorak, Hauptman, S. MacLaine, Mensel, Shamoon, Stein and D. Titus.

101 Introduction to Literature: Genres *I and II, 3*
Extensive reading in various forms of literature. Discussion and regular written criticism. *(Lec. 3) Not for English concentration credit.* Staff

102 Introduction to Literature: Theme *I and II, 3*
A theme such as Love and War, the Hero, Social Protest, Utopia, etc., in literature. Discussion and regular written criticism. *(Lec. 3) Not for English concentration credit.* Staff

110 Composition *I and II, 3*
Emphasizes correctness in writing and clear presentation of ideas. Reading exercises in exposition, and composition of essays. *(Lec. 3) Not a prerequisite for ENG 120. Not for English concentration credit.* Staff

112 Composition (Foreign) *I and II, 3*
Same as ENG 110, but restricted to students whose mother tongue is not English and who have need of special and closely supervised assistance in expressing themselves in English. *(Lec. 3) Prerequisite: admission upon recommendation of department.* R. M. Tutt

113 Composition (Fisheries) *I, 3*
Same as ENG 110. Admission restricted to students in the special two-year fisheries program upon recommendation by the College of Resource Development. *(Lec. 3)* Staff

120 Literature and Composition *I and II, 3*
Continuation of ENG 110. Extensive reading in various forms of writing. Training in appreciation and criticism of good literature. Regular written criticism and literary exercises. *(Lec. 3) ENG 110 not a prerequisite for ENG 120. Not for English concentration credit.* Staff

122 Literature and Composition (Foreign) *I and II, 3*
Same as ENG 120, but continuation of ENG 112. *(Lec. 3) Prerequisite: admission upon recommendation of department. Students enrolled in ENG 112 will be assumed to continue in ENG 122 unless otherwise recommended by the instructor.* R. M. Tutt

231 Literature of the Bible *II, 3*
Introduction to poetry and narrative in the Old Testament and the Apocrypha, primarily in the Authorized (King James) Version. *(Lec. 3)* Sorlien

241, 242 American Literature *I and II, 3 each*
ENG 241: Selections from American literature, beginnings to the Civil War. *ENG 242:* Selections from American literature, latter part of the nineteenth century to the present. *(Lec. 3) ENG 241 not prerequisite for ENG 242.* Staff

251, 252, 253 English Literature *I and II, 3 each*
ENG 251: Selections from English literature, beginnings to 1660. *ENG 252:* Selections from English literature, 1660-1832. *ENG 253:* Selections from English literature, 1832 to the present. *(Lec. 3) None of these courses is prerequisite for any other.* Staff

255 A Survey of English Drama *I, 3*
Development of English drama from its beginning to present day. Plays read will be selected on basis of their historical importance and intrinsic worth. *(Lec. 3)* Staff

261, 262 World Literature *I and II, 3 each*
Introduction to some masterpieces of literature other than English and American. *ENG 261:* Selective literary history of civilization revealed through Greek, Roman, Italian, and Spanish literature. *ENG 262:* Selections from great works of French, Russian, German, and Scandinavian literature. Reading is done in translation. *(Lec. 3) ENG 261 is not prerequisite for ENG 262.* Staff

263 Introduction to Poetry *I, 3*
Promotes intelligent reading of various forms of poetry which have developed through the ages. *(Lec. 3)* Staff

264 Introduction to Drama *I or II, 3*
Various forms of Western drama. Designed to promote an intelligent understanding of drama as a literary art form. *(Lec. 3)* Staff

265 Introduction to the Novel *I or II, 3*
Introduction to the novel form which will include appreciation of fictional themes and methods as well as significant shifts of mode, the comic, sentimental, Gothic, novel of purpose, and others. *(Lec. 3)* Staff

304 Creative Writing *I and II, 3*
Various types of creative composition: essays, stories, and poetry. Students analyze work by class members and by professional writers. Only students with an aptitude for writing should elect this course. *(Lec. 3) Prerequisite: permission of instructor.* Mathews and Petrie

305 Advanced Creative Writing *II, 3*
Provides further training for students especially talented in creative writing. Increased emphasis on independent projects in longer forms of prose and poetry. *(Lec. 3) Prerequisite: ENG 304 and permission of department.* Mathews and Petrie

310 Techniques of Critical Writing *I and II, 3*
Practice in the writing of literary criticism. Methods of literary analysis illustrated and applied to specific works. *(Lec. 3)* Staff

340 (243) The American Short Story *I and II, 3*
Critical study of the short story in America from early nineteenth century to the present. *(Lec. 3)* Staff

341, 342 The American Novel *I and II, 3 each*
ENG 341: Survey of the American novel through nineteenth century. *ENG 342:* Survey of the American novel since 1900. *(Lec. 3) ENG 341 is not prerequisite for ENG 342.* Staff

343 Modern American Poetry *I and II, 3*
Major contributions and movements in American poetry from 1900 to the present. *(Lec. 3)* Goldman and Potter

345 American Negro Literature: 1920 to the Present *I and II, 3*
Intensive study of major contributions to American literature by Negroes from the Harlem Renaissance

of the 1920's to the present. Representative works in poetry, drama, fiction and essays. *(Lec. 3)* Boyd

351, 352 The English Novel *I and II, 3 each*
ENG 351: Survey of English novel through first quarter of nineteenth century. Emphasis on Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. *ENG 352:* Outstanding developments of nineteenth- and early twentieth-century novels are stressed. *(Lec. 3) ENG 351 not prerequisite for ENG 352.* Staff

353 Modern British Poetry *I and II, 3*
Major contributions and movements in British poetry from 1900 to the present. *(Lec. 3)* Staff

361, 362 The European Novel *I and II, 3 each*
ENG 361: Major developments of European novel through early nineteenth century. Special attention to Cervantes, LeSage, Goethe, Stendhal, Balzac, and Gogol. *ENG 362:* Important contributions of nineteenth- and early twentieth-century novel. Special attention to Flaubert, Turgenev, Dostoevsky, Tolstoy, Zola, and Gide. *(Lec. 3) ENG 361 not prerequisite for ENG 362.* Collins and Gullason

365 Modern Drama *I and II, 3*
Critical study of modern drama: Continental, British and American. *(Lec. 3)* Staff

397, 398 Senior Honors Seminar *I and II, 3 each*
A flexible seminar restricted to those students eligible for honors in English and requiring extensive individual study and research which will culminate in a substantial honors essay. *(Lec. 3) Prerequisite: eligibility for honors in English.* Staff

433 The Elizabethan Drama *II, 3*
Critical study of outstanding plays written by Shakespeare's predecessors, contemporaries and successors, with emphasis on Elizabethan playhouse practice. *(Lec. 3) Prerequisite: junior or senior standing.* Barker, Hills and Smith

440 Literary Heritage of New England to 1860 *I, 3*
Literature of New England through the colonial, national, and romantic periods to the Civil War. Field trips will be taken to important literary sites. *(Lec. 3) Prerequisite: ENG 241 or permission of department.* Robinson and Schoonover

441, 442 American Authors *I and II, 3 each*
Intensive study of the work of one or two outstanding American writers. *ENG 441:* Dickinson, Emerson, Hawthorne, James, Melville, Poe, Thoreau, Twain and Whitman. *ENG 442:* Eliot, Faulkner, Fitzgerald, Frost, Hemingway, O'Neill, Arthur Miller, and Tennessee Williams. *(Lec. 3) Fall, 1971: O'Neill,* Smith. *Spring, 1972: Fitzgerald and Hemingway,* Hoffmann. *Fall, 1972: Hawthorne,* Robinson. *Spring, 1973: Frost and Eliot,* Goldman

445 American Romanticism *II, 3*
Major American Transcendentalists and Poe, Hawthorne, and Melville. *(Lec. 3) Prerequisite: permission of department.* Robinson

446 Modern American Drama *II, 3*
Major contributions and movements in modern American drama. *(Lec. 3)* Miller

450 The English Renaissance *II, 3*
Early developments of sonnet form and blank verse as illustrated by work of Wyatt, Surrey, Sidney and others. Attitudes and theories of period as expressed in More's *Utopia* and Bacon's *Essays* are examined in detail. *(Lec. 3) Prerequisite: junior or senior standing. In alternate years, next offered 1972-73.* Neuse and Sorlien

452 The Seventeenth Century, 1603-1660 *I, 3*
Poetical and prose works of Bacon, Jonson, Donne, Milton, and others. *(Lec. 3)* Sorlien

453 The Restoration Period *II, 3*
Major trends and developments in second half of seventeenth century as reflected in drama, verse satire, and prose of the age of Dryden, Bunyan, Locke, and Congreve. Special attention to Restoration comedy. *(Lec. 3)* Kunz and Sorlien

456 The Augustan Tradition in England *I, 3*
First half of eighteenth century in English literature, with emphasis on Addison and Steele, Pope, Gray, Swift, and Defoe. *(Lec. 3) Prerequisite: junior or senior standing.* Reaves

457 The Age of Johnson *II, 3*
Second half of eighteenth century with emphasis on Johnson, Goldsmith, Gibbon, Gray, Blake, Burns, and collapse of pseudo-classicism. *(Lec. 3) Prerequisite: junior or senior standing.* Joel

461 The Classical Epic *I, 3*
Survey of Greek and Latin epic poetry in translation, beginning with Homer and attempting to determine some principles of epic art. *(Lec. 3)* Sharpe

462 The Medieval and Modern Epic *II, 3*
Survey of nonclassical epic poetry with special emphasis upon Dante's *Divine Comedy* and Joyce's *Ulysses. (Lec. 3)* Sharpe

465 Greek and Roman Drama *I, 3*
Survey of Greek and Roman drama with special emphasis on art and achievement of major dramatists: Aeschylus, Sophocles, Euripides, Aristophanes, Plautus, Terence, and Seneca. *(Lec. 3)* Gullason

470 Chaucer *I, 3*
Study of syntax and pronunciation of Chaucer's language and appreciation of Chaucer as a poet. Emphasis on *The Canterbury Tales. (Lec. 3) Prerequisite: junior or senior standing.* MacLaine, Malina and Neuse

471 The Poetry of Edmund Spenser *I, 3*
Intensive study of first major poet of English Renais-

sance. Full range of Spenser's poetic achievement is examined, but special emphasis is given to *The Faerie Queene*. Course is conducted as a seminar. *(Lec. 3) Prerequisite: junior or senior standing and permission of department.* Neuse

472, 473 Shakespeare *I and II, 3 each*
ENG 472: Introduction to plays of Shakespeare as living theatrical productions. One or more examples from each main type. Character delineation, plot construction, and stagecraft devices emphasized. *ENG 473:* A second course in Shakespeare. Critical study of those plays not included in ENG 472. *(Lec. 3) Prerequisite: junior standing. ENG 472 not prerequisite for ENG 473.* Smith and Barker

474 Milton *II, 3*
Poetry and prose of John Milton, with special emphasis on *Paradise Lost. (Lec. 3) Prerequisite: junior or senior standing and permission of department.* Neuse

475 Major English Authors of the Eighteenth Century *I or II, 3*
Intensive study of the work of one or two outstanding English authors of the eighteenth century: Defoe, Swift, Fielding, Pope, Johnson, Blake, and Boswell. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Staff

476 Browning *II, 3*
Intensive study of work of Robert Browning as the most significant of Victorian poets. *(Lec. 3) Prerequisite: permission of department.* Staff

480 The Romantic Movement, 1798-1832 *I, 3*
Major poetry and significant non-fiction prose of Wordsworth, Coleridge, Scott, Byron, Shelley, Hunt, Landor, and Keats. *(Lec. 3) Prerequisite: junior, senior or graduate standing.* Petrie and Tutt

482, 483 English Literature: 1832-1900 *I and II, 3 each*
ENG 482: The poetry, non-fiction prose, and selected novels of the early and mid-Victorian period. Emphasis will be on the work of Tennyson, Browning, Arnold, Carlyle, Dickens, Thackeray, and others. *ENG 483:* The literature of the latter nineteenth century. Emphasis will be on Rossetti, Swinburne, Meredith, Hopkins, Hardy, Housman, Wilde, and others. *(Lec. 3) Prerequisite: junior, senior or graduate standing. ENG 482 not prerequisite for ENG 483.* Goldman and Seigel

484 Modern British Literature *II, 3*
Poetry, drama, non-fiction prose, and selected fiction of the modern period. Emphasis on the work of Conrad, Joyce, Lawrence, Woolf, Yeats, Auden, Thomas, and others. *(Lec. 3) Prerequisite: junior or senior standing.* Goldman, Mathews, and McCabe

511 Literary Research Methods *I and II, 3*
Problems and applications of the methods of literary research. Directed use of the research library. Usually required of all graduate students in the first year who have not had a similar course elsewhere. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Staff

530 History of the English Language *I, 3*
Historical study of development of English syntax, sounds, vocabulary and usage. *(Lec. 3) Prerequisite: graduate standing or permission of the instructor.* Titus

531 History of Critical Theory *I, 3*
Important critical theories from Aristotle to the twentieth century. Emphasis upon orientation of theories to various aspects of the literary situation. Some study of modern attitudes toward earlier critics. Open to graduate students and senior English majors. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Murphy

532 Modern Literary Criticism *II, 3*
Dominant modes and schools of criticism exemplified by T. S. Eliot, T. E. Hulme, I. A. Richards, Edmund Wilson, John Crowe Ransom, and other important critics. Pertinent related literary works. *(Lec. 3) Prerequisite: graduate standing or permission of instructor. In alternate years, next offered 1972-73.* Hoffmann and Goldman

541, 542 Studies in American Literature to 1865 *I and II, 3 each*
Selective literary and cultural issues for discussion and research. *(Lec. 3) Prerequisite: graduate standing or permission of instructor. Fall, 1971: Early New England Literature,* Potter. *Fall, 1972: Early Southern Literature,* Tutt. *Spring, 1973: Early American Gothic,* Tutt

543, 544 Studies in American Literature, 1865 to the Present *I and II, 3 each*
Selective literary and cultural issues for discussion and research. *(Lec. 3) Prerequisite: graduate standing or permission of instructor. Fall, 1971: The Twenties,* Hoffmann. *Spring, 1972: Short Story in the Twenties,* Gullason. *Fall, 1972: The Thirties,* Hoffmann. *Spring, 1973: Forms of Modern Tragedy,* Gullason

545 Problems in American Realism and Naturalism *I, 3*
Readings, discussions, and papers on stylistic, thematic, and philosophic issues relating to literary artists like Howells, James, Crane, Dreiser, Hemingway, and others. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Gullason

550 Middle English Literature *II, 3*
Medieval English writing given literary rather than linguistic study. Chaucer's *Troilus and Criseyde* and works by Malory, the *Pearl*-poet, Gower, The Wakefield Master and others. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* MacLaine

551 The Metaphysical Poets *I, 3*
Intensive analysis and interpretation of poetry of Donne, Herbert, Vaughan, Crashaw, and Marvell. *(Lec. 3) Prerequisite: graduate standing or permission of instructor. In alternate years, next offered 1971-72.* Sorlien

552 Studies in the English Romantic Period *II, 3*
Intensive study in some particular aspect of British Romantic Movement. The focus will vary, to include specialized areas such as genre concepts, prose, poetry, and major writers. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Petrie and Tutt

553 Studies in Victorian Literature *I or II, 3*
Specific literary themes, genres, significant literary-historical developments, or particular writers. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Goldman and Seigel

555 Modern British Novel *I, 3*
Important British novelists of twentieth century with emphasis on major trends in ideas and techniques. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Hoffmann

561 Modern European Novel *II, 3*
Major developments in European novel during twentieth century. Special attention to Proust, Mann, Kafka, Moravia, Silone, Lagerkvist, Malraux and Camus. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Gullason

564 Modern Poets *I or II, 3*
In-depth study of one or two major modern British or American poets such as Yeats, Eliot, Pound, Frost, Stevens, Williams, Auden, Thomas, Crane, Lowell, and others; or of a school or small group of poets such as The Imagists or Objectivists, the Auden-MacNeice-Spender group, The Fugitive Poets, etc. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Goldman

570 Anglo-Irish Writers *II, 3*
The Celtic Renaissance as a literary movement, its importance and influence. AE, Lady Gregory, Joyce, O'Casey, O'Flaherty, Stephens, Synge, Yeats, and others. *(Lec. 3) Prerequisite: graduate standing or permission of instructor.* Murphy

573 Problems in Shakespeare *II, 3*
Primarily a discussion course, concentrating on plays and characters that offer most interesting problems for student analysis. Solutions by leading critics are examined. *(Lec. 3) Prerequisite: permission of instructor.* Smith

574 The Scots' Poetic Tradition through Robert Burns *I, 3*
Intensive study of the poetry of Robert Burns, Fergusson, Ramsay, and others who sparked the Scottish revival. *(Lec. 3) Prerequisite: graduate standing or permission of instructor. In alternate years, next offered 1972-73.* MacLaine

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

630 Old English *I, 3*
Introduction to the language and literature. *(Lec. 3)* Staff

631 Advanced Old English *II, 3*
Advanced readings in Old English literature. *(Lec. 3) Prerequisite: ENG 630.* Malina

Courses 640 through 661 are lectures, discussions, extensive readings, individual research, and a substantial research paper. (Lec. 3) Prerequisite: permission of department.

640, 641 Seminar in American Literature before 1900 *I and II, 3 each*
Fall, 1971: Emerson-Thoreau, Marshall. *Spring, 1973: Crane,* Gullason

642, 643 Seminar in Modern Literature (American) *I and II, 3 each*
Fall, 1971: Hemingway, Gullason. *Fall, 1972: Steinbeck,* Gullason

650, 651 Seminar in English Literature of the Middle Ages *I and II, 3 each*
Fall, 1971: Troilus and Criseyde, MacLaine. *Spring, 1972: Fourteenth Century Poetry,* Mensel. *Spring, 1973: Medieval Romance,* Malina

652, 653 Seminar in English Literature of the Sixteenth Century *I and II, 3 each*
Spring, 1972: Marlowe and Jonson, Smith. *Fall, 1972: Renaissance Theories of Man and Literature,* Murphy

654, 655 Seminar in English Literature of the Seventeenth Century *I and II, 3 each*
Fall, 1971: Religious Verse, Jacobs. *Spring, 1972: Pepys and Bunyan,* Sorlien. *Fall, 1972: Dryden,* Sorlien. *Spring, 1973: Restoration Drama,* Kunz

656, 657 Seminar in English Literature of the Eighteenth Century *I and II, 3 each*
Fall, 1971: Eighteenth Century Novel, Joel. *Spring, 1972: Swift,* Reaves. *Fall, 1972: Burns,* MacLaine. *Spring, 1973: Sterne,* Joel

658, 659 Seminar in English Literature of the Nineteenth Century *I and II, 3 each*
Spring, 1972: Coleridge and Arnold, Goldman. *Fall, 1972: Mid-Victorianism,* Seigel

660, 661 Seminar in Modern Literature (English) *I and II, 3 each*
Fall, 1971: Modern British Satirists, McCabe. *Spring, 1972: The Series Novel,* Hoffmann. *Fall, 1972:*

Images of Reality in Modern Fiction, Goldman. *Spring, 1973: Bloomsbury Group,* Goldman

691, 692 Special Problems *I and II, 3 each*
Advanced study of an approved topic, under the supervision of a member of the staff. *(Lec. 3) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

EXPERIMENTAL STATISTICS (EST)

CHAIRMAN: Professor Hemmerle (Computer Science and Experimental Statistics). Professors Merenda and L. T. Smith; Associate Professors Carney and Lawing; Assistant Professor Hanumara.

411 Statistical Methods in Research I *I, 3*
Review of mathematical concepts. Descriptive statistics, presentation of data, averages, measures of variation, skewness, kurtosis. Elementary probability, binomial and normal distributions. Sampling distributions. Statistical inference, estimation, confidence intervals, testing hypotheses. Linear regression and simple correlation. *(Lec. 3) Prerequisite: MTH 109.* Carney and Hanumara

412 Statistical Methods in Research II *II, 3*
Multiple linear regression and correlation analysis, curvilinear regression. Analysis of variance and covariance. Analysis of enumerative data. Some nonparametic methods. *(Lec. 3) Prerequisite: EST 411.* Carney and Hanumara

500 Nonparametric Statistical Methods *II, 3*
Inference problems arising when sampling from populations that are not assumed to have a particular functional form. Topics include: rank and sign tests, permutation tests and randomization, estimation, and comparison with parametric procedures. Examples illustrating the applications of nonparametric techniques. *(Lec. 3) Prerequisite: EST 411 and MTH 451, or permission of instructor. In alternate years, next offered 1972-73.* Lawing and Hanumara

511 Linear Statistical Models *I, 3*
Review of mathematical and statistical concepts. The multivariate normal distribution. Distribution of quadratic forms. Power of the F-test. The basic linear models: the general linear hypothesis, regression models, experimental design models, variance component models, mixed models. *(Lec. 3) Prerequisite: MTH 215 and EST 412 or MTH 452. In alternate years, next offered 1971-72.* Carney

520 Fundamentals of Sampling and Applications *II, 3*
Simple random sampling; properties of estimates, estimation of standard errors, confidence limits. Estimation of sample size; stratified random sampling; optimum allocation, effects of errors, and quota sampling. Regression estimates; systematic and sequential sampling. *(Lec. 3) Prerequisite: EST 411. In alternate years, next offered 1971-72.* Carney and Hanumara

532 (or ASC 532) Experimental Design *II, 3*
Application of statistical methods to biological research and experimentation. Discussion of experimental situations for which various designs are most suitable. *(Lec. 3) Prerequisite: EST 411.* L. T. Smith

541 Multivariate Statistical Methods *I, 3*
Review of mathematical concepts in matrix analysis. Multivariate normal distribution. Tests of hypotheses on means, Hotelling's T^2, discriminant functions. Multivariate regression analysis. Canonical correlations. Principal components. Factor analysis. *(Lec. 3) Prerequisite: EST 412 or PSY 510. In alternate years, next offered 1972-73.* Hanumara and Hemmerle

576 Econometrics I
See Resource Economics 576.

577 Econometrics II
See Resource Economics 577.

591, 592 Problems in Experimental Statistics *I and II, 1-3 each*
Advanced work in experimental statistics. Study of recent developments in data analysis. Courses will be conducted as seminars or as supervised individual topics. *(Lec. 3) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

610 Factor Analysis
See Psychology 610.

635 Response Surfaces and Evolutionary Operations
See Industrial Engineering 635.

FINANCE (FIN)

CHAIRMAN: Professor Pitterman (Finance and Insurance). Professors Brainard and Poulsen; Assistant Professors Booth, Fitzgerald, Hershbarger, and Speicher.

321 Corporation Finance *I and II, 3*
Forms and sources of financing business firms, large and small, corporate and non-corporate. Emphasis is on financial planning and decision making. Financial policies are also considered in their social, legal and economic effects. *(Lec. 3) Prerequisite: ECN 123, 125 and 126, and ACC 202.* Staff

322 Investments *I and II, 3*
Problems of investing funds from point of view of individual and institutional investors. Basic principles of

mechanics of investing, investment banking, investment counseling and evaluation of forecasting market trends. *(Lec. 3) Prerequisite: ECN 123 and permission of instructor, or ECN 126, junior standing.* Pitterman

330 Problems in Business Finance *II, 3*
Computer assisted study of selected advanced problems in business finance. Case problems are also used. *(Lec. 3) Prerequisite: FIN 321.* Poulsen

332 Financial Institutions *I and II, 3*
Comprehensive analysis of American financial institutions, both private and governmental; their influence upon the operations of the economy; their relationships to the individual enterprise. Emphasis is on the internal problems of asset management of the institutions. Readings and cases. *(Lec. 3) Prerequisite: ECN 123 or 126.* Staff

341 Fundamentals of Real Estate *I, 3*
Nature and importance of real estate; principles of land utilization, urban development, property rights, markets, government regulations. *(Lec. 3) Prerequisite: junior standing.* Staff

410 Capital Markets *I and II, 3*
Explanation, analysis, and clarification of the economic foundations on which money and capital markets are based. Factors of supply and demand for funds are analyzed. Emphasis is on all sources of long-term and short-term capital. *(Lec. 3) Prerequisite: ECN 123 or 126.* Staff

415 Working Capital Management *I, 3*
The role that working capital management makes upon corporate liquidity and profitability. *(Lec. 3) Prerequisite: FIN 321 and upper-class standing.* Staff

416 Long-term Investment and Financing *II, 3*
An analytical exposition concerning the problems of selecting and financing long-term investments. The application of mathematical and model building techniques to these problems is emphasized. *(Lec. 3) Prerequisite: FIN 321 and upper-class standing.* Staff

433 Bank Financial Management *I, 3*
The nature of the financial decisions facing the management of an individual bank. Current bank financial practices and research. A computer simulations exercise provides decision-making experience. Appropriate financial banking models considered. *(Lec. 3) Prerequisite: permission of instructor and senior or graduate standing.* Booth

440 Problems in Security Investments *II, 3*
Examination of specific industries, companies, and securities from the individual and institutional point of view. Techniques of investment analysis, management of risks, return on investment values. Annual reports and current cases will be used. *(Lec. 3) Prerequisite: FIN 422.* Pitterman

452 International Financial Management *II, 3*
Methods of financing multi-national corporations. Foreign exchange, international cash flow, multinational funds flow and international liquidity. Problems of international financial control. *(Lec. 3) Prerequisite: permission of instructor and junior or senior standing.* Staff

491, 492 Special Problems *I and II, 3 each*
Directed readings and research work involving financial problems under the supervision of a member of the staff. *Prerequisite: permission of instructor and junior or senior standing.* Staff

641 Financial Management *I and II, 3*
Problems and decisions as to the management of business funds as viewed by the chief financial officer. Case method used. *(Lec. 3)* Staff

648, 649 Seminar in Finance *I and II, 3 each*
Independent research conducted along lines of a theme established by the instructor; individual topics based on reading and research interests of the students; each student to present two papers during the course of each semester. *(Lec. 3)* Staff

940 Principles and Practices of Business Finance and Their Application in Business *I and II, 3*
Uses of financial instruments, problems of capital financing, financial expansion and reorganization, operations of specialized financial institutions. *(Lec. 3) Graduate credit for matriculated MBA students only.* Staff

FISHERIES AND MARINE TECHNOLOGY (FIS)

CHAIRMAN: Associate Professor Sainsbury. Associate Professor Meade; Assistant Professors Hillier, McCauley, Merriam and Motte.

013 Shipboard Work I *I, 2*
Work aboard training vessels in port and at sea. Experience is gained in operating vessels, their equipment and principal methods of fishing. *(Lab. 6)* Sainsbury, Hillier

014 Shipboard Work II *II, 1*
Work aboard training vessels at sea and in port. Experience gained in rigging and working common gear used in the commercial fishing industry. *(Lab. 3) Prerequisite: FIS 013.* Sainsbury

015 Shipboard Work III *I, 1*
Work aboard training vessels at sea and in port. Rigging, working and evaluation of fishing gear. *(Lab. 3) Prerequisite: FIS 014.* Hillier

110 Marine Technology *II, 5*
Application of basic physical principles of statics, dynamics, heat, light, sound, magnetism and electricity to problems encountered in vessel operation, fishing gear, navigation, fish finding, handling and stor-

age of fish, engineering and electrical systems. *(Lec. 5)* Taber

118 Introduction to Commercial Fisheries *I, 4*
Commercial fisheries of the world, the United States and New England, including fishing grounds, resources, catch statistics and legislation. Introduction to fisheries biology with emphasis on the natural history of important commercial species and the food chain. Effect of fishing pressure and introduction to management of fishery resources. Utilization and principal catching methods for the various important commercial species, including vessels and gear. *(Lec. 4)* Meade, Sainsbury

121 Fishing Gear I *II, 3*
Detailed study of bottom and mid-water trawls and other dragging gear. Emphasis on construction, repair and use of different rigs and net designs, including the seine net. *(Lec. 2, Lab. 3) Prerequisite: FIS 013.* Hillier

122 Fishing Gear II *I, 3*
Detailed study of the purse seine, gillnet, trap and longline. Emphasis on the construction, repair and use of the various arrangements and designs of each. Brief treatments of other fishing methods. *(Lec. 2, Lab. 3) Prerequisite: FIS 121.* McCauley, Hillier

131 Seamanship *II, 3*
Basic shipboard terminology and orientation. Safety at sea. Characteristics and use of rope and wire, tackles, gear systems, stress factors. Shipboard maintenance. Ship handling. International rules of the road. Knots, bends, hitches, rope and wire splicing. *(Lec. 2, Lab. 3)* Motte

135 Fisheries Meteorology *I, 2*
Basic practical meteorology and weather forecasting for the mariner. The atmosphere, heat budget of the earth, hydrometers. Fundamental pressure systems, air masses, formation of fronts and associated weather. Precursory signs, tracks and vessel conduct for tropical revolving storms. Ice, icebergs and icing-up conditions. World meteorological organization, coding and decoding of weather reports. *(Lec. 2) Not open to students who have taken GEG 403.* Motte

141 Marine Engineering Technology I *I, 4*
Diesel engine operation, maintenance, testing, timing, and overhaul. Basic principles of diesel designs in common use, including fuel systems, combustion chambers, piston and liner assemblies, camshafts and crankshafts, cooling systems, and lubrication systems. *(Lec. 3, Lab. 3)* McCauley

142 Marine Engineering Technology II *II, 4*
Introduction to hydraulics, including operation, maintenance, troubleshooting, installation, and applications. Study of basic hydraulic systems, design of common hydraulic components, and selection of components for various applications. Study and application of mechanical and hydraulic diesel powered drive units. Layout and uses of shipboard water pumps. *(Lec. 3, Lab. 3)* McCauley

151 Fish Technology *I, 4*
Introduction to microbiology and biochemistry as they relate to spoilage of fish. Preservation and processing methods at sea and ashore. Plant sanitation and quality control. Processing of industrial fish. *(Lec. 3, Lab. 3)* Meade

161 Marine Electronics *II, 3*
Basic electricity applied to fishing. Basic solid state and vacuum tube electronics, DC and AC machinery, ship wiring, communications, depth and fish finders, radar, electronic navigation systems. Noise control, siting and preventive maintenance of equipment. *(Lec. 2, Lab. 3)* Merriam

171 Vessel Technology *II, 4*
Flotation principles, the lines plan, detailed treatment of stability, use of hydrostatic and stability information. Powering, propeller selection. Construction in wood, steel, ferro concrete and GRP. Introduction to vessel economics leading to choice of size and particulars. *(Lec. 3, Lab. 3)* Sainsbury

181 Navigation I *I, 4*
Fundamental rules and methods of chartwork. Chart projections and types. Position fixing, wind and tide allowance. Variation, deviation and compass error. Principle of transferred position line and doubling angle on the bow. Use of sextant angles, radar, hyperbolic, and celestial position lines for chartwork. Tidal theories and calculations involving parallel, plane and mercator sailings. *(Lec. 2, Lab. 4)* Motte

182 Navigation II *II, 3*
Continuation of Navigation I. Basic astronomy applied to celestial navigation. Study of time and the solar system. Azimuth, amplitude, pole star and meridian altitude problems. Sight reduction by calculation, short method tables and inspection. Use of information from electronic aids to navigation. *(Lec. 2, Lab. 4) Prerequisite: FIS 181.* Motte

192 Fishing Operations *II, 4*
Principles of fishing vessel operation. Year-round, seasonal, trip, daily planning and work. Working the New England grounds for principal commercial species, including correct rigging of gear and fishing procedures. Fishing vessel management and business procedures. *(Lec. 3, Lab. 3) Prerequisite: FIS 015 and 122.* McCauley

FOOD AND NUTRITIONAL SCIENCE (FNS)

CHAIRMAN: Professor Dymsza (Food and Nutritional Science, and Food Services). Associate Professors Bacon and Constantinides; Assistant Professors Goshdigian, Jenks, and B. C. Stanislao; Instructor Blecharczyk; Adjunct Professor G. Silverman.

101 Introductory Food Study *I and II, 3*
Basic principles of food selection in today's market and preparation to retain maximum nutritive values and palatability. *(Lec. 2, Lab. 3)* Staff

207 General Nutrition *I and II, 3*
Fundamental concepts of science of nutrition with application to world, community and personal aspects. *(Lec. 3)* Staff

221 Meal Management *I and II, 3*
Managerial aspects of planning, preparing and serving food for family meals and special occasions. Food economics and problems of purchasing. *(Lec. 2, Lab. 3) Prerequisite: FNS 101.* Staff

331 Advanced Food Study *I, 3*
Application of principles, techniques, and advanced theory to selected problems of food preparation. *(Lec. 2, Lab. 3) Prerequisite: FNS 101, CHM 124.* Bacon

333 Quantity Food Production *II, 3*
Adaptation of recipes, use of equipment, and methods suitable for large quantity food preparation, with experience in cafeteria service and catering. *(Lec. 1, Lab. 4) Prerequisite: FNS 101, junior standing or permission of department.* Goshdigian

336 Demonstration Methods of Food and Equipment *II, 2*
Basic principles and techniques of demonstrations. Evaluation of the educational effectiveness of the presentations. *(Lab. 4) Prerequisite: permission of department.* Staff

337 Introductory Food Science *I, 3*
Survey of the basic principles of food science and technology. Technology of food products. Food utilization and the world food problem. *(Lec. 3) Prerequisite: 1 year of chemistry.* Constantinides

378 Sensory Evaluation of Foods
See Animal Science 378.

401, 402 Special Problems *I and II, 2-4 each*
Open to qualified seniors and graduate students who wish to do advanced work. *(Lec. or Lab. according to nature of problem) Prerequisite: senior standing and permission of department.* Staff

438 Experimental Food Science *II, 3*
Principles and instrumentation techniques of basic and applied food research. Investigation of special food problems. *(Lec. 1, Lab. 6) Prerequisite: FNS 337 or permission of department.* Constantinides

441 Advanced Human Nutrition *I, 3*
Advanced study of principles of nutrition, factors affecting nutritional requirements and the role of nutrients in metabolic processes and in processed food products. *(Lec. 3) Prerequisite: FNS 207, biochemistry which may be concurrent, or permission of department.* Dymsza

444 Diet Therapy *II, 3*
Role of nutrition and diet in treatment of disease. *(Lec. 3) Prerequisite: FNS 441 or permission of department.* Staff

445 Readings in Nutrition *II, 2*
Reports and discussion of scientific developments. *(Lec. 2) Prerequisite: FNS 441 or permission of department.* Staff

502 Advanced Experimental Foods *II, 3*
Application of the principles of food science and technology in the development of food products, considering effective methods of preparation, processing and preservation, and the control and evaluation of food product quality. *(Lab. 6) Prerequisite: permission of department.* Staff

503 Nutrition Research Methods *I, 3*
Comprehensive study of literature. Practice in techniques and methods as applied to animal and human nutrition research. *(Lec. 1, Lab. 4)* Staff

504 Food Science and Nutrition Seminar *II, 3*
Studies and discussions of recent research. Presentation of papers on selected topics from basic and applied food science and nutrition. *(Lec. 3)* Staff

505, 506 Marine Foods Seminar *I and II, 1 each*
Study of current problems of marine foods such as those concerned with the resource, supply, health safety, nutritive value, preservation and consumer acceptability. Participation by students, faculty, and visiting lecturers. *(Lec. 1)* Staff

531 Teaching of Nutrition
See Education 531.

591, 592 Special Research Problems *I and II, 2-4 each*
Advanced work under supervision of staff member. Arranged to suit individual requirements of students. *Prerequisite: permission of department. For graduate students only.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

FOOD AND RESOURCE CHEMISTRY (FRC)

CHAIRMAN: Professor Salomon. Professors Chichester, Felbeck and Olney; Associate Professors Simpson and Rand; Assistant Professor Gilbert; Adjunct Associate Professor Zaroogian.

411 Soil Chemistry *I, 3*
Chemistry and analysis of soils. Previous courses in soils and quantitative analysis advised. *(Lec. 2, Lab. 3) (Lab. TBA) Prerequisite: junior standing.*
Salomon

412 Soil Biochemistry *II, 3*
Origin, chemical and physical characteristics, and transformations of organic compounds and biological polymers in soils. Previous courses in organic chemistry and soils advised. *(Lec. 1, Lab. 6) Prerequisite: junior standing. In alternate years, next offered in 1971-72.* Felbeck

421 Pesticide Chemistry *I, 3*
Chemical formulas, chemical and physical properties, toxicology and methods of analysis for insecticides, fungicides and herbicides. *(Lec. 2, Lab. 3) (Lab. TBA) Prerequisite: organic chemistry and junior standing.* Olney

431 Biochemistry of Foods *I, 3*
Introduction to food science with special emphasis on the chemistry and biochemistry of the essential components common to foods of plant and animal origin. *(Lec. 3) Prerequisite: organic chemistry.* Simpson and Rand

432 Biochemistry of Food Processing *II, 3*
Major emphasis on the problems of biochemical deterioration of foods and the principles of unit processes for the preservation of foods. Field trips and laboratory sessions will be scheduled. *(Lec. 2, Lab. 2) Prerequisite: organic chemistry.* Simpson and Rand

452 Plant Biochemistry *II, 3*
Basic course in the biochemistry of plant metabolism with emphasis on laboratory study of plant constituents. *(Lec. 2, Lab. 3) (Lab. TBA) Prerequisite: organic chemistry and junior standing.* Salomon

491, 492 Special Projects *I and II, 3 each*
Advanced work under supervision of staff member. Arranged to suit individual requirements of student. *(Lab. 9) Prerequisite: permission of department.* Staff

501, 502 Seminar *I and II, 1 each*
Preparation and presentation of papers on subjects in selected areas relating to Food and Resource Chemistry. Staff

526 (or MCH 526) Lipid Chemistry *II, 3*
Advanced course in the chemistry of biologically important lipids such as the fatty acids, neutral glycerides, phospholipids, steroids, and the chemistry and biochemistry of the carotenoids. *(Lec. 3) Prerequisite: BCH 581.* Olney, J. G. Quinn, Simpson, and Turcotte

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

691, 692 Research in Food and Resource Chemistry *I and II, 3 each*
Assigned research on an advanced level. Student is required to outline problem, conduct the necessary literature survey and experimental work, and to present his observations and conclusions in a report. Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

FOOD SERVICES (FDS)

CHAIRMAN: Professor Dymsza (Food and Nutritional Science, and Food Services). Assistant Professors Goshdigian and B. C. Stanislao.

335 Food Service Management *I, 3*
Job analysis, employee training, personnel relations, equipment requirements, and sanitation in institutional food service. *(Lec. 1, Lab. 4) Prerequisite: FNS 101 and junior standing or permission of department.* Goshdigian

336 Quantity Food Purchasing *II, 3*
Principles and methods of purchasing by specification, menu planning and cost analysis. Field trips required. *(Lec. 1, Lab. 4) Prerequisite: FNS 101 and junior standing or permission of department.* Staff

481, 482 Special Problems *I and II, 2-4 each*
Open to qualified seniors who wish to do advanced work. *(Lec. or Lab. according to nature of problem.) Prerequisite: senior standing and permission of department.* Staff

FOREST AND WILDLIFE MANAGEMENT (FOR)

CHAIRMAN: Associate Professor Gould. Professor Patric; Associate Professors J. H. Brown and Kupa; Adjunct Professor Rego.

301, 302 General Forestry *I and II, 3 each*
Scope of forestry, professional opportunities, present forest conditions and problems. Small forest management covering identification and characteristics of Rhode Island forest trees, surveying and inventory of tracts, management of various Rhode Island timber types, forest protection and marketing of forest products. Laboratory includes field application of forest techniques. *(Lec. 2, Lab. 2)* Gould and Brown

305 General Wildlife Management *I, 3*
Introduction to wildlife management. Typical forest and farm game species are studied. Forest and farm habitats are analyzed and management techniques emphasized. *(Lec. 2, Lab. 2) Prerequisite: BOT 111, ZOO 111, or BIO 101 and 102.* Gould

306 General Wildlife Management *II, 3*
Continuation of FOR 305 with introductory wetlands management. Typical furbearers, waterfowl and fish. Emphasis on habitat management. *(Lec. 2, Lab. 2) Prerequisite: FOR 305.* Gould

401 Forest Influences *I, 3*
Effects of forest vegetation on local climate, the hydrologic cycle, soil, and man; relationships to water yield and runoff. Measurement of precipitation, runoff and other variables. *(Lec. 3) Prerequisite: junior standing; one course in field botany recommended. In alternate years, next offered 1971-72.* Brown

402 Wildlife Populations *II, 3*
Ecological presentation of the characteristics of exploitable animal populations and the mechanisms that regulate their numbers through time with a survey of methods used in wildlife population research. *(Lec. 2, Lab. 3) Prerequisite: ZOO 111 or BIO 102 (ZOO 362 recommended). In alternate years, next offered 1971-72.* Kupa

491, 492 Special Projects *I and II, 1-3 each*
Special work to meet the needs of individual students in the fields of forestry and wildlife management. *(Lec. and/or Lab. according to nature of project.) Prerequisite: permission of department.* Staff

FRENCH (FRN)

CHAIRMAN: Associate Professor Kossoff (Languages). Professors Porter and Waters; Associate Professors Demers, J. Hyland and Rothschild; Assistant Professors Driver, Kuhn, Morello, Rogers and Toloudis; Instructors Benson and Mead.

101, 102 Elementary French *I and II, 3 each*
Fundamentals of grammar and pronunciation; exercises in reading, writing, and conversation. *(Lec. 3)* Staff

103, 104 Intermediate French *I and II, 3 each*
Development of facility in reading texts of moderate difficulty; supplemented by further work in grammar, conversation, and composition. *(Lec. 3) Prerequisite: FRN 102.* Staff

205, 206 Conversation and Composition *I and II, 3 each*
Facility in comprehension of spoken French, in speaking with ease and an acceptable accent on assigned topics; oral reports on articles read in newspapers and periodicals and frequent written compositions. *(Lec. 3) Prerequisite: FRN 104 or equivalent.* Staff

301, 302 The Civilization of France *I and II, 3 each*
A review of the geographical, historical, economic, social and esthetic factors contributing to the cultural development of France. *(Lec. 3) Prerequisite: for FRN 301, FRN 206; for FRN 302, FRN 301 or permission of department. Recommended for French majors in the General Teacher Education curriculum. In alternate years, next offered 1971-72.* Demers

305 Composition *I, 3*
Writing of literary French. Frequent compositions and critiques with emphasis on the stylistic devices. Recommended for those concentrating in French. *(Lec. 3) Prerequisite: FRN 206 or equivalent.* Porter

306 Oral Expression in French *II, 3*
Designed to improve ability in conversation, discussion, short speech-making, pronunciation, everyday vocabulary. Deals with matters of current interest in France selected by instructor and students. *(Lec. 3) Prerequisite: FRN 206 or equivalent.* Staff

325 Introduction to Literary Forms *I, 3*
Studies in the novel, poetry, theater and the essay. *Explication de texte* and short compositions. *(Lec. 3) Prerequisite: FRN 206. FRN 325 and FRN 206 may be taken concurrently by permission of instructor.* Staff

326 Introduction to Literary Movements *II, 3*
Evolution of literary movements from the Middle Ages to the present. *Explication de texte, exposés* and short compositions. *(Lec. 3) Prerequisite: FRN 206. FRN 326 and FRN 206 may be taken concurrently by permission of instructor.* Staff

391 Survey of French Literature from the Middle Ages *I and II, 3*
Major developments in French literature from the Middle Ages through 1789. Reading in translation of selected literary works from representative authors. *(Lec. 3) This course may not be taken for credit toward concentration requirements in French.* Staff

392 Survey of Nineteenth-Century French Literature *I or II, 3*
Reading in translation of selected literary works from representative nineteenth-century authors. *(Lec. 3) This course may not be taken for credit toward concentration requirements in French.* Staff

393 Survey of Twentieth-Century French Literature *I or II, 3*
Reading in translation of selected literary works from representative twentieth-century authors. *(Lec. 3) This course may not be taken for credit toward concentration requirements in French.* Staff

402 French Phonetics *II, 3*
Introduction to articulatory phonetics and to phonetic notation; practical work on phonetic transcription. Rudiments of recognizing and reproducing French intonation patterns. Practical work in the language laboratory in phonetics and intonation. *(Lec. 3) Prerequisite: FRN 205 or permission of instructor. Not for graduate degree program credit in French. In alternate years, next offered 1972-73.* Rogers

431, 432 French Literature of the Seventeenth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree pro-*

gram credit in French. In alternate years, next offered 1972-73. Morello

441, 442 French Literature of the Eighteenth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French. In alternate years, next offered 1972-73.* Rothschild

451 Romanticism *I, 3*
General survey of Romantic poets and prose writers. Authors studied are Chateaubriand, Constant, Lamartine, Musset, Vigny, Hugo. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Toloudis

452 Realism and Symbolism *II, 3*
Realist and Symbolist movements of the nineteenth century. Writers usually read are Balzac, Stendhal, Flaubert, Zola, Baudelaire, Verlaine, Rimbaud, Mallarmé. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* J. Hyland

461 Drama of the Twentieth Century *I, 3*
Representative dramatists. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Waters

462 Poetry of the Twentieth Century *II, 3*
Representative poets of the period. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Mead

463 Twentieth-Century Prose through 1950 *I, 3*
Special emphasis on the novelists of that period. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Demers

464 Twentieth-Century Prose since 1950 *II, 3*
Special emphasis on the *nouveau roman. (Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Demers

472 Black and Arab French Theater *II, 3*
French-language plays by authors of the Maghrib, the sub-Sahara, and the black diaspora. *(Lec. 3) Prerequisite: FRN 325 or 326 or permission of instructor. Not for graduate degree program credit in French.* Waters

497, 498 Directed Study *I and II, 3 each*
Designed particularly for the advanced student. Individual research and reports on problems of special interest. *Prerequisite: acceptance of a project by a member of the staff and departmental approval.* Staff

501 Advanced Composition *I, 3*
Primarily a course in stylistics designed to prepare undergraduate and graduate majors to write expository French prose. *(Lec. 3) Prerequisite: graduate status or permission of instructor. Required of all candidates for the M.A. degree in French. Should be taken in the first semester of the candidate's work.* Porter

502 Stylistics *II, 3*
Emphasis on acquisition of ability to write at length in an acceptable literary style. Each student will be expected to prepare a study of monograph length on an appropriate subject. *(Lec. 3) Prerequisite: FRN 501 or equivalent.* Porter

503, 504 History of the French Language *I and II, 3 each*
Linguistic development of French from the *Serments de Strasbourg* to the end of the Middle Ages. Particular attention to sound and form changes. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Porter

511, 512 French Literature of the Middle Ages *I and II, 3 each*
Intensive study of French literature in the medieval period. Reading of selected texts and discussion of the literary values of Old French. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Porter

513 Special Problems in Old French Literature *I, 3*
Detailed study of an individual author or of a particular subject in Old French literature. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Porter

521, 522 French Literature of the Sixteenth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Benson

531 The Tragic Theater of the Seventeenth Century *I, 3*
French tragic theater in the seventeenth century, with particular attention to the works and influence of Corneille and Racine. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Morello

532 The Comic Theater of the Seventeenth Century *II, 3*
French comic theater of the seventeenth century, with particular attention to the works and influence of Molière. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Morello

541 The Age of Enlightenment *II, 3*
Intellectual trends in seventeenth-century French literature as it relates to the important eighteenth century philosophical production of Montesquieu, Voltaire, Buffon, Diderot and others. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Rothschild

542 The Theater of the Eighteenth Century *I, 3*
Theater of the eighteenth century, with emphasis on the dramatic works of Regnard, LeSage, Marivaux, Voltaire and Beaumarchais. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Rothschild

543 The Novel of the Seventeenth and Eighteenth Centuries *I, 3*
Evolution of the French novel, with emphasis on writers such as D'Urfé, Scarron, Mme. de Lafayette, LeSage, Marivaux, Prévost, Voltaire and Diderot. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Rothschild

551 The Romantic Movement *I, 3*
Detailed study of the chief proponents of the movement, particularly Chateaubriand, Mme. de Staël, Constant, Lamartine, Hugo, Vigny, Musset, Sand *et al. (Lec. 3) Prerequisite: graduate status or permission of instructor.* Toloudis

552 Realism and Naturalism *I, 3*
French Realism and Naturalism as illustrated in Balzac, Flaubert, Zola, de Maupassant, the Goncourt *et al. (Lec. 3) Prerequisite: graduate status or permission of instructor.* J. Hyland

553 The Symbolist Movement *I, 3*
Intensive study of poetry of Baudelaire, Verlaine, Rimbaud, Mallarmé and of their sources and influence. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Waters

561 Contemporary French Theater through 1950 *I and II, 3*
Survey of important dramatists and *metteurs en scène* from Symbolism and Realism through 1950. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Toloudis

562 French Theater since 1950 *II, 3*
Emphasis on recent developments such as the theater of the absurd and social theater. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Waters

563 The Novel of the Twentieth Century *I, 3*
Intensive study of major novelists with emphasis on trends in philosophies and in techniques as illustrated by such authors as Gide, Mauriac, Malraux, Saint-Exupéry, Sartre, Camus, *et al. (Lec. 3) Prerequisite: graduate status or permission of instructor.* Toloudis

591 Proust and Claudel *II, 3*
Analysis and interpretation of the imaginative writings of Proust and Claudel. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Waters

594 Graduate Seminar *I and II, 3*
Group and/or individual investigation of special problems in French literature. Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

901, 902 Graduate Reading Course in French *I and II, 0*
Two-semester course prepares the graduate student in other fields to use French to further research in his major field. Attention is given primarily to acquiring a reading knowledge with little emphasis on the spoken language. Assumes no prior knowledge of French. Staff

GENERAL BUSINESS ADMINISTRATION (GBA)

110 Introduction to Business *I and II, 3*
Nature, philosophy, objectives, and scope of the American Business System. Emphasis in the interrelations of the functional areas. *(Lec. 3) Limited to students in the Fisheries and Marine Technology program.* Staff

410 Business Policy *II, 3*
Analysis of the problems of top management and integration of all areas in the business curriculum into management decision making. Conducted primarily on a case method basis. *(Lec. 3) Prerequisite: senior standing.* Staff

655 International Business Administration *I and II, 3*
Problems and policies of international business enterprise; economic, legal, political, social and cultural aspects. *(Lec. 3) Prerequisite: permission of department.* Staff

671 Methods of Business Research *I and II, 3*
Toward an understanding of the role, spirit, and methodology of business research. Assigned research projects. *(Lec. 3) Prerequisite: permission of department.* Poulsen

681 Administrative Policy and Decision-making *I and II, 3*
Review of the functional areas of marketing, production, finance, economics, accounting, quantitative methods, organization theory, interpersonal relationships, control and motivation systems, and communications. Includes the MBA written comprehensive examination according to Graduate School requirements. *(Lec. 3) Prerequisite: permission of MBA director.* Staff

GENETICS (GEN)

352 (or ASC 352 or BOT 352) General Genetics *I and II, 3*
General course dealing with the fundamental concepts of inheritance and variation in plants, animals, bacteria, and viruses. *(Lec. 3) Prerequisite: BOT 111, or BIO 101 or 102, or ZOO 111, sophomore standing.* L. T. Smith (I) and Mottinger (II)

354 (or ASC 354 or BOT 354) Genetics Laboratory *I and II, 2*
Basic principles of heredity demonstrated with various organisms ranging from viruses and bacteria to higher plants and animals. *(Lab. 4) Prerequisite: GEN 352 and permission of instructor. May be taken concurrently with GEN 352.* L. T. Smith (I) and Mottinger (II)

470 (or ASC 470) Population Genetics *II, 3*
Genetic structure of breeds or other population. Effect of gene number, degrees of dominance, gene interaction, non-genetic factors. Conditions of equilibrium. Rates of change in population mean and variability. Inbreeding, outbreeding, assortative mating, mass selection, family selection, progeny testing, selection indices, comparison of various breeding plans in plant and animal breeding. *(Lec. 3) Prerequisite: GEN 352 or equivalent. In alternate years, next offered 1972-73.* L. T. Smith

579 Advanced Genetics Seminar
See Zoology 579.

683 (or OCG 683) Quantitative Genetics I *I, 3*
Quantitative approach to population genetic phenomena. Derivation of theoretical genetic formulae. Expected genetic change and its constituent genetic parameters. *(Lec. 3) Prerequisite: GEN 352, MTH 141, or permission of instructor.* Staff

684 (or OCG 684) Quantitative Genetics II *II, 3*
Interpretation and application of theoretical genetic formulae and parameters. *(Lec. 3) Prerequisite: GEN 683 or permission of instructor.* Staff

GEOGRAPHY (GEG)

CHAIRMAN: Professor Alexander. Professors Baum, Higbee and Michel; Assistant Professors Brand and Havens.

Note: For additional courses, see Earth Science.

100 The Geography of Human Ecosystems *I and II, 3*
The evolution of human environments from the stone age to the contemporary megalopolis and the emergent world city in terms of man-earthspace-resource relationships. *(Lec. 3)* Higbee

103 Economic Geography *I and II, 3*
Surveys the geographic backgrounds of economic activities. Populations and the resources of agriculture, industry, and commerce are studied in terms of their world and regional distribution. *(Lec. 2, Rec. 1)* Staff

121 Cultural Geography *I and II, 3*
Introductory survey of cultural variations in the spatial organization of man's total environment. Attention to developmental processes affecting contemporary spatial patterns in agrarian and urban settings with emphasis on non-Western experiences. *(Lec. 3)* Brand

131 Political Geography *I and II, 3*
Pattern of political units throughout the world, special emphasis on boundaries, newly independent nations, and other aspects of political control over territory. *(Lec. 3)* Alexander

403 Meteorology and Climatology I *I, 3*
Introduction to the basic meteorological processes, their spatial and temporal variations. Energy and moisture budgets at the surface of the earth. *(Lec. 3) Prerequisite: ESC 101 or permission of department.* Havens

404 Meteorology and Climatology II *II, 3*
Selected topics in climatic classification, regional climate, micro-climatology, climatic change, and applied aspects of meteorology and climatology. *(Lec. 3) Prerequisite: GEG 403.* Havens

407 Selected Topics in Meteorology *II, 2*
Seminar, with each student exploring in depth some topic in meteorology germane to his particular interests. *(Lec. 2) Prerequisite: GEG 403 or equivalent.* Baum

411 Urban Geography *I, 3*
Growth and spatial organization of urban places at macro- and micro-regional scales of investigation in cross-cultural contexts. Emphasis on evolution of internal socio-cultural patterns and on the role of urbanization in modernization processes. *(Lec. 3) Prerequisite: one 100-level geography course or permission of department.* Brand

412 Seminar in Urban Geography *I and II, 3*
Urban patterns, their development, sizes, spacing, structure, and relationship to the global urban network. Emphasis on the urban environment as a context for geographic studies. *(Lec. 3) Prerequisite: GEG 100 or permission of department.* Higbee

421 Introductory Cartography *I and II, 3*
Compilation, design, and interpretation of maps. Practice in drawing maps and in cartographic use of statistical materials. *(Lec. 2, Lab. 3)* Staff

422 Advanced Cartography *II, 3*
Elementary photogrammetry, uncontrolled mosaics, and photo interpretation with an emphasis on the use of aerial photographs to supplement and simplify field research. Techniques for the automated graphic display of quantitative geographic information on the printer and increment plotter; interpolation algorithms; introduction to automated map interpretation. *(Lec. 2, Lab. 3) Prerequisite: GEG 421 or 6 credits in computer science, or permission of department.* Staff

432 Seminar in Political Geography *II, 3*
Special problems of territorial control, including the changing nature of international boundaries, elements

of unity and diversity within nations, and concepts of geopolitics. *(Lec. 3) Prerequisite: GEG 131 or permission of department.* Alexander

441 Geography of Europe *I, 3*
Physical and cultural elements of Europe, excluding the Soviet Union, with special emphasis on economic and political aspects of individual countries since World War II. *(Lec. 3) Prerequisite: GEG 103, 131, or permission of department.* Michel

442 Geography of the Soviet Union *I, 3*
Physical, economic, ethnographic, and political bases of Soviet Union. Problems of Soviet industrial and agricultural development. Changing patterns of settlement. *(Lec. 3) Prerequisite: ESC 101 and 105, or permission of department. In alternate years, next offered 1971-72.* Michel

443 Geography of the United States and Canada *II, 3*
Survey of geographic regions of United States and Canada, emphasizing interdependence of these regions upon one another and their potentials for future economic development. *(Lec. 3) Prerequisite: GEG 100 or permission of department.* Higbee

444 Geography of the Middle East and the Indian Subcontinent *II, 3*
Regional analysis of the lands and peoples from Egypt to East Pakistan, with emphasis upon the geographical problems of the modern states including boundary and water disputes, resource base, and economic development. *(Lec. 3) Prerequisite: ESC 101 and 105, or GEG 103, 121 or 131, or permission of department.* Michel

445 Geography of Modernization in Africa *II, 3*
Systematic survey of spatial aspects of the modernization process. Constraints and potentialities present in contrasting environmental-cultural complexes. Selective coverage of developmental processes active in explaining contemporary patterns of social and economic occupance. *(Lec. 3) Prerequisite: one 100-level geography course or permission of department.* Brand

446 Geography of the Polar Regions *II, 3*
Systematic and regional surveys of the physical and biological environments of the Arctic and sub-Arctic. Recent contributions to the geography of the Antarctic. *(Lec. 3) Prerequisite: ESC 101 or permission of department. In alternate years, next offered 1971-72.* Havens

451 Land Utilization *I, 3*
Physical differences in land quality and the various functions of land in the modern community. Consideration given to the principles of land planning for effective use and conservation in rural and urban areas. *(Lec. 3) Prerequisite: ESC 101.* Higbee

463 Geography of World Resources *II, 3*
Distribution, development, and rational utilization of the world's biological, mineral and energy resources, including the resources of the sea and sea bottom. *(Lec. 3) Prerequisite: GEG 103 or permission of department.* Staff

491, 492 Special Problems in Geography *I and II, 3 each*
Individual guidance in major readings in geography and methods of geographic research. *(Lec. 3) Prerequisite: permission of department.* Staff

502 Research Methods in Geography *I, 3*
Fundamentals of geographic research, including techniques of field observation and interpretation, and the introduction to the use of the Computer Laboratory and computer package program. *(Lec. 3) Prerequisite: GEG 491 or permission of department.* Staff

526 Plant Geography
See Botany 526.

543 Geography of Megalopolis *I, 3*
A geographical analysis of the northeastern seaboard of the United States in terms of its physical and economic foundations, its distinctiveness as a region, and the key role the analysis of Megalopolis plays in understanding incipient major conurbations in the United States and the world. *(Lec. 3) Prerequisite: GEG 443 or 544 or permission of department. In alternate years, next offered 1971-72.* Staff

544 Historical Geography of the United States *I, 3*
Selected regional analysis of the United States, stressing patterns of settlement, routes of migration, frontier advance, and resource development from the colonial period into the twentieth century. *(Lec. 3) Prerequisite: GEG 103, 443, or permission of department.* Staff

545 Geography of the North Atlantic Basin *II, 3*
Description and analysis of the North Atlantic Ocean and its borderlands, including northeastern North America and the western littoral of Europe. Emphasis on orientation to, and use of, the marine environment, and on the role of the North Atlantic both as a uniting and divisive force in the western community. *(Lec. 3) Prerequisite: GEG 131 or permission of department.* Alexander

571 Marine Geography *I, 3*
The marine region as a unique complex of physical and cultural elements. The purpose is to analyze functional relationships within the region and to assess forms of regional organization and control. *(Lec. 3) Prerequisite: permission of department.* Alexander

591, 592 Directed Study or Research *I and II, 3 each*
Covers areas of special research interests of graduate students. *(Lec. 3) Prerequisite: permission of department.* Staff

595 Problems of Modernization in Developing Nations
See Economics 595.

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

GEOLOGY (GEL)

CHAIRMAN: Professor J. A. Cain. Associate Professor Tynan; Assistant Professors J. J. Fisher, Hampton and Hermes; Lecturer Sage.

Note: For additional courses, see Earth Science.

103 Physical Geology *I, 3*
Introduction to the study of earth, its composition, development, and destruction in relation to natural processes and phenomena acting upon it. Laboratory includes introduction to study of minerals and rocks, their physical properties and mode of origin, and introduction to geologic and topographic map interpretation. *(Lec. 2, Lab. 2) This course followed by GEL 104 can satisfy the B.A. and B.S. curriculum requirements for 1 year of physical science.* J. J. Fisher and Hermes

104 Historical Geology *II, 3*
Development of continents and ocean basins, method of preservation of fossils, their classification, and introduction to study of fossil plants and animals. *(Lec. 2, Lab. 2) Prerequisite: GEL 103 or permission of instructor.* Tynan

105 Geological Earth Science
See Earth Science 105.

106 Geological Earth Science Laboratory
See Earth Science 106.

301 Geology of Mineral Resources *I, 3*
Origin and distribution of various mineral resources such as metals, coal, petroleum, natural gas, building and industrial materials. Strategic minerals, their world distribution and part played in world affairs. *(Lec. 3) Prerequisite: GEL 103, 302, or ESC 105 and 106. Offered in fall of even calendar years.* Cain

302 Engineering Geology *I, 3*
Introduction to principles of geology, and a consideration of geologic problems confronting civil engineers. General characteristics of various types of rock, coast and harbor control, reservoirs and dam sites, ground water, etc. *(Lec. 3).* Cain and Hampton

410 Geomorphology *I, 3*
Introduction to classification of landforms, their development, distribution and associated geologic processes. Cycles of development of coastal, glacial and fluvial landforms. Laboratory includes landform analysis of topographic maps and aerial photographs. Field trips illustrate both local and regional geomorphic features. *(Lec. 2, Lab. 3) Prerequisite: GEL 103 and 104, or ESC 105 and 106, and permission of instructor. Intended for geology majors.* Fisher

420 Mineralogy *I, 3*
Systematic study of crystallography, morphology, and the physical properties of minerals as related to their crystal structure and chemical composition. Laboratory study of crystal morphology and identification of the most common and geologically important minerals. *(Lec. 2, Lab. 3) Prerequisite: GEL 103 or ESC 105 and 106, PHY 112 or 214, and CHM 101 or 103, or permission of instructor.* Hermes

421 Optical Mineralogy *II, 3*
Elementary study of the optical properties of minerals and their identification using the polarizing microscope. The latter part of the course will consist of a systematic survey of the major rockforming minerals and their identification by optical techniques. *(Lec. 2, Lab. 3) Prerequisite: GEL 420.* Hermes

425 Principles of Geochemistry *I, 3*
Applications of basic chemical concepts to geological problems. Topics include historical geochemistry, crystal chemistry, the phase rule, geochemistry of natural rock systems, isotope geochemistry, distribution of the elements, and geochemical cycles. *(Lec. 3) Prerequisite: GEL 420, CHM 110 (may be taken concurrently) or permission of instructor. Offered in fall of even calendar years.* Hermes

430 Petrology *II, 3*
Composition, classification and genesis of igneous, sedimentary and metamorphic rocks. Interpretation of mineral assemblages and textures in both hand specimen and thin section. *(Lec. 2, Lab. 3) Prerequisite: GEL 420, CHM 110 and concurrent registration in GEL 421, or permission of instructor.* Cain

440 Introduction to Paleontology *I, 3*
History, methods, nature and problems. Systematic survey of animal organisms found as fossils with particular emphasis on their morphology, taxonomy and geologic distribution. Field trips for study and collection of fossil and modern invertebrate forms. *(Lec. 2, Lab. 4) Prerequisite: GEL 104, or ESC 105 and 106 and ZOO 111, or permission of instructor.* Tynan

450 Introduction to Stratigraphy and Sedimentation *II, 3*
Introduction to the principles underlying the formation, composition, sequence, and correlation of stratified rocks. Methods, procedures and techniques of studying sedimentary processes, sedimentary environments, stratigraphic relationships, and stratigraphic correlation. *(Lec. 2, Lab. 3) Prerequisite: GEL 103 and 104 or ESC 105 and 106 and GEL 430, or permission of instructor.* Hampton

465 Introduction to Geophysics *II, 3*
Introduction to the physical properties of the earth, its interior, and the forces shaping the major tectonic structures. Primarily solid state geophysics relating to earth's crust, gravity, the earth's core, geomagnetism, earthquakes and seismology. Field application of instrumental geophysical exploration techniques. *(Lec.*

2, Lab. 3) Prerequisite: GEL 103 or ESC 105 and 106, PHY 112 and 214, or permission of instructor. Offered in spring of odd calendar years. Staff

470 Structural Geology *II, 3*
Stress and strain relationships as they pertain to rocks. Manifestations of these phenomena in geologic structures and criteria for recognizing them. *(Lec. 2, Lab. 3) Prerequisite: GEL 103 and 104, or ESC 105 and 106.* Hampton

490 Senior Thesis *I and II, 3*
Introduction to independent research. Student will select an area of study and will work in close conjunction with a faculty member of his own choice. *(Lab. 6) Prerequisite: senior standing and permission of instructor. Not for graduate degree program credit.* Staff

510 Coastal Geomorphology *II, 3*
Principles of coastal development and interpretation in relation to endogenetic and exogenetic shore processes including beach formation and erosion. Former beaches on emerged coastal plains and submerged continental shelves are related to experimental model studies and applied field studies. *(Lec. 2, Lab. 3) Prerequisite: GEL 410, or permission of instructor. Offered in spring of odd calendar years.* Fisher

526 Igneous and Metamorphic Geochemistry *II, 3*
Applications of elementary thermodynamics to geologic problems including phase equilibria and igneous and metamorphic reactions. Incorporates the classical approach and a survey of the current literature in the area of geochemical petrology. *(Lec. 3) Prerequisite: GEL 425, MTH 243. Offered in spring of odd calendar years.* Hermes

530 Igneous Petrology *I, 3*
Tectonic and chemical bases for igneous phenomena stressing the association concept of igneous activity. Evaluation of the criteria used in petrogenetic interpretations. *(Lec. 2, Lab. 3) Prerequisite: GEL 430 and CHM 331, or permission of instructor. Offered in fall of odd calendar years.* Cain

531 Metamorphic Petrology *II, 3*
Facies concept and other methods of interpreting metamorphic mineral assemblages. Chemical and fabric changes during metamorphism, including principles of structural petrology. *(Lec. 2, Lab. 3) Prerequisite: GEL 430 and CHM 331, or permission of instructor. Offered in spring of even calendar years.* Cain

541 Animal Micropaleontology *II, 3*
Concentrated study of animal microfossils with primary emphasis on taxonomy, morphology, ecology, and stratigraphic occurrence. *(Lec. 2, Lab. 3) Prerequisite: GEL 440 or permission of instructor. Offered in spring of even calendar years.* Tynan

542 Plant Micropaleontology *I, 3*
Concentrated study of plant microfossils with primary emphasis on taxonomy, morphology, ecology, and stratigraphic occurrence. *(Lec. 2, Lab. 3) Prerequisite: GEL 541 and BOT 111, or permission of instructor. Offered in fall of even calendar years.* Tynan

550 Sedimentation *I, 3*
Study of sedimentary processes. Topics include the origin of the original rock, transport of clastics and dissolved materials, deposition of sediments, changes in the sediments before complete lithification, and lithification. Laboratory: comprises methods and techniques to obtain data for solution of sedimentary problems. *(Lec. 2, Lab. 3) Prerequisite: GEL 440, 450, or permission of instructor. Offered in fall of even calendar years.* Hampton

551 Sedimentary Petrology *II, 3*
Characteristics of sediments and sedimentary rocks as a function of the environments of source, transportation, deposition, and diagenesis. *(Lec. 2, Lab. 3) Prerequisite: GEL 550 or permission of instructor. Offered in spring of odd calendar years.*

555 Stratigraphy *II, 3*
Study of the principles and methods used to analyze and interpret areal and time relationships of stratified rocks and the history of life contained in the rocks. *(Lec. 2, Lab. 3) Prerequisite: GEL 450 or permission of instructor. Offered in spring of odd calendar years.* Tynan

561 Evaluation of Geologic Data *I, 3*
Discussion of the quantification of geologic data including methods and limitations of quantification. Development and evaluation of concepts of sampling, accuracy, precision, and hypothesis and model formulation as applied to geology. Sources, types, and degrees of error in sampling, measuring and presenting geologic data. *(Lec. 3) Prerequisite: two 100-level courses in geology and BST 501 or equivalent, or permission of instructor. Offered in fall of even calendar years.* Cain

581 (or OCE 581) Coastal Engineering Geology *II, 3*
Discussion of the interaction of geological factors and coastal structures. Shore materials, energy-material relationships, and the interference of man-made structures with the natural regimen emphasized. *(Lec. 3) Prerequisite: GEL 302 or 410, or OCE 540, or permission of instructor. Offered in spring of even calendar years.* Fisher

585 Geohydrology *I, 3*
Introduction to ground-water hydrology and drainage basin analysis and their relation to geomorphology, glacial geology and sedimentology. Laboratory work in analog models and analysis of water resources in various geologic environments from geologic maps and aerial photography. Field studies in geophysical methods of investigation. *(Lec. 2, Lab. 2) Prerequisite: GEL 302 or 410 or 450 or permission of department. Offered in fall of odd calendar years.* Fisher

590 Special Problems *I and II, 1-3*
Advanced work under the supervision of a member of

the staff arranged to suit the individual requirements of the student. *(Lec. and/or Lab. according to the nature of the problem.) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

Note: For other related courses see PHY 522 and OCG 540, 630, 631, 643, 644, 645, 647.

GERMAN (GER)

CHAIRMAN: Associate Professor Kossoff (Languages). Professors B. A. Woods and F. L. Woods; Assistant Professors Dornberg, Grandin, Kalinke, and Terras; Instructor Myers.

101, 102 Elementary German *I and II, 3 each*
Fundamentals of grammar and pronunciation; exercises in reading, writing, and conversation. *(Lec. 3)* Staff

103, 104 Intermediate German *I and II, 3 each*
Development of facility in reading narrative and expository prose; exercises in grammar, listening comprehension, and speaking. *(Lec. 3) Prerequisite: GER 102.* Staff

205, 206 Conversation and Composition *I and II, 3 each*
Development of facility in spoken and written German using contemporary writings and topics; special emphasis on general classroom discussion. *(Lec. 3) Prerequisite: GER 104 or equivalent.* Staff

325, 326 Introduction to Modern German Literature *I and II, 3 each*
Literary appreciation of German narrative, drama and lyric poetry by leading writers from 1885 to the present. *(Lec. 3) Prerequisite: GER 104 or equivalent.* B. A. Woods

391, 392 Masterpieces of German Literature *I and II, 3 each*
GER 391: Literary works from the Middle Ages through 1800 in English translation. *GER 392:* Literary works from 1800 to the present in English translation. *(Lec. 3) May not be used toward a concentration in German. In alternate years, next offered 1971-72.* Kalinke and Grandin

409 History of the German Language *I, 3*
Development of the German language from early Germanic to modern German. Emphasis on cultural influences on linguistic change. *(Lec. 3) Prerequisite: GER 206 or permission of instructor. In alternate years, next offered 1971-72.* F. L. Woods

431 German Literature from 800 to 1700 *II, 3*
Literary works from the Old High and Middle High German periods through the age of Baroque. Readings in modern German. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1971-72.* Kalinke

441, 442 German Literature of the Eighteenth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the time. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1972-73.* Grandin

451, 452 German Literature of the Nineteenth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the time. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1971-72.* Dornberg

481 The German Lyric *I, 3*
Intensive study of the German lyric from the seventeenth century to the present. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1971-72.* B. A. Woods

482 German Drama *I, 3*
Works and theories of representative German dramatists from the seventeenth century to the present. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1972-73.* Dornberg

483 German Narrative *II, 3*
Narrative prose in German literature from the eighteenth century to the present, including the novel, the novelle, and short stories. *(Lec. 3) Prerequisite: GER 206 or equivalent. In alternate years, next offered 1972-73.* Grandin

497, 498 Directed Study *I and II, 3 each*
Designed particularly for the advanced student. Individual research and reports on problems of special interest. *Prerequisite: acceptance of a project by a member of the staff and departmental approval.* Staff

901, 902 Graduate Reading Courses in German *I and II, 0*
Two-semester course prepares the graduate student in other fields to use German to further research in his major field. Attention is given primarily to acquiring a reading knowledge with little emphasis on the spoken language. Assumes no prior knowledge of German. Staff

GREEK (GRK)

CHAIRMAN: Associate Professor Kossoff (Languages). Assistant Professor Cashdollar; Instructor Campbell.

101, 102 Introductory Greek *I and II, 3 each*
Grammar and syntax of ancient Attic Greek combined with reading practice. In the second semester a text of standard Attic prose is read. *(Lec. 3)* Cashdollar

HISTORY (HIS)

CHAIRMAN: Professor Findlay. Professors Metz and Thomas; Associate Professors Briggs, Gutchen, Kim, Klein and Weisbord; Assistant Professors B. G. Brown, Bryan, J. A. Cohen, Daniel, Obelkevich, Roughton, Silvestri, Strom and Thurston; Instructor Higgins.

101 History of Western Civilization to 1715 *I and II, 3*
Introductory course treating Western history in its broadest sense from the Egyptian civilization through the era of Louis XIV. *(Lec. 3)* Staff

102 History of Western Civilization since 1715 *I and II, 3*
Continuation of HIS 101: Western history to the present time. *(Lec. 3)* Staff

111 History of Ancient Greece and Rome *I, 3*
From the Greek and Latin settlements to the Germanic invasions with emphasis on political, social, economic and aesthetic developments. Includes rise of the Christian Church. Recommended for juniors and seniors. *(Lec. 3)* Daniel

112 History of Medieval Europe *II, 3*
Primary western Europe. Follows HIS 111. Medieval Church, feudalism, revival of town life, commerce, industry and money economy, rise of national states and development in the arts. *(Lec. 3)* Daniel

115 Introduction to Western Cultural History *I or II, 3*
Survey of the intellectual and cultural history of the Western world from the Renaissance to the present. *(Lec. 3) Not open to students who have passed HIS 102.* Staff

121 History of England to 1500 *I, 3*
England from the Roman occupation with emphasis on Norman Conquest, feudalism and subsequent political, legal, economic, intellectual, artistic, and social developments. *(Lec. 3)* Staff

122 History of England since 1500 *I or II, 3*
Continuation of HIS 121 with emphasis on constitutional conflicts and developments, commerce, agricultural and industrial revolutions, artistic, intellectual, and social developments. *(Lec. 3) HIS 121 not prerequisite for HIS 122.* Gutchen

132 Introduction to Russian and Soviet History *I or II, 3*
Selected topics in the development of Russian civilization since the ninth century. *(Lec. 3)* Thurston

141 History of the United States to 1865 *I or II, 3*
Colonial and Revolutionary periods, and economic, social and political development of the United States through the Civil War. *(Lec. 3)* Staff

142 History of the United States since 1865 *I or II, 3*
Reconstruction period and general social, economic and political development to the present. *(Lec. 3)* Staff

147 History of American Foreign Relations *I or II, 3*
Introductory survey to the diplomatic history of the United States from the American Revolution to the present. Main currents of American diplomacy with special emphasis on the role of public opinion in the development of foreign policy. *(Lec. 3)* Staff

150 Introduction to Afro-American History *I or II, 3*
Survey of Negro American history from African origins to the current racial confrontation. *(Lec. 3)* Strom

171 East Asian Culture and History *I or II, 3*
Introduction to the culture and history of East Asia. Emphasis on the literary, artistic and philosophical traditions of East Asia especially as these aspects relate to and influence contemporary developments. *(Lec. 3)* Kim

173 Introduction to Muslim Civilization *I or II, 3*
Introduction to the history of religion, politics and culture in Muslim civilization from the seventh century to the present with emphasis on more recent developments. *(Lec. 3)* Roughton

180 Introduction to Latin American Civilization *I or II, 3*
Survey of the social, cultural and political history of the Latin American region from the pre-Conquest era to the present time. *(Lec. 3)* Bryan

391 Directed Study or Research *I and II, 3*
Special work arranged to meet the needs of individual students who desire advanced work. *(Lec. or Lab.) Prerequisite: permission of department.* Staff

394 History as a Discipline *I or II, 3*
An introduction to the philosophy and history of history; the relation of history to other disciplines. *Prerequisite: junior standing.* Staff

395 Seminar in History *I or II, 3*
Introduction to historical research and writing. Topics vary. Required for history concentration. *Prerequisite: permission of department.* Staff

405 Western Europe in the High Middle Ages *I or II, 3*
Primarily France and England in the twelfth and thirteenth centuries. Emphasis on the Medieval Gothic-Catholic culture, the rise of towns and the development of a money economy. *(Lec. 3)* Daniel

406 The Renaissance *I, 3*
Europe in transition during the fourteenth through the early sixteenth centuries; the economic, social, and religious backgrounds of the Renaissance. Emphasis upon cultural and artistic developments. *(Lec. 3)* Daniel

407 The Reformation *II, 3*
Change of European society resulting from Protestant

and Catholic Reformations; rise of secular states and emerging national states. Emphasis upon cultural developments and the dawn of modern science. *(Lec. 3)* Daniel

408 History of Europe, 1648-1789 *I, 3*
Survey of the European state system from the Treaty of Westphalia to the French Revolution. Emphasis on relations among the states and diplomatic developments. Social, intellectual and economic forces at work prior to the upheavals of the revolutionary decade. *(Lec. 3)* Silvestri

409 The French Revolution and Napoleon *II, 3*
Causes of the French Revolution and the Napoleonic Empire, their historical development from 1789 to 1815, and their effect upon subsequent European history. *(Lec. 3)* Silvestri

410 History of Europe, 1815-1914 *I, 3*
Major political, economic, and intellectual developments in Europe from the defeat of Napoleon I to the outbreak of World War I with emphasis upon the Revolutions of 1848, the unification of Italy and Germany, the impact of the Industrial Revolution, nationalism and imperialism, and the background of World War I. *(Lec. 3)* Thomas

411 History of Europe since 1914 *II, 3*
Detailed study of developments from 1914 to the present: the wars, the post-war adjustments, the communist and fascist ideologies, the history of individual states, and social and intellectual trends. *(Lec. 3)* Thomas

414 Seventeenth- and Eighteenth-Century European Cultural History *I, 3*
Intellectual and social movements of the Age of Reason and the Age of Enlightenment. *(Lec. 3)* Briggs

415 Nineteenth- and Twentieth-Century European Cultural History *II, 3*
Intellectual and cultural movements from Romanticism through Existentialism. *(Lec. 3)* Staff

416 History of Science to 1700 *I, 3*
Survey of the genesis and development of scientific thought, the formation of the scientific community, and the cultural influences of science from the Greeks to 1700. *(Lec. 3)* Briggs

417 History of Science since 1700 *II, 3*
Continuation of HIS 416 from about 1700 to the present. *(Lec. 3)* Briggs

418 Diplomatic History of Europe since 1815 *I, 3*
Materials used in writing diplomatic history, review of the major crises with their causes and consequences, and movements for the collective security. *(Lec. 3) Prerequisite: HIS 102 or permission of instructor.* Thomas

420 Constitutional History of England *I, 3*
Advanced course in the Middle Ages and constitutional crises in the sixteenth and seventeenth centuries. In addition to its cultural importance, it should prove valuable to pre-legal students and advanced students in political science. *(Lec. 3) Prerequisite: HIS 121 and 122 or permission of department.* Staff

421 Tudor and Stuart England, 1485-1714 *II, 3*
Anglican revolt (Henrican, Edwardian and Elizabethan), revival of Parliament, Elizabethan society, Puritanism and the two revolutions in the seventeenth century. *(Lec. 3)* Staff

422 England in the Eighteenth and Nineteenth Centuries *I, 3*
Political, social, economic and cultural factors which made the nineteenth century the era of the *Pax Britannica.* Emphasis on the structure of eighteenth-century politics and the forces which broke down that structure and shaped the liberalism of the next century. *(Lec. 3)* Gutchen

423 Twentieth-Century Britain *II, 3*
History of Britain since 1906. Emphasis upon her changing role as a world power, the impact of economic change on politics and society, and the development of the social welfare state. *(Lec. 3)* Gutchen

426 German History, 1640-1871 *I, 3*
Rise of Brandenburg-Prussia from the time of the Great Elector to the unification of Germany under Bismarck's aegis in 1871, with the emphasis on political and cultural history. *(Lec. 3) Prerequisite: HIS 408 and 410 strongly recommended.* Staff

427 German History since 1871 *II, 3*
Rise and fall of the Second and Third Reich from the unification in 1871 to the present split between the Federal Republic of (West) Germany and (East) German Democratic Republic, with emphasis on political and cultural history. *(Lec. 3) Prerequisite: HIS 426 or permission of department.* Staff

430 History of France since 1815 *II, 3*
French political and social history from the end of the First Empire to the Fifth Republic. Complexities of class divisions and their repercussions on French political history. *(Lec. 3)* Silvestri

432 History of Russia to 1917 *I, 3*
Origin and growth of the Russian nation from the earliest pagan beginnings to the Bolshevik Revolution. The conversion of Russia to Christianity, the Tatar conquest, the peasant revolts, the westernizing drives of Peter I and Catherine II, and the final emergence of Imperial Russia as a great power in the nineteenth century. *(Lec. 3) Prerequisite: HIS 101 and 102 or permission of department, junior standing or above.* Thurston

433 History of the Soviet Union *II, 3*
Russian history from the revolutions of 1917 to the present. Emphasis on the reconstruction of Russian institutional life by the Bolsheviks, and political, eco-

nomic, intellectual, and ideological developments. *(Lec. 3) Prerequisite: HIS 102.* Thurston

435 American Colonial History to 1763 *I, 3*
American history from the founding of the colonies to the end of the French and Indian War, including developments within the colonies as well as their relationship with England. *(Lec. 3) Prerequisite: HIS 141 or equivalent.* Metz

436 The American Revolution and Confederation, 1763-1789 *II, 3*
Social, political and economic aspects of the Revolution and Confederation periods. *(Lec. 3) Prerequisite: HIS 141 or permission of instructor.* Cohen

437 The United States during the Early National Period, 1789-1850 *I, 3*
American history from the Constitution through the Federalist, Jeffersonian, and Whig periods with emphasis upon political developments and social and economic aspects of the era. *(Lec. 3) Prerequisite: HIS 141 or permission of instructor.* Cohen

438 Civil War and Reconstruction *II, 3*
American history during the period 1850-1877, giving equal emphasis to the background of the Civil War, the war itself, and the social, political, and economic aspects of Reconstruction. *(Lec. 3)* Strom

439 Emergence of Industrial America, 1877-1917 *I, 3*
Emphasis upon the growth and consolidation of business, urbanization and the Populist and Progressive movements. Some consideration of America's emergence as a world power. *(Lec. 3) Prerequisite: HIS 142 or permission of instructor.* Klein

440 United States History from 1917 to 1945 *I or II, 3*
Social, political, and economic developments between the World Wars. Emphasis upon domestic affairs but special attention given to the involvement of the United States in World War II. *(Lec. 3)* Klein

441 United States History since 1945 *I or II, 3*
Social, political, and economic developments since the end of World War II. Equal emphasis upon the domestic sphere and the role of the United States in the world. *(Lec. 3)* Klein

442 Social and Intellectual History of the United States to 1865 *I, 3*
Survey of social and intellectual development to the end of the Civil War, including literary, artistic, and scientific trends, reform movements and growth of the democratic ideal. *(Lec. 3)* Metz

443 Social and Intellectual History of the United States, 1865 to the Present *II, 3*
Social and intellectual development after the Civil War, including literary, artistic, scientific trends, with particular attention to the interaction between concepts and institutions during periods of social reform. *(Lec. 3) Prerequisite: HIS 142 or permission of instructor.* Klein

445 History of the Negro Peoples *II, 3*
Survey of the history of the Negro peoples in the United States and Africa in the modern period. Emphasis upon the links between the "New World" Negro and the African; comparative slave systems and the history of racist ideology. *(Lec. 3) Prerequisite: junior standing.* Weisbord

448 American Social Reform *I or II, 3*
Comparative study of the history of American social reform. *(Lec. 3)* Strom

450 Constitutional History of the United States *II, 3*
The origins, framing and development of the Constitution of the United States with particular attention to the social and economic influences that have shaped our form of government and our attitudes toward it. *(Lec. 3) Prerequisite: HIS 141 and 142.* Metz

452 Diplomatic History of the United States *I, 3*
Survey of the displomatic history of the United States from colonial times to the present. Special emphasis on the various forces that affected diplomatic development. *(Lec. 3) Prerequisite: HIS 141 and 142.* Staff

462 History of Rhode Island *II, 3*
History of Rhode Island from the first English settlement to the present day. Attention will be given to social, political, and economic aspects of internal development and to the relation of the state to the region and the nation. *(Lec. 3) Prerequisite: HIS 141 and 142.* Metz

471 History of the Far East: Classical Period *I, 3*
Survey of the classical civilizations of China, Japan, and Korea during the period up to the arrival of European power in Eastern Asia. *(Lec. 3)* Kim

472 History of the Far East: Modern Period *II, 3*
Modern history of the Far East. An analysis of the reaction of China, Japan, and Korea to the challenge presented to them by the Western powers, tracing the growth of these nations into modern powers. *(Lec. 3)* Kim

473 History of Modern China *II, 3*
Political, social, economic, and cultural development of China since 1800 with the emphasis on the development of Chinese nationalism and on the rise, theory, and practice of Chinese communism. *(Lec. 3)* Kim

474 History of Modern Japan *I, 3*
Background and significance of the Meiji restoration (1868) and modernization; the development of Japanese militarism, the fall of the Japanese Empire and the emergence of the "New Japan." *(Lec. 3)* Kim

476 Southwest Asia and North Africa to 1683 *I, 3*
History of Southwest Asia and North Africa from the development of Islam in seventh-century Arabia until the defeat of the Ottoman Empire at Vienna.

Emphasis upon the religious, social, legal, and political institutions. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Roughton

477 Southwest Asia and North Africa since 1683 *II, 3*
Southwest Asia and North Africa from the second siege of Vienna. Transformation of Ottoman and Iranian societies under the influence of Western ideas and institutions. Development of Arab, Turkish, and Iranian nationalisms. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Roughton

479 Imperialism and Its Impact upon Colonized Peoples *I, 3*
Historical analysis of colonialism and imperialism, the struggle for independence and the problems confronting newly independent states, with emphasis on the Third World. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Roughton

481 History of Colonial Latin America *I, 3*
The European background, native cultures, conquest and settlement of Latin America, together with political, economic and social development of the area, concluding with wars for independence. *(Lec. 3)* Bryan

482 History of Modern Latin America *II, 3*
Continuation of HIS 481, covering Latin American history from independence to the present time. *(Lec. 3)* Bryan

483 History of Modern Mexico *I or II, 3*
An analysis of the social, economic and political development of Mexico from 1810 to the present, emphasizing the Revolution of 1910, its background and aftermath. *(Lec. 3)* Bryan

488 History of Sub-Saharan Africa *I, 3*
Ancient and Medieval Africa, and the impact of Islam; the "Glorious Age" of the Sudanic empires; the slave trade and the age of exploration; the period of European partition and the rise of African nationalism. *(Lec. 3) Prerequisite: junior standing.* Weisbord

501 Colloquium in European History *I or II, 3*
Intensive study of major interpretative works in European history. *(Lec. 3) Prerequisite: graduate or senior standing, permission of department.* Staff

515 Seminar in Twentieth-Century Diplomacy *II, 3*
Research in the history of international relations since 1900. *(Lec. 3) Prerequisite: HIS 410 or 411 or permission of department.* Thomas

516 Seminar in the History of Science *I or II, 3*
Seminar devoted to exploration of some historical aspects of scientific development. The major topics will change from semester to semester. *(Lec. 3)* Briggs

521, 522 Readings and Research in European History *I and II, 3 each*
Intensive study of selected topics in European history. With permission of the department, this course may be taken twice for credit. *(Lec. 3) Prerequisite: graduate or senior standing, permission of department.* Staff

535 Colloquium in American History *I or II, 3*
Intensive study of major interpretative works in American history. *(Lec. 3) Prerequisite: graduate or senior standing, permission of department.* Staff

540 Seminar in American Colonial History: The Seventeenth and Eighteenth Centuries *I or II, 3*
Intensive research on selected topics in the Colonial period of American history. *(Lec. 3) Prerequisite: permission of department.* Staff

541 Seminar in Nineteenth-Century American History *I and II, 3*
Intensive research on selected topics in the broad period between adoption of the Constitution and World War I. *(Lec. 3) Prerequisite: permission of department.* Staff

542 Seminar in Twentieth-Century United States History *I and II, 3*
Intensive research on selected topics in United States history since 1900. *(Lec. 3) Prerequisite: permission of department.* Staff

543 Seminar in the History of the United States, Foreign Relations *II, 3*
Research in the history of U.S. foreign relations since 1775. All aspects of foreign relations, including both internal and external factors and historiographical problems will be considered. *(Lec. 3) Prerequisite: HIS 452 or permission of department.* Staff

550 Seminar in Black Nationalism and the International Race Problem *I or II, 3*
Examination of the historical roots of black nationalism in the United States and the international implications of racial conflicts in selected areas of the world. *(Lec. 3) Prerequisite: permission of instructor.* Weisbord

560 Research in Local History *II, 3*
Directed research in secondary and primary materials on topics of interest to the individual. *(Lec. 3) Prerequisite: HIS 141 and 142.* Metz

580 Colloquium in Latin-American History *I or II, 3*
Intensive study of major interpretative works in Latin American history. *(Lec. 3)* Bryan

591 Directed Study or Research *I and II, 3*
Directed readings, research, or study designed to meet the particular needs of individuals or small groups of graduate students. Staff

593 Seminar in Historical Studies *I and II, 3*
Advanced study in the major literature of American or European history. Emphasis placed upon problems of historiography and historical criticism. *(Lec. 3) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

HOME MANAGEMENT (HMG)

CHAIRMAN: Professor Crandall. Instructors Goertz and Noring.

210 Management in Family Living *I and II, 3*
Interaction of resources, goals, and managerial processes in the home seen in the context of the larger community. Applications primarily in the area of human resources. *(Lec. 3)* Crandall

320 Family Economics *I and II, 3*
Factors affecting family financial decisions and their effect upon the individual family and the community. *(Lec. 3) Prerequisite: HMG 210 or permission of department.* Goertz

340 Family Housing *I and II, 3*
Evaluation and study of types of housing in relation to the family and community. Emphasis on socio-economic factors, housing laws, and aesthetic qualities concerned with housing. *(Lec. 3) Prerequisite: HMG 210 or permission of department.* Noring

350 Household Equipment *I, 3*
Fundamental principles and management involved in selection, use and care of household equipment, and related utilities. *(Lec. 2, Lab. 2)* Goertz

370 Home Management Residence *I and II, 3*
Residence in the Home Management Center with experience in group relationships, application of managerial principles, and solving managerial problems. *Prerequisite: HMG 210 and FNS 101.* Noring

371 Seminar in Home Management *I and II, 3*
The application and analysis of concepts of management in established households. Parallels HMG 370. *Prerequisite: HMG 210, FNS 101, and open to married students only.* Noring

401 Home Management Problems of Deprived Families *II, 3*
Seminar in understanding and assisting families faced with managerial problems due to social and economic deprivation. Some field experience provided. *(Lec. 3) Prerequisite: HMG 320 and SOC 202 or permission of department. In alternate years, next offered 1971-72.* Goertz

470 Special Problems in Home Management *I and II, 2-4*
Special problems to be selected from the areas of home management theory, consumption economics, work simplification, and equipment depending upon the specific interest of the student. *(Lab. TBA)* Staff

570 Special Problems in Home Management *I, 3*
Advanced study to be selected from areas of home management theory and its application, work simplification, family economics and equipment. *(Lab. TBA)* Staff

575 Presentation of Home Management Principles *II, 3*
Special problems in presenting principles of home management at the secondary level, the college level, and in adult education. *(Lec. 3)* Staff

HONORS COLLOQUIUM (HCL)

401 Honors Colloquium I *I and II, 3*
Independent study, discussions, faculty conferences and attendance at Honors Colloquium Distinguished Lecture Series. Colloquium theme changes each year. Enrollment limited to University Honors Program students. Coordinator, 1971-72: Albert Silverstein

402 Honors Colloquium II *I and II, 3*
Same as HCL 401. *Prerequisite: HCL 401.*

403 Honors Colloquium III *I and II, 3*
Same as HCL 401. *Prerequisite: HCL 402.*

404 Honors Colloquium IV *I and II, 3*
Same as HCL 401. *Prerequisite: HCL 403.*

INDUSTRIAL ENGINEERING (IDE)

CHAIRMAN: Professor C. F. James. Professor D. E. Nichols; Associate Professors Lawing, Rubinsky and Stanislao; Assistant Professors Branson, Lawson and Shao.

220, 221 Industrial Engineering I, II *I and II, 3 each*
Introduction to industrial engineering. Elementary topics in production control, inventory control, forecasting, motion and timestudy, methods analysis. Elementary operations research and quantitative techniques. Depreciation, obsolescence, time value of money, and other topics in engineering economics related to the selection and replacement of capital equipment and evaluation of project proposals. *(Lec. 3) Prerequisite: MTH 142; for IDE 220, credit or registration in CSC 201; for IDE 221, IDE 220.* Staff

330 Manufacturing Analysis *I and II, 2*
Theory and applications of materials processing technology; thermal considerations, mechanics of machine systems, power and force relations, and tool analyses. Numerical control of metrology will also be emphasized. *(Lec. 1, Lab. 3) Prerequisite: credit or registration in CVE 220 or permission of department.* Staff

350, 351 Industrial Engineering Systems Design I, II *I and II, 3 each*
Design and analysis of systems of production facilities and materials handling. Compensation, production and inventory control systems. Applications of and case problems in operations research, probability and

statistics, engineering economy and other foundation areas. Introduction to simulation. Design and analysis of industrial engineering systems. *(Lec. 3) Prerequisite: for IDE 350, IDE 221, 412, 432; for IDE 351, IDE 350, 433.*

391, 392 Special Problems in Industrial Engineering *I and II, 1-3 each*
Independent study and seminar type work under close faculty supervision. Discussion of advanced topics in industrial engineering in preparation for graduate work. *Prerequisite: junior standing and permission of department.* Staff

404 Engineering Economy *I, 3*
Effects of economics on engineering decisions in design, selection, and replacement of equipment and evaluation of project proposals. Theory of depreciation and obsolescence. *(Lec. 3) Prerequisite: ECN 123, MTH 142. Not open to students with credit in IDE 220.* Staff

411 Engineering Statistics I *I, 3*
Elementary probability theory, random variables, and probability distributions. Moment generating functions, expected values, bivariate normal distributions. Introduction to applied statistics in engineering. *(Lec. 3) Prerequisite: MTH 142.* Staff

412 Engineering Statistics II *II, 3*
Continuation of IDE 411. Estimation, hypotheses tests, sampling theory, linear regression. Other engineering applications of applied statistics. *(Lec. 3) Prerequisite: IDE 411.* Staff

422 Production Facilities Design *II, 3*
Analysis and design of production facilities. Line and manpower balancing. Design of material flow networks. Quantitative modeling and simulation applied to productions facilities design. *(Lec. 3) Prerequisite: IDE 411, 432.* Staff

430 Design and Analysis of Compensation Systems *II, 3*
Wage and employment theory, job evaluation, motivational systems, supplemental payments; labor force loading, leveling and scheduling. An analysis of the influence of unions on labor price theory. *(Lec. 3) Prerequisite: senior standing.* James

432 Operations Research I *I, 3*
Introduction to major areas of operations research and their application to systems analysis. Linear programming, game theory, elementary network analysis and related topics. *(Lec. 3) Prerequisite: MTH 243, MTH 215 or equivalent.* Staff

433 Operations Research II *II, 3*
Introduction to inventory and replacement models, queuing theory, simulation, simple stochastic models, and their relation to selected problems in industrial engineering. *(Lec. 3) Prerequisite: IDE 412, MTH 243.* Branson

440 Materials Processing and Metrology I *II, 3*
Analyses of material behavior characteristics under dynamic loading conditions for tools and cutting materials. Thermal analyses, mechanics of machine systems, power and efficiency. Processing control systems such as digital control, analog control, and numerical control. Design and analyses of systems of metrology. *(Lec. 2, Lab. 3) Prerequisite: CHE 332 or 437, CVE 220.* Stanislao

491, 492 Special Problems *I and II, 1-6 each*
Advanced work under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem.) Credits not to exceed a total of 12. Prerequisite: permission of department.* Staff

500 Network Application in Industrial Engineering *II, 3*
Industrial system problems that can be formulated in terms of flows in networks. Critical path scheduling, transportation problems, allocation, sequencing, and line balancing are some of the topics to be considered. *(Lec. 3) Prerequisite: IDE 432 and permission of instructor. In alternate years, next offered 1972-73.* Staff

510 Hnman Factors *II, 3*
Analytic relationships between man and his working environment. The design of equipment, facilities and environmental controls to meet the capabilities and limitations of the human being. *(Lec. 3) Prerequisite: permission of instructor.* Staff

513 Statistical Quality Control *I, 3*
Topics in statistical quality control systems. Single, multiple, and sequential sampling. Design and analysis of a wide variety of statistical control systems used in conjunction with discrete and continuous data, for several kinds of data emission. *(Lec. 3) Prerequisite: IDE 412 or equivalent.* Nichols

517 Applied Control Theory in Industrial Engineering *I, 3*
Complex control mechanisms will be studied and applied to production and manufacturing operation. Automatic control systems for production and manufacturing will be designed and analyzed. *(Lec. 3) Prerequisite: IDE 404, MTH 244 and permission of instructor.* Stanislao

520 Material Handling *I, 3*
Development of principles for the engineering design and evaluation of equipment to move industrial materials in and between processes, including the chemical and physical characteristics of the material to be handled, rates of material flow, queuing and economics. *(Lec. 3) Prerequisite: MCE 263, CVE 220, IDE 404.* Staff

525 Simulation
See Computer Science 525.

533 (633) Advanced Statistical Methods for Research and Industry *I, 3*
Estimation and testing; regression and correlation; analysis of variance and related topics. Applications in industrial operations and engineering research. *(Lec. 3) Prerequisite: IDE 412 or equivalent.* Staff

535 Industrial Reliability Engineering *II, 3*
Theories of reliability applicable to the design and operations of manufacturing processes and product quality assurance control systems. Quantitative analyses of economic specifications, performance levels, maintenance levels, and redundancy systems. *(Lec. 3) Prerequisite: permission of instructor.* Staff

540 Production Control and Inventory Systems *I, 3*
Theory and practice of industrial production control and inventory systems. A broad spectrum of mathematical models for static, dynamic, perpetual, and periodic inventory systems as they affect and relate to production. *(Lec. 3) Prerequisite: permission of instructor.* Staff

541 Materials Processing and Metrology II *I, 3*
Continuation of IDE 440. Engineering analyses in the processing of materials. A detailed study of dynamic coupling, tool-workpiece interaction, energy and thermal analysis; mechanics of material removal and displacements, advanced topics in mechanical electrical systems for processing of materials. *(Lec. 3) Prerequisite: IDE 440 or permission of instructor.* Stanislao

550, 551 Advanced Topics in Probabilistic Operations Research I and II *I and II, 3 each*
Concepts of simple random processes and their application in the analysis of industrial problems. Random walk, branching processes, recurrent events, discrete and continuous Markov chains, birth and death models and their application to inventory, replacement, reliability, and waiting line problems. *(Lec. 3) Prerequisite: IDE 411, MTH 215, or equivalent.* Staff

555 Engineering Applications of Mathematical Programming I *I, 3*
Sensitivity analysis and pricing problems, practical problems in degeneracy and duality, decomposition methods for large-scale systems, applied convex, integer, nonlinear and quadratic programming methods. An introduction to stochastic programming. *(Lec. 3) Prerequisite: IDE 432 and permission of instructor.* Staff

556 Engineering Applications of Mathematical Programming II *II, 3*
Continuation of IDE 555. *(Lec. 3) Prerequisite: IDE 555 and permission of instructor. In alternate years, next offered 1972-73.* Staff

560 Process Engineering *II, 3*
Design and selection of processes, equipment, instrumentation and production sequence for efficient and economic manufacture of products through mathematical analyses of physical and economic principles. *(Lec. 3) Prerequisite: IDE 330, 404.* Stanislao

565 Theory of Scheduling *II, 3*
Sequencing problems, finite sequencing for a single machine, n/m job shop problems with analytical and heuristic procedures, networks applied to scheduling, queuing systems in scheduling, probabilistic scheduling problems. Survey of selected literature. *(Lec. 3) Prerequisite: permission of instructor. In alternate years, next offered 1971-72.* Staff

591, 592 Special Problems *I and II, 1-6 each*
Advanced work under supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to the nature of the problem) Credits not to exceed a total of 12. Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

610 Topics in Applied Queuing Theory *I, 3*
Poisson and Erlang queues, imbedded chains, M/G/1 and G/M/1 queues, and related topics in queuing theory. Analysis of a wide variety of queues with an applications orientation. *(Lec. 3) Prerequisite: IDE 433 or permission of instructor. In alternate years, next offered 1971-72.* Branson

634 Design and Analysis of Industrial Experiments *II, 3*
Further development of topics in analysis of variance. Randomized blocks, Latin squares and related designs, factorial experiments, confounding and fractional replications, and split-plot designs. Design and analyses of engineering experiments. *(Lec. 3) Prerequisite: IDE 633.* Staff

635 (or EST 635) Response Surfaces and Evolutionary Operations *II, 3*
Methods of determining the response surface for multiple factors over a specified range and techniques for seeking an optimum. First and second order response surfaces. Rotatable second order design. Central composite rotatable designs. Multi-variable EVOP programs and other topics in evolutionary operations. *(Lec. 3) Prerequisite: IDE 633 or equivalent.* Lawing

641 Molecular Aspects of Materials Processing
See Chemical Engineering 637.

642 Advanced Topics in the Processing of Materials I *I or II, 3*
Extensive studies of contemporary and classical research in metallic materials processing. Systems study of problems of processing modern materials and the technological achievements in processing. *(Lec. 3) Prerequisite: IDE 541 or permission of instructor. In alternate years, next offered 1971-72.* Stanislao

643 Advanced Topics in the Processing of Materials II *I or II, 3*
Extensive studies of contemporary and classical research in non-metallic materials processing. Systems study of problems of processing modern materials and the technological achievements in processing. *(Lec. 3) Prerequisite: IDE 541 or permission of instructor. In alternate years, next offered 1972-73.* Stanislao

645 Manufacturing Engineering: Design, Analysis, Synthesis *II, 4*
Consideration of production and logistic systems, quantitative models introduced in and applied to congestion problems, industrial planning, behavioral theory, control, scheduling, and other problem areas of the industrial enterprise. *(Lec. 4) Prerequisite: permission of instructor.* Stanislao

657 Geometric and Dynamic Programming *II, 3*
Basic concepts of geometric programming, the duality theorem, approximation and limiting techniques. Nature of dynamic programming, deterministic and stochastic sequential decision problems. Lagrange multipliers in both geometric and dynamic programming. *(Lec. 3) Prerequisite: IDE 555. In alternate years, next offered 1971-72.* Shao

660 Methods of Optimization *II, 3*
Methods of optimization: indirect, direct elimination, climbing. Geometric programming. Problems and other topics in applied optimization. *(Lec. 3) Prerequisite: CSC 500 and permission of instructor. In alternate years, next offered 1971-72.* Staff

691, 692 Advanced Special Problems in Industrial Engineering *I and II, 1-6 each*
Advanced work under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problems) Credits not to exceed a total of 12. Prerequisite: permission of department.* Staff

INSURANCE (INS)

CHAIRMAN: Professor Pitterman (Finance and Insurance). Professor Brainard; Assistant Professors Fitzgerald and Hershbarger.

301 General Principles and Practices of Insurance *I and II, 3*
Comprehensive introduction to general insurance field: fire, automobile, casualty, life, inland and ocean marine insurance, and suretyship. *(Lec. 3)* Staff

313 Property Insurance *I and II, 3*
Insurance for owners of property, real and personal, held for family or business purposes; fire and marine perils generally and the policy forms relative thereto including the major package policies. *(Lec. 3)* Staff

314 Property Insurance *I, 3*
Continuation of INS 313; burglary, power plant, glass insurance; suretyship; general liability. *(Lec. 3)* Staff

322 Automobile Insurance *II, 3*
Detailed study of the law of negligence and automobile liability insurance, automobile physical damage insurance; financial responsibility laws; manuals; forms. *(Lec. 3)* Staff

325 Life Insurance *II, 3*
Functions of life insurance, types of contracts, settlement options, simple programming, computation of premiums and reserves, dividends, contract interpretation. Industrial life, group insurance, pension plans, health insurance, company organization, state supervision. *(Lec. 3) Note: course prepares for R.I. state licensing examination in life and accident and health insurance and for Part I of charter life underwriter examination.* Staff

333 Social Insurance *I, 3*
Federal, state and private programs of economic security and social insurance including workmen's compensation, non-occupational disability, pension plans, survivor's insurance, unemployment compensation, health insurance, employee benefit programs, guaranteed wages, etc. *(Lec. 3) Prerequisite: ECN 125 and 126.* Staff

ITALIAN (ITL)

CHAIRMAN: Associate Professor Kossoff (Languages). Professor Capasso; Assistant Professor Viglionese; Instructors Marcarelli, Marcheschi, and Trivelli.

101, 102 Elementary Italian *I and II, 3 each*
Elements of the language, pronunciation, grammar, inductive reading; exercises in reading, writing, and conversation. *(Lec. 3)* Staff

103, 104 Intermediate Italian *I and II, 3 each*
Development of facility in reading texts of moderate difficulty, supplemented by further work in grammar, conversation, and composition. *(Lec. 3) Prerequisite: ITL 102 or permission of department.* Staff

205, 206 Conversation and Composition *I and II, 3 each*
Intensive course in conversation and composition. Promotes facility in speaking and understanding idiomatic Italian. *(Lec. 3) Prerequisite: ITL 104 or permission of department.* Staff

325, 326 Introduction to Italian Literature *I and II, 3 each*
Basic course in appreciation of literature. Representative texts of Italian narrative, drama, and lyric poetry. Elements of the methods of criticism. *(Lec. 3) Prerequisite: ITL 104.* Staff

409, 410 History of the Italian Language *I and II, 3 each*
ITL 409: Development of the Italian language from Latin. Early documents and dialects. Sound and form changes between vulgar Latin and early Italian. *ITL 410:* Evolution of the Italian language through the centuries. Examination and discussion of the various

dissenting factions which contributed to the formation of the national language. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1971-72.* Marcheschi

411, 412 Italian Literature of the Middle Ages *I and II, 3 each*
Intensive study of Italian literature in the medieval period, with special emphasis on Dante's minor works. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1972-73.* Marcheschi

421, 422 Italian Literature of the Renaissance *I and II, 3 each*
Representative writers of the period read and discussed against the background of the cultural history of Renaissance Italy. Emphasis on Petrarca, Boccaccio, Poliziano, Machiavelli, Ariosto and Tasso. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1971-72.* Viglionese

431 Italian Literature of the Seventeenth Century *I, 3*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1972-73.* Viglionese

442 Italian Literature of the Eighteenth Century *II, 3*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1972-73.* Viglionese

451, 452 Italian Literature of the Ninteenth Century *I and II, 3 each*
Study of representative authors of the nineteenth century. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1972-73.* Staff

461, 462 Italian Literature of the Twentieth Century *I and II, 3 each*
Special attention to principal literary movements of the century as illustrated by leading writers of the period. *(Lec. 3) Prerequisite: ITL 206. In alternate years, next offered 1971-72.* Trivelli

481, 482 La Divina Commedia *I and II, 3 each*
Analysis and interpretation of Dante's outstanding work from the social, religious, philosophical, and political viewpoints of the Middle Ages. *(Lec. 3) Prerequisite: ITL 411 and 412 or permission of instructor. In alternate years, next offered 1971-72.* Staff

497, 498 Directed Study *I and II, 3 each*
Designed particularly for the advanced student. Individual research and reports on problems of special interest. *(Lec. 3) Prerequisite: acceptance of a project by a member of the staff and department approval.* Staff

JOURNALISM (JOR)

CHAIRMAN: Associate Professor Batroukha. Associate Professor Doctor; Assistant Professors Anderson and Thompson; Special Lecturer Parker.

210 Introduction to Mass Communications *I and II, 3*
Communications media viewed as comprising an institutional order; its relation to other social orders, including the political, the industrial, and the military; the role of ideas in shaping media policy, structure, and content. Recommended for majors in English, the social sciences, and marketing. *(Lec. 3)* Staff

212 News Writing and Reporting *I and II, 3*
Fundamentals of news gathering and factual writing for the mass communications media. Practice in writing news and feature stories, with evaluation of each student's work. *(Lec. 2, Lab. 2) Prerequisite: sophomore standing and permission of department.* Staff

215 Pictorial Journalism *I and II, 3*
Introduction to use of graphic arts in journalism. Emphasis on photography as a communications medium, with instruction and practice in basic techniques of picture taking, processing, and editing. *(Lec. 2, Lab. 2) Prerequisite: permission of department.* Staff

324 Magazine Article and Feature Writing *II, 3*
Practice in planning, researching, and writing articles and feature stories for magazines and newspaper feature sections. Analysis of markets, free-lance and job opportunities. Articles are written and submitted to publications during the course. *(Lec. 3) Prerequisite: junior standing and permission of department.* Staff

325 Copy Editing *II, 3*
Instruction and practice in news selection and display, copy editing, headline writing, illustration, and page make-up of newspapers and other periodicals. *(Lec. 2, Lab. 2) Prerequisite: JOR 212 or permission of department.* Staff

326 Advanced Reporting *II, 3*
Instruction and supervision in planning, developing and writing news stories for publication and/or broadcasting. Class sessions and outside assignments include press conferences with newsworthy individuals, investigative and interpretive reporting, and reporting in depth. *(Lec. 2, Lab. 2) Prerequisite: JOR 212, junior standing and permission of department.* Staff

334 History of Journalism in the United States *I, 3*
Development of the newspaper during the early, middle and later periods of nation's growth; rise of other media; effects of economic and social changes on the press; future of journalism in the United States. *(Lec. 3) Prerequisite: JOR 210 or 212, and junior standing.* Staff

361 Internship in News Writing and Reporting *I and II, 3*
Students are assigned to newspapers to do general reporting. Requires an average of eight hours a week practice time during the semester. Students meet as a group one hour a week. If a student's special interest warrants, he may be assigned to a medium other than a newspaper. *(Lec. 1, Lab. 8) Prerequisite: JOR 212 and permission of department.* Staff

362 Internship in News Editing *II, 3*
Students are assigned to newspapers for practice in various aspects of editing, with major emphasis on copy editing and headline writing. Requires an average of eight hours a week practice time during the semester. Students meet as a group one hour each week. If a student's special interest warrants, he may be assigned to a medium other than a newspaper. *(Lec. 1, Lab. 8) Prerequisite: JOR 325 and permission of department. In alternate years, next offered 1972-73.* Staff

433 Contemporary Press Problems *I, 3*
Selected areas of press concerns, including factors in press content, professionalism and journalistic ethics, economic influences and indicated trends. *(Lec. 3) Prerequisite: senior standing.* Staff

435 Theory of Communication *I, 3*
General principles of communication. Emphasis on the effects of mass communications, propaganda techniques in the mass media and public opinion formation and change. *(Lec. 3) Prerequisite: senior standing.* Staff

438 Governmental and Legal Aspects of Mass Communication *I, 3*
Role of government and the law in the communication of news. Legal problems of the mass media—including basic laws affecting freedom of the press, as well as press privileges and responsibilities. Case studies used for illustration. *(Lec. 3) Prerequisite: senior standing.* Staff

440 Criticism, Opinion and Interpretation in the Mass Media *II, 3*
Examination of increasing emphasis on interpretation and analysis in the reporting of public events; the development, present status and future prospects of mass media criticism in such fields as literature, health, architecture and the visual and performing arts; role of opinion in the form of both editorial pages and signed columns. *(Lec. 3) Prerequisite: senior standing.* Staff

441 International Communications *I, 3*
Examination and comparison of the development, roles and purposes, structure, control, content, audiences, effects and problems of the print and broadcast media of some major foreign nations. *(Lec. 3) Prerequisite: senior standing.* Staff

442 Independent Study and Projects in Mass Communications *I and II, 1-3*
Individual reading programs, research or projects in journalism and mass communications. *Prerequisite: junior standing, acceptance of a project by a member of the staff, and department approval.* Staff

452 Public Relations Principles and Publications *I, 3*
General principles and procedures in public relations: emphasis on the role of the public relations practitioner as a specialist in communications; analysis of content, objectives, and management of publications produced as part of a public relations function. *(Lec. 3) Prerequisite: senior standing.* Staff

LATIN (LAT)

CHAIRMAN: Associate Professor Kossoff (Languages). Assistant Professor Cashdollar; Instructor Campbell.

101, 102 Elementary Latin *I and II, 3 each*
Latin grammar and syntax. Exercises in reading prose. *(Lec. 3)* Campbell

201 Intermediate Latin *I and II, 3*
Review of grammar, and exercises in reading prose or verse of an author to be selected. *(Lec. 3) Prerequisite: LAT 102 or equivalent.* Campbell

202 Intermediate Latin: Virgil *I and II, 3*
Reading and study of selected works of Virgil. *(Lec. 3) Prerequisite: LAT 201 or equivalent.* Campbell

311 Readings and Composition *I, 3*
Selected works of Horace, combined with practice in writing Latin prose. *(Lec. 3) Prerequisite: LAT 202 or equivalent.* Campbell

312 Readings and Composition *II, 3*
Reading of selected works of Latin prose, poetry, and/or drama. Writing of Latin prose. *(Lec. 3) Prerequisite: LAT 311 or equivalent.* Campbell.

497, 498, Directed Study *I and II, 3 each*
Individual research and reports on problems of special interest. *Prerequisite: acceptance of a project by a member of the staff and departmental approval.* Staff

LIBRARY SCIENCE (LSC)

DEAN: Professor Humeston (Graduate Library School). Associate Professors Bergen and Chin; Assistant Professors Bohnert, Healey, Salvatore, Schneider and Tryon.

501 The Library in Society *I and II, 3*
The library traced from antiquity through its place today as a social agency in the major countries of the world, with attention also to education for and the philosophy and ethics of the profession of librarianship. *(Lec. 3)* Bergen

502 Library Administration *I and II, 3*
Libraries and their governing agencies, scientific management principles, organization and operation of library departments, personnel problems and procedures, budget preparation, statistics, and quarters and planning. *(Lec. 3)* Bohnert or Healey

503 Selection of Library Materials *I and II, 3*
Study of and practice in using the principles involved in the selection of books and nonbook materials for collections of all types of libraries. *(Lec. 3)* Tryon

504 Basic Reference *I and II, 3*
Practical experience in the use of basic reference materials, with readings and discussion of the philosophy and administrative aspects of reference work. *(Lec. 3)* Schneider

505 Cataloging and Classification *I and II, 3*
Descriptive and subject cataloging of books and other library materials with stress on subject headings and cross references, using the Dewey Decimal Classification and introducing conventional procedures and those that employ machines. *(Lec. 3)* Chin

506 Technical Services *I and II, 3*
Principles and policies employed in the acquisition, organization, conservation, and circulation of book and nonbook materials in libraries of various kinds. *(Lec. 3)* Chin

510 History of Books and Printing *I or II, 3*
Western civilization as affected by the book arts and the extension of culture through the printed book, with stress on literary property and censorship as related to printing and libraries. *(Lec. 3)* Tryon

511 Comparative Librarianship *I and II, 3*
The practice of librarianship in selected countries, including the social, economic, and political factors influencing its development, with consideration of the role of cooperation among international organizations. *(Lec. 3)* Bergen

520 The School Library *I and II, 3*
The school library in relation to the school curriculum, other community library resources, and extracurricular needs of the students. Special problems in the selection of materials, budgets, and standards for the library as a materials center with an active part in the teaching function of the school. *(Lec. 3) Prerequisite: LSC 502.* Salvatore

521 Public Library Service *I or II, 3*
Reading on and discussion of the backgrounds, aims, and problems of the American public library, with particular attention to larger unit systems. *(Lec. 3) Prerequisite: LSC 502.* Healey

522 College and University Library Service *I or II, 3*
Philosophic and practical considerations implicit in the functions, organization, and management of college and university libraries as these differ from other types of libraries. *(Lec. 3) Prerequisite: LSC 502.* Tryon

523 Special Library Service *I or II, 3*
Organization, management, and regular and special procedures as they apply to special libraries, with particular emphasis upon standards and planning for space and equipment. *(Lec. 3) Prerequisite: LSC 502.* Bohnert or Chin

524 Medical Librarianship *II, 3*
The functions and administration of medical libraries, along with the book selection tools, special cataloging methods, and essential reference works and bibliographies thereof. *(Lec. 3) Prerequisite: permission of instructor.* Chin

526 Automation in Libraries *I or II, 3*
The application of technology and systems analysis to the operation of various types of libraries. *(Lec. 3) Prerequisite: permission of instructor.* Healey

527 Seminar in Library Administration *I and II, 3*
Intensive study of selected problems in important areas of library administration by means of discussion, readings, special lectures, and the presentation of papers based on literature surveys or research. *(Lec. 3) Prerequisite: permission of instructor.* Healey

528 Multi-Media and the Library *I and II, 3*
The role of A-V materials in media centers and other types of libraries. *(Lec. 3) Prerequisite: LSC 520.* Salvatore

530 Reading Interests of Children *I or II, 3*
Survey of the development of children's literature, with analysis of current trends in publication, the limited-vocabulary book at beginning and advanced levels, and the significance of illustrations for the reading process. Fiction considered but main emphasis on informational books as recreational reading. *(Lec. 3) Prerequisite: LSC 503.* Salvatore

531 Reading Interests of Adolescents *I or II, 3*
Materials of special interest to high school students in school and public libraries, stressing nonfiction but including fiction for the age group and for adults and the responsibility of the library in the drop-out problem. *(Lec. 3) Prerequisite: LSC 503.* Salvatore

532 Reading Interests of Adults *I or II, 3*
Examination of the range and depth of books as a source of appeal to adults with emphasis on reading, annotations, and discussion to develop critical faculties. *(Lec. 3)* Tryon

533 Children's Library Materials *I and II, 3*
Books and related library materials in the area of creative literature for children: history, bibliography, selection, evaluation, and presentation. *(Lec. 3) Prerequisite: LSC 503.* Salvatore

536 Storytelling *I, 3*
Selection, adaptation, and presentation of stories for children of all ages, including attention to sources of materials, planning the story hour, and training and practice in the art of storytelling. *(Lec. 3)* Staff

540 Library Materials in the Humanities *I and II, 3*
Important library resources in the humanities, including the major works, serial publications, and reference and bibliographical materials thereof. *(Lec. 3) Prerequisite: LSC 504.* Schneider

541 Library Materials in the Social Sciences *I and II, 3*
Important library resources in the social sciences, including the major works, serial publications, and ref-

erence and bibliographical materials thereof. *(Lec. 3) Prerequisite: LSC 504.* Bergen or Schneider

542 Library Materials in Science and Technology *I and II, 3*
Important resources in science and technology including the major works, serial publications, and reference and bibliographical materials thereof. *(Lec. 3)* Bohnert or Chin

543 Government Publications *I or II, 3*
Survey of the publishing activities and publications of national, state, and local governments with emphasis on the publications of the United States government. *(Lec. 3) Prerequisite: LSC 504.* Schneider

544 Information Science for Librarians *I or II, 3*
Introduction to information storage and retrieval (analysis, semantics, thesaurus building, and data banks and their implications) as it applies to librarianship. *(Lec. 3)* Bohnert

545 Technical Information Centers *I and II, 3*
New technical information centers which provide publication, consultant, and question-answering services, emphasizing the differences between them and technical libraries and professional societies. *(Lec. 3) Prerequisite: permission of instructor.* Bohnert

550 Advanced Cataloging *I or II, 3*
Cataloging special materials, corporate author entry theory, and catalog department organization, for prospective catalogers and those interested in the technical processing aspects of librarianship. *(Lec. 3) Prerequisite: LSC 505.* Chin

560 Research in Librarianship *I or II, 3*
Methods of investigating problems in library science and an introduction to and evaluation of the literature of the field. *(Lec. 3) Prerequisite: permission of instructor.* Humeston or Bohnert

591, 592, 593 Independent Work *By Appt., 1-3 each*
Supervised reading or investigation in areas of special interest to students who obtain written approval for such study prior to registration for the semester for which it is proposed. *Prerequisite: 18 hours of library science with a B average.* Staff

LINGUISTICS (LIN)

CHAIRMAN: Associate Professor Kossoff (Languages). Professor F. L. Woods; Assistant Professor Rogers.

409, 410 Introduction to the Study of Language *I and II, 3 each*
Fall semester: basic principles of descriptive linguistic science. Spring semester: principles of historical linguistics. *(Lec. 3) Accepted toward concentration credit in a language.* F. Woods

414 Romance Linguistics *II, 3*
Evolution of the major literary Romance languages (French, Spanish, Italian, Portuguese, Rumanian) from late Latin with emphasis on phonology and morphology. Analysis of representative texts in Latin and early Romance. The diffusion and dialectal fragmentation of Romance. Taught in English. *(Lec. 3) Prerequisite: FRN 205, SPA 205, ITL 205, or LIN 410, or permission of department. Some knowledge of Latin recommended but not required. Not for graduate degree program credit.* Rogers

LITERATURE IN ENGLISH TRANSLATION

The following courses, offered within the Department of Languages, may not be used for major credit in either languages or English.

Classics
391 Masterpieces of Greek Literature
392 Masterpieces of Roman Literature
393 Literature of Greek Mythology

French
391 Survey of French Literature from the Middle Ages
392 Survey of Nineteenth-Century French Literature
393 Survey of Twentieth-Century French Literature

German
391, 392 Masterpieces of German Literature

Russian
391, 392 Masterpieces of Russian Literature

Spanish
391, 392 Masterpieces of Spanish Literature

The following courses are offered for major credit in English but may not be used for major credit in languages.

English
261, 262 World Literature
361, 362 The European Novel
461 The Classic Epic
462 The Medieval and Modern Epic
465 Greek and Roman Drama
561 Modern European Novel

MANAGEMENT SCIENCE (MGS)

CHAIRMAN: Professor Vollmann. Associate Professors Jarrett, Shen and Sternbach; Assistant Professors Armstrong, Budnick, Della Bitta, Gross, Mojena, Shih and Zartler.

101, 102 (QBA 101, 102) Introduction to Quantitative Analysis for Business and Economics *I and II, 3 each*
Elementary study of selected quantitative tools and techniques which facilitate analysis of business and economic problems and aid in the process of decision-

making. Set theory, linear and exponential functional relationships, demand and supply curves, linear algebra and calculus are covered. *(Lec. 3)* Armstrong, Budnick, Della Bitta, Gross and Mojena

107 (QBA 107) Introduction to Computer Programming for Business *I and II, 3*
Computer operation and programming fundamentals including flowcharting and program writing in one of the common computer programming languages, such as FORTRAN, BASIC, or COBOL, emphasizing business application. Assigned problems are debugged and run on the computer. *(Lec. 3)* Armstrong, Mojena, Zartler and Staff

309 (MGT 309) Production Management *I and II, 3*
Essential elements of production management with special emphasis upon motion and time study, industrial control methods, budget and cost analysis. *(Lec. 3)* Vollmann and Zartler

310 (MGT 310) Materials Management *II, 3*
Advanced work on material utilization, use of substitute materials, evaluation of materials-handling equipment, containers and packaging, inventory management and control, quality assurance, and acceptance sampling. *(Lec. 3) Prerequisite: permission of department.* Vollmann and Zartler

363 (QBA 363) Electronic Data Processing for Business and Industry *I, 3*
The role of the computer as an aid in managerial decision-making. Programming the computer, determination of the user's system requirements, and application to typical but varied business operations. *(Lec. 3)* Armstrong, Zartler and Staff

364 (QBA 364) Quantitative Analysis of Managerial Operations *II, 3*
Quantitative techniques and their application to representative business problems, linear and other types of mathematical programming are applied to business. Statistical decision theory, queuing and simulation techniques. *(Lec. 3) Prerequisite: BST 202 or permission of instructor.* Jarrett, Gross and Staff

365, 366 (QBA 365, 366) Management Science I and II *I and II, 3 each*
MGS 365: Analysis of mathematical and statistical models used in decision-making in management. Deterministic and probabilistic models. Various applications to business are stressed. *MGS 366:* Continuation. *(Lec. 3) Prerequisite: BST 202.* Armstrong, Jarrett, Mojena, Shen and Shih

457 (MGT 457) Advanced Production Management *I, 3*
Production function, its place in organizational structure, production analysis, machine utilization and machine loading. Process and method planning. Application of operations research, linear programming and other tools of quantitative approach in production. *(Lec. 3) Prerequisite: BST 202 or permission of instructor.* Vollmann and Zartler

458 (MGT 458) Advanced Production Management *II, 3*
Problems and techniques of production planning, routing, dispatching. Cost data for decision-making. Capital costs and investment criteria. PERT, CPM and LOB used in production. Value analysis. *(Lec. 3) Prerequisite: BST 202 or permission of instructor.* Vollmann and Zartler

476 (MGT 476) Management System Analysis *II, 3*
Interrelation and integration of systems in management. Analysis of the framework of optimization of the system objective relative to its environmental constraints. *(Lec. 3) Prerequisite: senior standing in the MGS program or permission of instructor.* Vollmann and Zartler

491, 492 (MGT 491, 492) Special Problems *I and II, 3 each*
Lectures, seminars and instruction in management science techniques with special emphasis on students' research projects. *Prerequisite: MGS 101, 102, 107, 363; BST 201, 202; advanced standing and permission of instructor.* Staff

681 Operations Management *II, 3*
Problems facing the manager of production and other business processes which are devoted to the creation of capital as well as consumer goods and services are examined and analyzed, employing modern decision-making techniques. *(Lec. 3) Prerequisite: MGS 980 and BST 981.* Vollmann and Zartler

682 (QBA 682) Quantitative Business Analytical Techniques *I and II, 3*
Development and application of the principal mathematical and statistical techniques used in model building and decision-making in the firm under conditions of certainty and uncertainty. *(Lec. 3) Prerequisite: MGS 980 and BST 981.* Gross, Jarrett, Shen and Shih

683 (QBA 683) Business Decision Theory *I, 3*
A statistical analysis of managerial decision-making under uncertainty. Bayesian statistical inference and subjective probability are stressed. Comparisons between Bayesian method and classical statistics are discussed and applications to business problems are emphasized. *(Lec. 3) Prerequisite: BST 981, MGS 980 or equivalent.* Jarrett and Shih

684 (QBA 684) Advanced Programming Methods in Management Decisions *II, 3*
Introduction to nonlinear and dynamic programming. Emphasis on application of modern mathematical optimization techniques in single-stage and multiple-stage management decision problems. Management applications of the Kuhn-Tucker theorem, quadratic programming, geometric programming, convex programming, integer programming, and dynamic programming. *(Lec. 3) Prerequisite: MGS 980 and 682 or equivalent.* Gross and Shih

980 (QBA 980) Quantitative Methods for Business Analysis *I and II, 3*
Mathematical tools useful to managers. Depth coverage given to differential and integral calculus, vectors and matrices. *(Lec. 3) Graduate credit for matriculated MBA students only.* Armstrong, Gross, Shen and Staff

MARINE AFFAIRS (MAF)

DIRECTOR: Professor Alexander (Geography); COORDINATOR: Mr. Rosslin. Professors Lampe, Knauss, Marshall, Middleton, and Rorholm; Assistant Professor Fisher.

650 Seminar in Marine Affairs *II, 6*
Interdisciplinary seminar by representatives of each department offering core courses in the Marine Affairs Program; faculty-student workshops focus on relations among the various marine-oriented disciplines in solving problems associated with the marine environment. Emphasis on integration of information and techniques from food and resource economics, geography, ocean engineering, the oceanographic sciences, and political science. One or more substantial papers required. Staff

MARKETING MANAGEMENT (MMG)

CHAIRMAN: Professor Alton. Professor Weeks; Associate Professors Bowman, C. R. Hill, E. M. Johnson and Wiener; Assistant Professor Loudon.

323 Marketing Principles *I and II, 3*
Marketing from a managerial viewpoint with consumer emphasis. Product, pricing, channels, promotion. Marketing institutions, social welfare, and legal considerations. *(Lec. 3)* Staff

331 Analysis of Sales Methods *I, 3*
Analytical study of the knowledge and performance of the sales force. Economic, sociological, and psychological relationships to the sales efforts in the market place. *(Lec. 3) Prerequisite: MMG 323 or permission of instructor.* Bowman

332 Sales Management *I, 3*
Planning, organization, and control of sales operations. Emphasis is placed upon the sales manager's functions and problems. Cases. *(Lec. 3) Prerequisite: MMG 323.* Bowman

334 Consumer Behavior *I, 3*
Analysis and review of perception, motivation and communication behaviors of consumers as they relate to marketing with particular emphasis upon advertising and selling. *(Lec. 3)* Staff

335 Fundamentals of Advertising *II, 3*
Condensed but comprehensive introduction to advertising. Basic course for advanced study of specific phases of advertising. *(Lec. 3) Prerequisite: MMG 323 or permission of instructor.* Hill

355 Advertising Copy and Layout *I, 3*
Study and practice in creation of effective advertising copy and layout for print and broadcast media. *(Lec. 2, Lab. 3) Prerequisite: MMG 335 or permission of instructor.* Hill

443 Retail Store Management *I, 3*
Store organization, operation and control. *(Lec. 3) Prerequisite: MMG 323.* Staff

452 International Marketing *II, 3*
Planning and organizing for international marketing operations from a commercial point of view. Differences in market arrangements, legal, cultural, and economic factors in various countries. Strategy of product, pricing, promotion, channels. *(Lec. 3) Prerequisite: MMG 323.* Staff

462 Marketing Research *II, 3*
Nature, scope and applications of marketing and advertising research. *(Lec. 3) Prerequisite: BST 202, MMG 323.* Hill

464 Marketing Policy and Problems *II, 3*
Summary course with emphasis upon decision-making in all marketing areas. Emphasis on use of the case method. *(Lec. 3) Prerequisite: MMG 323 and senior standing.* Staff

474 Advertising Seminar *I, 3*
Summary course covering advertising problems, innovations, ethics, laws and the literature. Major paper required on a significant problem in the field. *(Lec. 3) Prerequisite: MMG 335 or graduate standing, or permission of instructor.* Hill

475 Advertising Campaigns *II, 3*
Analyses and execution of advertising campaigns. Utilizes skills from other advertising and marketing studies. Field trips. *(Lec. 3) Prerequisite: MMG 335, 462, or graduate standing, or permission of instructor.* Hill

481, 482 Directed Study *I and II, 3 each*
Independent study supervised by department faculty. Seminar meetings concerned with specific marketing topics. *Prerequisite: permission of department.* Staff

651 Marketing Management *I and II, 3*
Analysis of marketing problems and determination of marketing policies in product development, promotion, pricing, channel selection; legal aspects. *(Lec. 3) Prerequisite: MMG 950 or equivalent.* Staff

656 International Marketing Management *I and II, 3*
Marketing policy-making for the multinational firm; organizing for international marketing; its opportunities, pricing, channels, promotion, research. *(Lec. 3) Prerequisite: MMG 651.* Staff

658, 659 Seminar in Marketing *I and II, 3 each*
Preparation and presentation of papers on selected topics in marketing. *(Lec. 3) Prerequisite: MMG 950 and 651.* Staff

950 Marketing Survey *I and II, 3*
Fundamentals of marketing. Broad coverage of the field; its place in the economy. *(Lec. 3) Graduate credit for matriculated MBA students only.* Staff

MATHEMATICS (MTH)

CHAIRMAN: Professor Lakshmikantham. Professors Haggerty and Roxin; Associate Professors Driver, Fraleigh, Hachigian, Hosay, Schwartzman, Sine, Suryanarayan and Verma; Assistant Professors Barron, Beauregard, R. Caldwell, Datta, Finizio, Grove, Ladas, Lavoie, Lewis and P. T. Liu.

107 Introduction to Finite Mathematics *I and II, 3*
Introduction to concepts and processes of modern mathematics concerned with logic, sets, and the theory of probability. Role of these concepts in the social and physical sciences of today. *(Lec. 3) Not open to mathematics majors except for mathematics education students.* Staff

108 Topics in Mathematics *I and II, 3*
Designed to introduce the non-mathematics students to the spirit of modern mathematics. Topics are from number theory, topology, set theory, algebra, and presuppose little mathematical background. Emphasis is on the development of reasoning ability and not on manipulative techniques. *(Lec. 3) Not open to mathematics majors except for mathematics education students.* Staff

109 Algebra and Trigonometry *I and II, 3*
Integrated development of the fundamentals of algebra and trigonometry. Review of quadratic equations, systems of equations, mathematical induction, binomial theorem, trigonometric formulas. *(Lec. 3)* Staff

125 Fundamentals of Euclidean Geometry *II, 3*
Rigorous development of elementary Euclidean plane geometry. Introduction to non-Euclidean geometries for comparison. Recommended for those planning to teach geometry in secondary schools. *(Lec. 3)* Staff

141 Introductory Calculus with Analytic Geometry *I and II, 3*
Integration of calculus and analytic geometry. The analytic geometry treats such topics as graphing, straight line and conic sections; the calculus deals with the applications of the derivative in determining maxima and minima rates of change, and in the study of rectilinear motion. Antidifferentiation is introduced early and is used to find area, volume, length of arc and surface area. *(Lec. 3) It is recommended that students electing MTH 141 have completed four units of high school mathematics including trigonometry.* Staff

142 Intermediate Calculus with Analytic Geometry *I and II, 3*
Second course completes the integrated study of both plane analytic geometry and of differential and integral calculus. Applications related to trigonometric, logarithmic, and exponential functions, including polar coordinates and vector algebra, are covered. *(Lec. 3) Prerequisite: MTH 141 or equivalent.* Staff

215 Introduction to Algebraic Structures *I, 3*
Elementary properties of groups, rings, fields, and vector spaces. Detailed study of finite dimensional vector spaces, linear transformations, matrices, determinants, and systems of linear equations. *(Lec. 3) Prerequisite: MTH 142 or equivalent.* Staff

243 Calculus and Analytic Geometry of Several Variables *I and II, 3*
Applications of analytic geometry and calculus to space of three dimensions, including multiple integration and partial differentiation. It also includes infinite series. *(Lec. 3) Prerequisite: MTH 142.* Staff

244 Differential Equations *I and II, 3*
Classification and solution of differential equations involving one independent variable. Applications to all the physical sciences are studied. This course is basic for further study in applied mathematics and for advanced work in physics and engineering. *(Lec. 3) Prerequisite: MTH 243.* Staff

316 Algebra *II, 3*
Theory and structure of groups. Topics from ring theory, principal ideal domains, unique factorization domains, polynomial rings, field extensions, and Galois theory. *(Lec. 3) Prerequisite: MTH 215.* Staff

322 Concepts of Geometry *II, 3*
Survey of geometrical systems including non-Euclidean, affine, and projective spaces and finite geometries. A modern view of Euclidean geometry will be presented using both synthetic and analytic methods. *(Lec. 3) Prerequisite: MTH 141 or equivalent.* Staff

335, 336 Advanced Calculus I, II *I and II, 3 each*
Sets and functions, real topology, continuity and uniform continuity, the Riemann integral, improper integrals, sequences and series of functions, implicit and inverse function theorems, transformation of multiple integrals. Detailed proofs emphasized. *(Lec. 3) Prerequisite: MTH 243.* Staff

353 Foundations of Mathematics *I, 3*
Sets and relations. Construction of the integers, rational numbers, and real numbers from postulates. Completeness of the real number system. Axiom of choice. Transfinite cardinal and ordinal numbers. Transfinite induction. *(Lec. 3) Prerequisite: MTH 142 or equivalent.* Staff

373 Machine Aided Analysis *I and II, 3*
Computer programming with problem and machine oriented languages: roots of equations, matrix operations, numerical quadrature and differentiation, differ-

ential equations. Flow charts. Business applications, non-numerical problems. *(Lec. 3) Prerequisite: MTH 243 or junior standing.* Staff

381 History of Mathematics *I, 3*
General survey course in development and philosophy of mathematics. Provides a cultural background and foundation for advanced study in various branches of the subject. *(Lec. 3) Prerequisite: MTH 142 or equivalent.* Staff

382 Number Theory *II, 3*
Some of the arithmetic properties of the integers including number theoretic functions, congruences, diophantine equations, quadratic residues and classically important problems. *(Lec. 3) Prerequisite: MTH 243.* Staff.

391 Special Problems *I and II, 1-3*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *Prerequisite: permission of department.* Staff

418 Matrix Analysis *II, 3*
Canonical forms, functions of matrices, characteristic roots, applications to problems in physics and engineering. *(Lec. 3) Prerequisite: MTH 215 or permission of instructor.* Staff

425 Topology *I, 3*
Abstract topological spaces and continuous functions. Generalizations of some classical theorems of analysis. *(Lec. 3) Prerequisite: MTH 243 or equivalent.* Staff

441 Introduction to Partial Differential Equations *I, 3*
One-dimensional wave equation. Linear second order partial differential equations in two variables. Separation of variables and Fourier series. Non-homogeneous boundary value problems. Green's functions. *(Lec. 3) Prerequisite: MTH 244.* Staff

442 Vector and Tensor Analysis *II, 3*
Linear transformations, covariant and contravariant vectors. Vector calculus. Divergence and Stokes' theorems. *(Lec. 3) Prerequisite: MTH 244 or equivalent.* Staff

443 Tensor Analysis and Applications *II, 3*
Tensor algebra, covariant differentiation, differential geometry, applications for mathematical physics. *(Lec. 3) Prerequisite: MTH 442.* Staff

444 Ordinary Differential Equations *II, 3*
Introduction to fundamental theory of ordinary and functional-differential equations. Series and numerical methods. Topics from stability, periodic solutions, or boundary-value problems. Applications to physics, engineering, biology. *(Lec. 3) Prerequisite: MTH 244 and permission of instructor.* Staff

451 Introduction to Probability and Statistics *I, 3*
Theoretical basis and fundamental tools of probability and statistics. Probability spaces, properties of probability, distributions, expectations. Some common distributions and elementary limit theorems. Basic principles of statistical testing and estimation. *(Lec. 3) Prerequisite: MTH 243 or equivalent.* Staff

452 Mathematical Statistics *II, 3*
Continuation of MTH 451 in the direction of statistics. Theory of statistical inference, the standard tests, regression, analysis of variance. *(Lec. 3) Prerequisite: MTH 451.* Staff

456 Probability *II, 3*
Continuation of MTH 451 in the direction of probability theory. Further problems in probability theory and applications. Markov chains and other stochastic processes. Generating functions, integral transforms and other advanced techniques. *(Lec. 3) Prerequisite: MTH 451.* Staff

461 Methods of Applied Mathematics *I, 3*
Topics selected from vector analysis, elementary complex analysis, Fourier series, Laplace transforms, special functions, elementary partial differential equations. Emphasis on development of techniques rather than mathematical theory. *(Lec. 3) Prerequisite: MTH 244.* Staff

462 Functions of a Complex Variable *I and II, 3*
First course in the theory of functions of a single complex variable, including analytic functions, power series, residues and poles, complex integration, conformal mapping and applications. *(Lec. 3) Prerequisite: MTH 243 or equivalent.* Staff

472 Introduction to Numerical Analysis *I, 3*
Basic operations of computation, approximation, interpolation, numerical differentiation and integration. Numerical solution of ordinary differential equations. Numerical solution of sets of equations. Matrix inversion. *(Lec. 3) Prerequisite: MTH 244.* Staff

492 (392) Special Problems *I and II, 1-3*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *Prerequisite: permission of department.* Staff

515, 516 Algebra I, II *I and II, 3 each*
Groups, rings, modules, commutative algebra. *(Lec. 3) Prerequisite: MTH 316.* Staff

525 Topology I *I, 3*
Topological spaces, separation properties, connectedness, compactness, uniformities. Function spaces, spaces of continuous functions and complete spaces. *(Lec. 3) Prerequisite: MTH 425 or equivalent.* Staff

526 Topology II *II, 3*
Homotopy. Fiberspaces. Homology and cohomology. Notions of homological algebra. Products. *(Lec. 3) Prerequisite: MTH 525.* Staff

535, 536 Measure Theory and Integration *I and II, 3 each*
Elements of topology and linear analysis. Lebesgue measure and integration in R, in R^n, and in abstract spaces. Convergence theorems. Bounded variation, absolute continuity, and differentiation. Lebesgue-Stieltjes integral. Fubini and Tonelli theorems. The classical Banach spaces. *(Lec. 3) Prerequisite: MTH 336.* Staff

545, 546 Ordinary Differential Equations I, II *I and II, 3 each*
Existence and uniqueness theorems. Continuous dependence on parameters and initial conditions. Singularities of the first and second kinds, self-adjoint eigenvalue problems on a finite interval. Oscillation and comparison theorems. Elements of asymptotic theory. Elements of stability theory of Lyapunov's second method. *(Lec. 3) Prerequisite: MTH 335 and 462.* Staff

550 Advanced Probability *I, 3*
Investigation in depth of a topic in foundations or applications of modern probability theory. *(Lec. 3) Prerequisite: MTH 456.* Staff

551 Advanced Mathematical Statistics I *I, 3*
A thorough development of classical and modern statistics: sampling theory, asymptotic sampling, theory for large samples and exact sampling distributions. The theory of estimation including unbiased estimates, consistent estimates, sufficient statistics, non-parametric and parametric statistics and multidimensional confidence regions. Utility of the theory illustrated by applications from various fields. *(Lec. 3) Prerequisite: MTH 452, 335, or permission of instructor. MTH 335 may be taken concurrently.* Staff

552 Advanced Mathematical Statistics II *II, 3*
Continuation of MTH 551: tests of significance, sample hypothesis, composite hypothesis, most powerful tests, unbiased tests, analysis of variance, regression and multiple regression. Utility of the theory illustrated by applications from various fields. *(Lec. 3) Prerequisite: MTH 551.* Staff

561 Advanced Applied Mathematics *II, 3*
Linear spaces, theory of operators, Green's functions, eigenvalue problems of ordinary differential equations. Application to partial differential equations. *(Lec. 3) Prerequisite: MTH 461.* Staff

562 Complex Function Theory *I, 3*
Analytic continuation, Riemann surfaces. The theory of conformal mapping. Representation theorems and applications. Entire functions. *(Lec. 3) Prerequisite: MTH 462.* Staff

572 Numerical Analysis *II, 3*
Further numerical methods of solution of simultaneous equations, partial differential equations, integral equations. Error analysis. *(Lec. 3) Prerequisite: MTH 472.* Staff

591, 592 Special Problems *I and II, 1-3 each*
Advanced work, under the supervision of a member of the department and arranged to suit the individual requirements of the student. *Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

601 Seminar *I and II, 3*
A graduate seminar in the field of specialization of a member of the department. *Prerequisite: permission of department.* Staff

629, 630 Functional Analysis I, II *I and II, 3 each*
Banach and Hilbert spaces, basic theory. Bounded linear operators, spectral theory. Applications to analysis. Application to a special topic such as differential operators, semigroups and abstract differential equations, theory of distributions, or ergodic theory. *(Lec. 3) Prerequisite: MTH 536 and permission of instructor.* Staff

635, 636 Selected Topics in Real Analysis I, II *I and II, 3 each*
Advanced topics of current research in real analysis will be presented with a view to expose the students to the frontiers of the subject. *(Lec. 3) Prerequisite: permission of department.* Staff

641 Partial Differential Equations I *I, 3*
First order systems. The Cauchy-Kowalewsky theorem. The Cauchy problem. Classification of partial differential equations. Hyperbolic equations. Mainly the theory of the subject. Students interested in techniques for the solution of standard equations should take MTH 441. *(Lec. 3) Prerequisite: MTH 215, 335, and 462.* Staff

642 Partial Differential Equations II *II, 3*
Elements of potential theory. Elliptic equations. Green's function. Parabolic equations. Introduction to the theory of distributions. *(Lec. 3) Prerequisite: MTH 641.* Staff

645, 646 Selected Topics in Differential Equations I, II *I and II, 3 each*
Advanced topics of current research in differential equations will be presented with a view to expose the students to the frontiers of the subject. *(Lec. 3) Prerequisite: permission of department.* Staff

659, 660 Selected Topics in Applied Mathematics I, II *I and II, 3 each*
Advanced topics of current research in applied mathematics will be presented with a view to expose the students to the frontiers of the subject. *(Lec. 3) Prerequisite: permission of department.* Staff

691, 692 Special Topics I, II *I and II, 3 each*
Advanced topics of current research in mathematics will be presented with a view to expose the students to

the frontiers of the subject. *(Lec. 3) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

901 Mathematics Colloquium *I and II, 0*
Current topics in various fields of mathematics, given by special lecturers. *Prerequisite: permission of department.* Staff

MECHANICAL ENGINEERING AND APPLIED MECHANICS (MCE)

CHAIRMAN: Professor Test. Professors Bradbury, G. A. Brown, Conta, Dowdell, Ferrante, C. D. Nash, Schenck, and F. M. White; Associate Professors DeLuise, Goff, Hagist, Hatch, Parker, Velletri, and M. P. Wilson; Assistant Professors Kim, Lessmann, and Palm.

162 Statics *I and II, 3*
Study based on Newton's laws of force systems in equilibrium and their effects on particles, systems of particles, and rigid bodies. Both scalar and vector methods of analysis are developed. *(Lec. 3) Prerequisite: MTH 141.* Staff

212 Mechanical Engineering Laboratory I *II, 1*
For description of this course, see MCE 313-316.

263 Dynamics *I and II, 3*
Kinematic and kinetic study of the motion of particles, systems of particles, and rigid bodies, acted upon by unbalanced force systems, using both scalar and vector methods and including the development of methods of analysis based on the direct application of Newton's laws, the work-energy principle, and the impulse-momentum principle. *(Lec. 3) Prerequisite: MCE 162.* Staff

313 Mechanical Engineering Laboratory II *I, 1*

314 Mechanical Engineering Laboratory III *II, 1*

315 Mechanical Engineering Laboratory IV *I, 1*

316 Mechanical Engineering Laboratory V *II, 1*
Courses MCE 212 and 313 through 316 compose an integrated sequence of laboratory courses from the sophomore through senior year. Subjects include statistical data analysis, curve plotting and fitting, techniques of engineering computations and report writing, digital and analog computer techniques, basic measurement techniques and principles of error evaluation, demonstration experiments, and measurements in basic areas of dynamics, fluid mechanics, stress analysis, sound, vibration, thermodynamics, heat transfer, lubrication, and other aspects of mechanical engineering. Comprehensive tests on prime movers and mechanical apparatus, such as boilers, turbines, internal combustion engines, water wheels, pumps, refrigeration equipment, wind tunnels, compressors, etc., are included. In the senior year the student carries out specialized tests and experiments of his own choice or engages in a project introducing him to research, on which comprehensive reports are required. *(Lab. 3 each)* Staff

323 Kinematics *I and II, 3*
Analysis of mechanisms by analytical and related graphical methods including linkages, cams, gears, gear trains, differential mechanisms, escapements, computing, and miscellaneous mechanisms; vector methods including complex exponential representation of a vector in a plane. *(Lec. 3) Prerequisite: EGR 102, MCE 263.* Hatch and Staff

336 Introduction to Air Pollution Control *II, 3*
Meteorological and legal aspects, effects, sources, and control of air pollution. *(Lec. 2, Lab. 3) Prerequisite: permission of department.* DeLuise

341 Fundamentals of Thermodynamics *I and II, 3*
Basic principles and laws of thermodynamics and their relation to pure substances, ideal gases, and real gases. The use of thermodynamic property tables. The development of the concepts of reversibility and availability. A study of thermodynamic diagrams and processes. *(Lec. 3) Prerequisite: MTH 243, MCE 263, credit or registration in PHY 341.* DeLuise, Lessmann, and Test

342 Mechanical Engineering Thermodynamics *II, 3*
Continuation of MCE 341 including the study of mixture of gases and vapors, topics of gas dynamics and chemical thermodynamics, and applications of thermodynamics to power cycles and refrigeration processes. *(Lec. 3) Prerequisite: MCE 341.* Parker, Wilson and Test

354 Fluid Mechanics *I and II, 3*
Physical properties of fluids, development of continuity, energy, and momentum concepts using vector methods and the application of these concepts to problems involving viscous and non-viscous fluids including boundary layer flows and flows in closed conduits and around immersed bodies. *(Lec. 3) Prerequisite: MCE 263 and MTH 244 or 461.* Dowdell, Hagist, Lessmann, and White

372 (472) Engineering Analysis I *I, 3*
Application of advanced mathematical methods to the solution of mechanical engineering problems with emphasis on the techniques of engineering analysis. *(Lec. 3) Prerequisite: MTH 244, junior standing.* Velletri and Nash

373 Engineering Analysis II *II, 3*
Continuation of MCE 372. *(Lec. 3) Prerequisite: MCE 372.* Staff

391, 392 Honors Work *I and II, 1-3 each*
Independent study and seminar-type work under faculty supervision for honors students. *Prerequisite: admission to departmental honors program.* Staff

417 (or ELE 417) Direct Energy Conversion *II, 3*
Stresses the physical understanding of processes by which energy is converted directly to electricity. Fuel cells and thermoelectric, thermionic, photovoltaic, and magnetohydrodynamic generators. *(Lec. 3) Prerequisite: background in electricity and magnetism, thermodynamics of fluid systems, and modern physics; permission of instructor.* Lessmann, Poularikas or Zirkind

423 Design of Machine Elements *I, 3*
Design and analysis of machinery involving application of the principles of strength of materials. General problem of determining adequacy of design; factor of safety, stress concentration, fatigue, creep temperature stress. Study of mechanical power transmission devices, gears, springs, shafts, fasteners, ball bearing reliability. *(Lec. 3) Prerequisite: MCE 323, CVE 220.* Hatch and Staff

424 Dynamics of Machines *I, 3*
The forces in machinery, including linkages, intermittent motions, trains of mechanism, static, inertia and combined forces, balancing, critical speeds and gyroscopic effects. *(Lec. 3) Prerequisite: MCE 323, MTH 244.* Hatch and Goff

425 Lubrication and Bearings *I, 3*
Theory of hydrodynamic lubrication and bearing design, chemical aspects of lubricants and additives, bearing metals and their surface properties, friction and wear. *(Lec. 3) Prerequisite: MCE 354.* Bradbury

426 Advanced Mechanics of Materials *II, 3*
Advanced problems in stress and deformation of elastic members; general stress relations, principal stresses, theories of failure, thick cylinders and discs, curved bars, torsion of noncircular members, and buckling of bars, plates and shells. *(Lec. 3) Prerequisite: CVE 220.* Hatch and Goff

428 Mechanical Control Systems *II, 3*
Analysis of mechanical, electromechanical, hydraulic, pneumatic, and thermal control systems; transient and frequency response of linear systems; introduction to Laplace transformation applied to automatic control systems, transfer function, system stability; computer applications. *(Lec. 3) Prerequisite: MCE 263 or equivalent and MTH 244.* Nash and Wilson

429 Comprehensive Design *II, 3*
Creative design of engineering systems including possible socioeconomic and ecological considerations. Projects involving original design and analyses. Selected advanced topics in design: reliability and probability considerations, decision theory, optimum design, case studies of recent innovations. *(Lec. 3) Prerequisite: MCE 423.* Hatch and Nash

437 Rocket Propulsion *II, 3*
Propellants and propellant systems. Discussion of rocket design on basis of principles of thermodynamics, fluid mechanics and heat transfer. *(Lec. 3) Prerequisite: MCE 342, 354, 448, or permission of instructor.* DeLuise and White

438 Internal Combustion Engines *I, 3*
Principles, design and operation of internal combustion engines, including cycles, combustion, fuels, detonation, carburation, cooling and heat transfer, supercharging, ignition, engine friction and lubrication. Gasoline and diesel, two- and four-stroke cycle types and performance of various engines. *(Lec. 3) Prerequisite: MCE 342.* Parker

439 Applied Energy Conversion *II, 3*
Modern power systems including steam and gas turbines, nuclear power stations, fuel cells, and thermionic and thermoelectric devices. *(Lec. 3) Prerequisite: MCE 342 and 448 or permission of instructor.* Parker

448 Heat and Mass Transfer *I, 3*
Transfer of heat by conduction, convection and radiation in steady and unsteady states. Theory and application of dimensional analysis and study of heat and mass transfer in equipment such as heat exchangers and steam condensers. *(Lec. 3) Prerequisite: MCE 341.* Wilson, Parker, and DeLuise

455 Advanced Fluid Mechanics *I, 3*
Continuation of MCE 354. Selected topics in advanced fluid mechanics including potential flows, gas dynamics, fluid machinery, and electric and magnetic field effects. *(Lec. 3) Prerequisite: MCE 354.* Dowdell, Hagist, and White

457 (or OCE 457) Fluidics *II, 3*
Description and analysis of various fluidic devices with special emphasis on jet attachment devices. Fluid circuit theory including the design of fluidic systems for special applications. *(Lec. 3) Prerequisite: MCE 354.* Wilson

463 Intermediate Dynamics *I, 3*
Dynamics of particles and rigid bodies developed by vector methods. Applications in planetary, projectile and gyroscopic motion. Introduction to Lagrangian mechanics; generalized coordinates, virtual work. Lagrange's equations and applications. *(Lec. 3) Prerequisite: MTH 244, MCE 263.* Velletri and Staff

464 Vibrations *II, 3*
Elementary theory of mechanical vibrations, including the one-degree-of-freedom system, multi-mass systems, vibration isolation, torsional vibration, beam vibration and critical speeds, analogies and vibration instruments. *(Lec. 3) Prerequisite: MTH 244, MCE 263.* Bradbury, Hatch, and Velletri

491, 492 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. and Lab. according to nature of problem) Credits not to exceed total of 12. Prerequisite: permission of department.* Staff

501, 502 Graduate Seminar *I and II, 1 each*
Participation in seminar discussions, presentation of papers based on research or detailed literature surveys. Attendance is required of all students in graduate residence. A maximum of 1 credit per year is allowed and no more than 2 credits are allowed for the entire period of residence. *(Lec. 1)* Staff

517 (or ELE 517) Magnetofluidmechanics *I or II, 3*
Formulation of the basic concepts and equations governing the interaction between electromagnetic fields and a moving, electrically conducting, continuum fluid. Wave motions in MFM systems and engineering applications. *(Lec. 3) Prerequisite: MCE 455 and ELE 511 or PHY 431, or permission of instructor.* Lessmann

521 Reliability Analysis and Prediction *II, 3*
Statistical analysis of failure of complex engineering systems, design factors contributing to functional system survival, failure, distribution functions, redundancy, confidence, reliability testing. *(Lec. 3) Prerequisite: MTH 451 or equivalent, MCE 423 or permission of instructor.* Nash

524 Advanced Kinematics and Linkage Design *I, 3*
Systematics of mechanisms and synthesis of linkage design. *(Lec. 3) Prerequisite: MCE 423.* Hatch

531 Underwater Power Systems
See Ocean Engineering 531.

532 Coastal Zone Power Plants
See Ocean Engineering 532.

540 Environmental Control in Ocean Engineering
See Ocean Engineering 540.

541 Thermodynamics *I, 3*
Advanced study of classical thermodynamics with emphasis on basic concepts, laws, and thermodynamic relations. *(Lec. 3) Prerequisite: MCE 341, 354.* Brown and Wilson

542 Statistical Thermodynamics *II, 3*
Irreversible thermodynamics, kinetic theory of gases, statistical thermodynamics and the development and application of the partition function. *(Lec. 3) Prerequisite: MCE 341.* Wilson

545 Heat Transfer *I, 3*
Conduction in two and three dimensions and conducting systems with radiation and fluid motion. Solutions obtained by mathematics, computer-numerical methods, and analog devices. *(Lec. 3) Prerequisite: MCE 448.* Schenck

546 Convection Heat Transfer *II, 3*
Study of the relationship between heat transfer and fluid flow with emphasis on the solution of governing equations by exact methods, integral methods and similarity techniques. *(Lec. 3) Prerequisite: MCE 448.* Test

550 Theory of Continuous Media *I, 3*
Basic course for first-year graduate students which develops and unifies the laws of mechanics as applied to the behavior of continua. Application to solids and fluids. *(Lec. 3) Prerequisite: CVE 220, MCE 354, 372, or permission of instructor.* Dowdell and Kim

551 Hydrodynamics *I, 3*
Fundamental concepts of inviscid fluid motion. Rotational and irrotational flows. Applications to rotating fluids, flow around bodies, and other incompressible flows. *(Lec. 3) Prerequisite: MCE 354.* Dowdell, Hagist, and White

552 Hydrodynamics of Viscous Fluids *II, 3*
Fundamental equations of viscous, heat conducting flow. Application to exact viscous solutions, stability and transition, laminar and turbulent boundary layers, heat convection, diffusion, and dissipation. *(Lec. 3) Prerequisite: MCE 551.* Dowdell, Hagist, and White

563 Advanced Dynamics *I and II, 3*
Dynamics of a system of particles, D'Alembert's principle and Lagrange's equations from an advanced point of view. Variational methods, non-conservative and non-holonomic systems; matrix-tensor specifications of rigid body motions, inertia tensor, tops and gyroscopes. General theory of small oscillations of a system of particles, normal coordinates. Hamilton's equation of motion, canonical transformation, Hamilton-Jacobi theory. *(Lec. 3) Prerequisite: MCE 463 or permission of instructor.* Velletri and Nash

564 Advanced Vibrations *I, 3*
Theory of vibration of systems with concentrated masses and stiffness; systems with one degree of freedom, vibration isolation systems with many degrees of freedom, matrix methods, dynamic vibration absorbers, torsional vibration, approximate numerical methods and mobility and impedance methods. Experimental methods and design procedures. *(Lec. 3) Prerequisite: MCE 464.* Bradbury and Nash

565 Advanced Vibrations *II, 3*
Theory of vibration with continuously distributed mass and stiffness. Wave, characteristic function and integral equation methods of solution of string, longitudinal and torsional systems. Vibration and critical speeds of beams and rotating shafts, the methods of Rayleigh, Ritz, and Stodola, and self-excited vibrations. *(Lec. 3) Prerequisite: MCE 564.* Bradbury and Nash

572 Theory of Elasticity *II, 3*
Advanced theory of elasticity of isotropic and anisotropic bodies; plane stress and plane strain analysis via classical and Muskhelishvili's method, three-dimensional applications in torsion, bending, and semi-infinite solids. *(Lec. 3) Prerequisite: MCE 550 or permission of instructor.* Kim

573 Theory of Plates *I and II, 3*
Development of classical theory of plates and application to plates of various shapes under various load-

ings; buckling and large deflections. *(Lec. 3) Prerequisite: CVE 220, MTH 244, MCE 372, or permission of instructor.* Goff, Nash, and Staff

575 Elastic Stability *I and II, 3*
Stability analysis of bars under separate and combined axial, lateral, and torsional loadings; buckling of plates and shells, energy methods and numerical methods. *(Lec. 3) Prerequisite: CVE 220, MTH 244, MCE 372, or permission of instructor.* Goff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

645 Boiling Heat Transfer and Two-phase Flow
See Chemical Engineering 645.

646 (or CHE 646) Radiation Heat Transfer *I or II, 3*
Radiant exchange between surfaces. Radiative properties of surfaces. Exchange among non-ideal surfaces. Gas-radiative exchange. Radiative exchange with volume emitters. Furnace design applications. *(Lec. 3) Prerequisite: MCE 545 or CHE 644 or permission of instructor.* Brown

654 Statistical Theories of Turbulence *I, 3*
Analytical description of random phenomena; three-dimensional space-time correlations. Theories of turbulence including anisotropy and non-homogeneity. Applications to meteorology, boundary layers, and turbulent diffusion. *(Lec. 3) Prerequisite: MCE 552 or permission of instructor.* Hagist

655 Viscous Compressible Flow *II, 3*
Flow of real fluids at extremely high speeds, with emphasis on the development of basic physical relations. Application to several problems in space technology. *(Lec. 3) Prerequisite: MCE 541, 545, 551.* Dowdell, Hagist, and White

656 Flow of Compressible Fluids *II, 3*
Fundamental equations of compressible fluid flow. Solution of these equations for flows at high subsonic and supersonic velocities. *(Lec. 3) Prerequisite: MCE 551 or permission of instructor.* Hagist, White, and Staff

666 Nonlinear Mechanics *I and II, 3*
Dynamics of nonlinear systems, free and forced oscillations; graphical methods, integral curves, singular points, limit cycles and stability. Van der Pol and Hill equations, perturbation methods, approximate methods of Duffing, Poincaré, Kryloff and Bogoliuboff. *(Lec. 3) Prerequisite: MCE 564.* Nash and White

673 Thermal Stress Analysis *I, 3*
Theory of stress and deformation in bodies subjected to thermal environments and restraints. Application to problems in thermoelasticity, thermal fatigue, thermoplasticity, and creep analysis. *(Lec. 3) Prerequisite: MCE 448, 550.* White and Kim

674 Theory of Shells *I and II, 3*
Development and application of membrane and bending theories of shells of various shapes. Variational methods and buckling of shells. *(Lec. 3) Prerequisite: CVE 220, MCE 573, or permission of instructor.* Kim

677 Fatigue Failure and Fracture Mechanics *II, 3*
Advanced study of fracture induced by repeated loading, damage theories, fundamental theories of microscopic crack initiation and growth, statistical aspects of fatigue failure, theory of crack propagation. *(Lec. 3) Prerequisite: MTH 451, MCE 429, 550, or permission of instructor.* Nash

679 Plasticity and Creep *II, 3*
Stress-induced flow of nominally solid materials, effect of temperature, combined stress problems; stress-dependent creep of metals at elevated temperatures, creep buckling, anelastic creep, related dislocation theory. *(Lec. 3) Prerequisite: MCE 550 or permission of instructor.* Goff

691, 692 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem.) Credits not to exceed a total of 12. Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

MEDICAL TECHNOLOGY (MTC)

DIRECTOR: Associate Professor C. W. Houston.

101, 102 Medical Technology Seminar *I and II, 1 each*
Lectures, discussions and demonstrations designed to relate college course work to that of the hospital laboratory. *(Lec. 1) Required of freshmen in the Medical Technology curriculum.* Houston

201, 202 Medical Technology Seminar *I and II, 1 each*
Lectures, discussions and demonstrations designed to relate college course work to that of the hospital laboratory. *(Lec. 1) Required of sophomores in the Medical Technology curriculum.* Houston

MEDICINAL CHEMISTRY (MCH)

CHAIRMAN: Professor Bond. Professor Modest; Associate Professors Pringle and C. I. Smith; Assistant Professors Abushanab and Turcotte.

334 Inorganic Medicinal Chemistry *I, 2*
Physical properties and chemical structures, physical properties and biological activity, inorganic compounds of medicinal and pharmaceutical importance including radioisotopes. *(Lec. 2) Prerequisite: third year standing and permission of department.* Bond

339 Drug Analysis *II, 5*
Principles of quantitative and qualitative assays of drugs, employing physical, chemical and biological methods and techniques. *(Lec. 3, Lab. 6) Prerequisite: third year standing and permission of department.* Smith, DeFanti, Worthen

443, 444 Organic Medicinal Chemistry *I and II, 3 each*
Selected compounds of medicinal and pharmaceutical importance. Uses, syntheses, incompatibilities, correlation of physical properties, structures and biological activity. *(Lec. 3) Prerequisite: CHM 222.* Abushanab and Turcotte

497, 498 Special Problems *I and II, 1-5 each*
Method of carrying out a specific research project in medicinal chemistry. Literature search, planning, laboratory work and the writing of an acceptable report. *(Lab. 3-15) Prerequisite: permission of department.* Staff

501 Radiopharmaceuticals *I, 3*
The theoretical and applied aspects of the commonly used isotopes of pharmaceutical significance with emphasis on the diagnostic, therapeutic, and tracer applications in biological systems and techniques of development, formulation, quality control, and safe utilization. *(Lec. 2, Lab. 3) Prerequisite: CHM 222, PHY 112 and MCH 334 or permission of department.* Smith

526 Lipid Chemistry
See Food and Resource Chemistry 526.

533 Advanced Drug Assay *I and II, 2-4*
Advanced chemical and physical methods of analytical control related to pharmaceutical research and industrial pharmacy. *(Lec. 1, Lab. 3-9) Prerequisite: MCH 339.* Smith

548 (or PCG 548) Physical Methods of Identification *II, 3*
The utilization of physical methods (primarily spectroscopic) in the structure elucidation of complex organic molecules. Emphasis on interpretation of ultraviolet, infrared, nuclear magnetic resonance, mass and optical rotatory dispersion spectra. *(Lec. 3) Prerequisite: CHM 425 and/or permission of instructor.* Turcotte, Tashiro, Shimizu, Abushanab

549 Synthesis *I and II, 3*
Theoretical and applied aspects in synthesis of selected organic compounds of medicinal significance. *(Lab. 9) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

621, 622 Seminar *I and II, 1 each*
Seminar discussions including presentation of papers on selected topics in medicinal chemistry. *(Lec. 1) Students attend seminar each semester while in graduate residence, but a maximum of 1 credit per year is allowed. No more than 3 credits allowed for the entire period of residence.* Staff

643 Advanced Organic Medicinal Chemistry *II, 3*
Synthesis, modes of action, and effects on pharmacological activity. Analgesics, cholinergics, folic acid antagonists, diuretics, and sulfonamides are included. *(Lec. 3) Prerequisite: CHM 422 and permission of instructor. In alternate years, next offered 1971-72.* Turcotte

646 Alkaloids *I, 3*
Advanced course dealing with proof of structure, synthesis, chemical properties and biological activity of various alkaloids. *(Lec. 3) Prerequisite: permission of department.* Abushanab

697, 698 Research in Medicinal Chemistry *I and II, 1-3 each*
Literature survey, laboratory work and a detailed research report on one or more assigned topics in medicinal chemistry. *(Lab. 3-9) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

MILITARY SCIENCE (MSC)

CHAIRMAN: Professor Bates. Assistant Professors Carter, Dinniman, King, Malley, Mason and Robinson.

110 Military Science *I, 2*
Basic concepts of military history; principles of war; definitions of strategy, tactics, logistics, civil-military relations. Warfare through the ages; antiquity—Persia to the Civil War. *(Lec. 2)* Staff

120 Military Science *II, 2*
Warfare through the ages: Civil War through the Korean War. Civilian control. Developing a limited war capability. Counter insurgency. *(Lec. 2) Prerequisite: MSC 110 or permission of department.* Staff

210 Military Science *I, 2*
National security and the concept of force. The bases of a nation's capacity for developing force; geographical position, nature of population. *(Lec. 2, Lab. 2)* Staff

220 Military Science *II, 2*
National security and the concept of force. Force as related to other types of influence, levels of military force, areas of effectiveness of these types of war, and military doctrines regarding these types of military force. *(Lec. 2, Lab. 2) Prerequisite: MSC 210 or permission of department.* Staff

310, 320 Military Science *I and II, 2 each*
Advanced courses: application of the principles of war, small unit tactics, leadership development, plan and execute tactical problems. *(Lec. 2, Lab. 2) Prerequisite: MSC 110, 120, 210, 220, or permission of department.* Staff

330, 340 Military Science (General) *I and II, 3 each*
Advanced courses: military law, obligations and responsibilities of an officer, Army readiness program, administrative management, world change and military implications, logistics, the military team, internal defense and development. *(Lec. 3, Lab. 2) Prerequisite: MSC 310, 320.* Staff

MUSIC (MUS)

CHAIRMAN: Associate Professor Giebler. Professor Clair; Associate Professors Abusamra and Burns; Assistant Professors D. Buck, Fuchs, Gibbs, Kent, Poe and Rankin; Special Instructors Adams, Allan, L. Buck, DiNunzio, Goneconto, Greene, Immomen, LeBer, Marinaccio, Ricci and Zeitlin.

LITERATURE AND HISTORY

101 Introduction to Music *I and II, 3*
Introductory course designed to foster a better understanding and appreciation of the world's great music. A consideration of musical styles, techniques and forms from the listener's standpoint. *(Lec. 3)* Buck, Clair, Kent, and Poe

102 Music Masterworks *II, 3*
A selection of music masterworks from different eras stressing those elements which elevate these compositions above others. Discriminatory listening will be stressed. *(Lec. 3) Prerequisite: MUS 101 or equivalent.* Staff

221, 222 History of Music *I and II, 3 each*
MUS 221: Development of music primarily in Western culture from Ancient times through the Middle Ages, Renaissance and the Baroque periods. *MUS 222:* Continuation to include the Rococo, Classical, Romantic, and Modern eras. *(Lec. 3) Prerequisite: MUS 101 or equivalent.* Gibbs

304 Introduction to Contemporary Music *II, 2*
Major trends, forms, styles and idioms of music from 1875 to the present. *(Lec. 2) Prerequisite: MUS 101.* Gibbs

305 Folk Music *I, 3*
Study of folk songs, dances and instruments of the world with emphasis upon American sources. *(Lec. 3)* Poe

407 The Symphony *II, 3*
Survey of the development of the symphony from its beginnings in the mid-eighteenth century to the present. Includes a study of the evolution of the orchestra and the sonata form and considers cultural influences exerted upon the composers. *(Lec. 3) Prerequisite: MUS 101, 222.* Giebler

408 The Opera *II, 3*
History of the opera from its beginning in Florence at the turn of the seventeenth century to the present. *(Lec. 3) Prerequisite: MUS 221, 222.* Gibbs

431 The Baroque Era *I and II, 3*
Music of the so-called thorough-bass period (ca. 1600-1750) to include the emergence of opera and oratorio, autonomous instrumental music and the concerto style, culminating in the works of Bach and Handel. *(Lec. 3) Prerequisite: MUS 221, 222.* Giebler

432 The Classical Era *II, 3*
Music of the period ca. 1725-1815, beginning with the decorative gallant style of the Rococo composers and culminating in the expressive architectonic textures in the works of Haydn, Mozart and early Beethoven. *(Lec. 3) Prerequisite: MUS 221, 222.* Kent

433 The Romantic Era *I, 3*
Music of the nineteenth century within the context of the Romantic movement (1815-1875). Major composers and their works in various media are considered with respect to their historical significance. *(Lec. 3) Prerequisite: MUS 221, 222.* Kent

481, 482 Piano Literature and Pedagogy *I and II, 2 each*
MUS 481: Intensive study of keyboard literature from 1700 to 1825. Analysis of styles and forms and their implications for performance. Study of teaching methods and materials. *(Lec. 2) Prerequisite: MUS 216, 222, and 252B or 262B or permission of department. MUS 482:* A continuation of MUS 481 involving literature from the nineteenth century to the present. *(Lec. 2) Prerequisite: same as for MUS 481.* Rankin

THEORY AND COMPOSITION

113, 114 Diatonic Harmony and Ear Training *I and II, 3 each*
MUS 113: Rhythmic, melodic, and harmonic elements of music. Scales, intervals, and the chord structure. Sight-singing, rhythmic articulation and melodic dictation. Part-writing, analysis, keyboard work, and harmonic dictation involving primary triads. *(Lec. 2, Lab. 2) Prerequisite: concurrent or previous keyboard experience. MUS 114:* Continuation, covering all diatonic triads, dominant and supertonic seventh chords, and modulation to closely related keys. *(Lec. 2, Lab. 2) Prerequisite: MUS 113.* Buck and Fuchs

117 Applied Composition *I and II, 1*
Private study in composition for students interested in original work in contemporary idioms. Emphasis on the mastery of the basic craft and individual creative expression. May be repeated once for additional credit. *(Lec. 1) Prerequisite determined by audition.* Gibbs

215, 216 Advanced Harmony and Ear Training *I and II, 3 each*

MUS 215: Advanced rhythmic, melodic and harmonic practice approached through sight-singing, dictation, analysis, keyboard work and part-writing including original work. Covers all seventh chords, chromatic alteration, chromatic progression and foreign modulation. *(Lec. 2, Lab. 2) Prerequisite: MUS 114 or equivalent. MUS 216:* Continuation, covering ninth, eleventh and thirteenth chords, melodic elaboration. Introduction to contrapuntal textures and contemporary idioms. *(Lec. 2, Lab. 2) Prerequisite: MUS 215.* Rankin

311, 312 Conducting *I and II, 2 each*

MUS 311: Choral conducting. Special techniques for direction and rehearsal of choral groups. Problems of tone, diction and balance and the organization of school, church, community and professional groups. Analysis of major choral works from the conductor's standpoint. *(Lec. 2) Prerequisite: MUS 216.* Abusamra. *MUS 312:* Instrumental conducting. Problems of the conductor; score reading, interpretation, technique of rehearsal and direction. *(Lec. 2) Prerequisite: MUS 216.* Clair

317 Form and Analysis *I, 3*

Critical study of musical structure. Works of various composers are analyzed with reference to motive and phrase as generative elements in design. *(Lec. 3) Prerequisite: MUS 216.* Gibbs

321 Orchestration *I, 3*

Range, timbre, transpositions and other characteristics of the instruments of the orchestra, singly and in combination. Exercises in writing for choirs of the orchestra and for full orchestra. Setting of one of small homophonic forms of full orchestra required of each student. *(Lec. 3) Prerequisite: MUS 317.* Gibbs

418 Composition *II, 3*

Original work in small binary, ternary, variation and sonatina forms for various instrumental and vocal groups. *(Lec. 3) Prerequisite: MUS 317.* Gibbs

419 Composition *I, 2*

Continuation of *MUS 418,* stressing original composition in larger forms and study of twentieth-century techniques. *(Lec. 2) Prerequisite: MUS 418.* Gibbs

420 Counterpoint *II, 3*

Systematic study of motive manipulation with reference to traditional contrapuntal devices. Emphasis is placed upon harmonic counterpoint of late Baroque but more recent practices are considered. Creative work in canon, invention, fugue, and chorale-prelude. *(Lec. 3) Prerequisite: MUS 317.* Giebler

422 Advanced Orchestration *II, 2*

Continuation of *MUS 321,* emphasizing score reading and orchestrational styles. Transcription for orchestra of a major keyboard work required as a semester project. *(Lec. 2) Prerequisite: MUS 321.* Gibbs

427, 428 Sixteenth-Century Counterpoint *I and II, 2 each*

MUS 427: Practical study of modal polyphony based on the style of Palestrina and his contemporaries, covering *cantus firmus* techniques, imitation and various other contrapuntal devices in two-voice textures. *MUS 428:* Continuation of *MUS 427.* Writing in modal polyphonic textures of three to six voices. Motet and madrigal composition. *(Lec. 2) Prerequisite: MUS 216.* Giebler

441 Special Projects *I and II, 3*

Advanced work in research or of a creative nature in the field of history, theory and composition. Advisory basis, permission of department and instructor required for registration. *Prerequisite: completion of the most advanced undergraduate course in the field.* Staff

APPLIED MUSIC

Instruction in voice and various instruments covering problems in tone production, techniques, interpretation, repertoire and public performance. Instruction consists of private lessons weekly for courses carrying credit. At least three hours' preparation is expected for each hour of credit. Lessons are limited by the instructional time available. A special fee is charged for private instruction. Class instruction is available without charge for preparatory courses which carry no credit. Courses of instruction are offered in:

A Voice	H Bass Viol	Q French Horn
B Piano	J Flute	R Trombone
C Organ	K Oboe	S Baritone Horn
D Harpsichord	L Clarinet	T Tuba
E Violin	M Bassoon	U Percussion
F Viola	N Saxophone	V Guitar
G Violoncello	P Trumpet	

Requirements for Admission. Students who wish to enroll in courses in applied music for credit must give evidence through an audition of at least two years' study at intermediate or high school level and secure permission of the department.

050 Preparatory *I and II, 0*

Class or private instruction. Select appropriate letter and voice or instrument from the list above and add to course number, as 50E Violin. The course may be repeated for a second semester if the work of the first semester is satisfactory. *(Lec. 1)* Staff

251 to 254 Applied Music as Minor or Elective *I and II, 1-2 each*

Private instruction, lower-level. Select appropriate letter and voice or instrument from the list above and add to course number, as 251B Piano. Each course is a prerequisite to the next. Normally, one-credit courses are repeated before entering the next level. *(Lec. 1)* Staff

261 to 264 Applied Music Major *I and II, 3 each*

Private instruction, lower-level, for applied music majors only. Select appropriate letter and voice or instru-

ment from the list above and add to course number, as 261A Voice. Each course is a prerequisite to the next. *(Lec. 1)* Staff

451 to 454 Applied Music as Minor or Elective *I and II, 1-2 each*
Private instruction, upper-level. Select appropriate letter and voice or instrument from the list above and add to course number as 451B Piano. Each course is a prerequisite to the next. Normally, one-credit courses are repeated before entering the next level. *(Lec. 1)* Staff

461 to 464 Applied Music Major *I and II, 4 each*
Private instruction, upper-level, for applied music majors only. Select appropriate letter and voice or instrument and add to course number, as 461A Voice. Each course is a prerequisite to the next. *(Lec. 1)* Staff

ORGANIZATIONS AND ENSEMBLES

Performance of literature for large organizations and small ensembles. Small instrumental ensembles are normally restricted to one performer per part. Registration is open to any qualified student upon consent of the instructor. Courses may be repeated each semester for additional required or elective credit.

391 University Symphony Orchestra *I and II, 1 each*
(Lec. 3)

392 University Marching Band *I, 1*
Marching Band members also register for PEM 103 for 1 credit. *(Lec. 3)* Burns

393 University Chorus *I and II, 1 each*
(Lec. 3) Abusamra

394 Symphonic Wind Ensemble *II, 1*
(Lec. 3) Burns

395 Concert Choir *I and II, 1 each*
(Lec. 3) Abusamra

399 Chamber Music Ensembles *I and II, 1 each*
Chamber music ensembles are designated as A Keyboard Ensemble, B String Ensemble, C Woodwind Ensemble, D Brass Ensemble, E Percussion Ensemble, F Stage Band, G Madrigal Singers. Select appropriate letter and small ensemble from list and add to course number, as 399B String Ensemble. Other ensemble combinations may be added. *(Lec. 2)* Staff

MUSIC EDUCATION

Instruction in Music Education courses 169 through 182 is open only to students in the music education curriculum.

169 Percussion Instruments Class *I or II, 1*
(Lec. 1) Goneconto

171, 172 Piano Class *I and II, 1 each*
(Lec. 1) Staff

173, 174 Voice Class *I and II, 1 each*
(Lec. 1) Abusamra and Gibbs

175, 176 String Instruments Class *I and II, 1 each*
(Lec. 1) Adams and Clair

177, 178 Woodwind Instruments Class *I and II, 1 each*
(Lec. 1) Staff

179, 180 Brass Instruments Class *I and II, 1 each*
(Lec. 1) Burns

181, 182 Intermediate Piano Class *I and II, 1 each*
Further development of basic keyboard performance. Improvised accompaniments to folk songs. Sight transposition. Some score reading. Further development of reading skills using materials on the level of Bartok: Mikrokosmos, Books 2 and 3 and Clementi: Sonatinas, Op. 36. *(Lec. 1) Prerequisite: MUS 172 or equivalent.* Staff

339, 340 Methods and Materials in Teaching Music *I and II, 3 each*
MUS 339: Organization of the vocal music program in the elementary and secondary school with analysis of method and introduction to materials. *(Lec. 3) Prerequisite: junior standing.* Poe. *MUS 340:* Organization of the instrumental music program in the elementary and secondary school with analysis of method and introduction to materials. *(Lec. 3) Prerequisite: junior standing.* Burns

445 Music in the Elementary School *II, 3*
Detailed study of the objectives of music in the elementary grades together with an analysis of programming, procedure and supervision of music teaching at that level. *(Lec. 3) Prerequisite: MUS 339, its equivalent, or experience in teaching music.* Poe

Note: See EDC 484 for required practice teaching in music education. Other recommended courses for teachers: EDC 102, 312, MUS 445, and PSY 113.

NUCLEAR ENGINEERING (NUE)

CHAIRMAN: Professor A. R. Thompson (Chemical Engineering). Program Coordinator: Associate Professor Rose. Associate Professors Madsen and Mairs; Assistant Professor Knickle; Adjunct Associate Professor DiMeglio; Adjunct Assistant Professor Doyle.

538 (or CHE 538) Nuclear Metallurgy *II, 3*
Metallic materials of particular interest in nuclear engineering. The production and physical metallurgy of uranium, thorium, the transuranium elements, and the rare earths; protection against corrosion, radiation damage. *(Lec. 3) Prerequisite: CHE 332.*

581 (or CHE 581) Introduction to Nuclear Engineering *I and II, 3*
Survey course to acquaint students with the field and to emphasize the special application of principles learned in the several specialized branches of engineering. Major topics considered are nuclear physics, problems in the design of reactor cores, materials of construction, instrumentation and control, and health physics. *(Lec. 3) Prerequisite: PHY 340 or 341.* Knickle

582 (or CHE 582) Radiological Health Physics *I, 3*
Fundamentals of health physics and radiation protection are covered. Calibration and use of survey and monitoring equipment are emphasized in the laboratory. *(Lec. 2, Lab. 3) Prerequisite: permission of instructor. In alternate years.* Rose

583 (or CHE 583) Nuclear Reactor Theory *II, 3*
Elementary theory of self-sustained nuclear reactors. Diffusion and slowing-down theory of neutrons and the determination of the critical size and homogeneous thermal reactors with and without reflectors. One-group, two-group and modified two-group approaches are emphasized. *(Lec. 3) Prerequisite: PHY 340 or 341.* Knickle

585 (or CHE 585) Measurements in Nuclear Engineering *I, 3*
Basic techniques used in measuring the interaction of radiation and matter. Principles of ionization chambers, proportional and Geiger-Mueller counters, scintillation counters as well as the related circuitry are presented. Laboratory work stresses a thorough familiarization with the use of these instruments. *(Lec. 2, Lab. 3) Prerequisite: PHY 340 or 341 or permission of department.* Rose

586 (or CHE 586) Nuclear Reactor Laboratory *II, 3*
Theoretical and experimental determination of reactor characteristics. Experimental equipment includes a neutron howitzer, a subcritical training reactor and a one megawatt swimming pool reactor. Digital and analog computer facilities are utilized in calculations. *(Lec. 1, Lab. 4) Prerequisite: NUE 585.* Rose

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

682 (or CHE 682) Radiation Shielding *II, 3*
Detailed study of the problems involved in radiation shielding. The principles of radiation protection are briefly reviewed first. *(Lec. 3) Prerequisite: NUE 581. In alternate years.* Knickle

683 (or CHE 683) Advanced Nuclear Reactor Theory *II, 3*
Advanced treatment of nuclear reactor theory, emphasizing the transport theory and multi-group calculations. Determination of critical size of heterogeneous reactors. Time-dependent transient behavior and basic theory of reactor control are also discussed. Use of digital and analog computers is incorporated. *(Lec. 3) Prerequisite: NUE 583.* Rose

687 (or CHE 687) Nuclear Chemical Engineering *II, 3*
Applications of chemical engineering to the processing of materials for and from nuclear reactors. *(Lec. 3) Prerequisite: NUE 581 and permission of instructor. In alternate years.* Rose

NURSING (NUR)

DEAN: Professor Tate. Professor Cumings; Associate Professors Cumberland, Hart, Hirsch, Houston, McElravy and Michael; Assistant Professors Barden, Cobain, Del Papa, Harrison, O'Neill, Palmer and Pearson; Instructors Ansbacher, Blount, Boger, Campbell, Castro, Elias, Foglia, Gould, Levy, Moretti, Schuler and Seeley.

100 Professionalism and Nursing *I, 2*
Social influences promoting the growth of a profession. The criteria of a profession, relationship to nursing. Educational philosophy of the College of Nursing. Patterns of education and practice in nursing. Group work orientation. *(Lec. 1, Lab. 4)* Harrison and Staff

110 Health and Illness *II, 2*
Components and interdependence of physical and emotional health. National and international health needs and resources. The psychosocial impact of illness on individuals and families; the significance of the nurse-patient relationship. Integration of behavioral concepts. Selected experiences in nurse-patient relationships. *(Lec. 1, Lab. 4)* Harrison and Staff

150 Human Sexuality *II, 2*
An interdisciplinary approach to the study of individual and societal determinants in the development, integration and expression of human sexuality and a code of sexual behavior. Changing social values, sexual mores and behavior and such social problems as illegitimacy, venereal disease, overpopulation and a social-sexual behavior are investigated. *(Lec. 2) Prerequisite: open to all matriculated undergraduate students. S/U credit.* Maternal Child Health Staff

200, 210 Nursing in Contemporary Society *I and II, 2 each*
Trends and issues in professional practice and education and their relationship to the social order. Historical and philosophical foundation of nursing. *(Lec. 2) Open only to graduate nurse students.* Houston

220 Fundamentals of Nursing *I, 4*
Basic course designed to develop an understanding of application of science principles in the practice of the profession of nursing; emphasis on meeting basic body needs of people. *(Lec. 2, Lab. 8) Prerequisite: NUR 110.* Palmer and Staff

230 Care of the Adult I *II, 6*
Emphasis on the use of the problem-solving approach in the care of patients with major health and nursing problems. Group discussions increase the student's understanding of herself, her patients, and their families. *(Lec. 10, Lab. 9; one-half semester) Prerequisite: NUR 220, or R.N. status and PHC 225.* Palmer and Staff

240 Care of the Adult II *II, 6*
Continuation of NUR 230. *(Lec. 8, Lab. 9; one-half semester)* Palmer and Staff

301 Maternal and Child Health Nursing *I and II, 7*
Emphasis upon family-centered health concepts and their interrelationship with physiological, pathological, psychosocial and cultural influences on child growth and development and family functioning. *(Lec. 7) Prerequisite: CDF 200 or PSY 232; PHC 226 and NUR 240. Must be taken concurrently with NUR 302.* Cumberland and Staff

302 Maternal and Child Health Nursing Practicum *I and II, 4*
Utilization of family-centered health concepts in the application of nursing principles and techniques to maternal and child care in selected community agencies. *(Lab. 12) Must be taken concurrently with NUR 301. S/U credit.* Cumberland and Staff

311 Mental Health and Psychiatric Nursing *I and II, 3*
Development of the basic knowledge and understanding necessary to the use of self as a therapeutic agent as related to mental health and illness. Application of content is made to all areas of nursing. *(Lec. 6; twice each semester) Prerequisite: NUR 240. Must be taken concurrently with NUR 312.* McElravy and Staff

312 Mental Health and Psychiatric Nursing Practice *I and II, 3*
Supervised experience in the development of the ability to use oneself as a therapeutic agent as related to mental health and illness. Application of content is made to all areas of nursing. *(Lab. 18; twice each semester) Prerequisite: NUR 240. Must be taken concurrently with NUR 311. S/U credit.* McElravy and Staff

320 Public Health and Public Health Nursing *I and II, 7*
Correlation of theory and practice of the basic principles of public health and public health nursing. Supervised field instruction in a public health nursing agency helps the student develop skills in giving health service to selected patients and families. *(Lec. 8, Lab. 18; twice each semester) Prerequisite: NUR 301 and 302.* Barden and Staff

330 Care of the Adult III *I, 7*
Opportunity to plan and implement care for an adult patient or group of patients with increased complexity of nursing needs. Development of concepts and trends in the care of patients with long-term needs. Critical thinking is encouraged through weekly seminars. *(Lec. 10, Lab. 12) Prerequisite: NUR 240 and PHC 226.* Palmer and Staff

340 Senior Nursing Practice *I, 7*
Emphasis on the care of adults with complex nursing problems and the leadership role of the nurse. Basic concepts of the role of nursing in community preparedness for disaster. *(Lec. 9, Lab. 15) Prerequisite: NUR 330 and senior standing.* Palmer and Staff

350 Conference on Professional Nursing *I and II, 2*
Discussion of major nursing and health issues. Emphasis is placed upon the professional nurse's responsibility to the profession and to the community in which she lives. *(Lec. 2) Prerequisite: senior standing.* Tate

390 Directed study *I and II, 3*
Honors thesis or equivalent independent project relating to the nursing major. A faculty adviser provides guidance in problem delineation, development and drafting of a study plan in the area of a student's special interest. Project need not be completed in one semester, but no more than three credits are allowed. *Prerequisite: admission to College of Nursing honors program.* Staff

501, 503 Advanced Clinical Nursing *I or II, 3 each*
Cross-clinical seminar through which the graduate student is helped to broaden and deepen knowledge of theory, concepts and problems that are common to all nursing. *(Lec. 3) Must be taken concurrently with NUR 502, 504.* Staff

502, 504 Advanced Clinical Nursing Practicum *I or II, 3 each*
Intensive study of significant nursing problems in health agencies, selected cooperatively by student and instructor with regard to student's needs and interests. A substantial paper involving independent study in NUR 501, 502, 503, 504 is required. *(Lec. 1, Lab. 6) Must be taken concurrently with NUR 501, 503. Required of all graduate students in nursing.* Staff

505 Research in Nursing *I, 3*
Current research in nursing, emphasizing interpretation and applications. Methodology related to clinical nursing and community health. Students select a problem and develop a project as a learning experience. *Prerequisite: graduate standing and a basic course in statistics.* Staff

510 Teaching in Clinical Nursing *I or II, 3*
A seminar in which the student is assisted in planning, developing, implementing and evaluating classroom and clinical teaching. *(Lec. 3) Prerequisite: NUR 501, 502. Must be taken concurrently with NUR 511.* Staff

511 Teaching Practicum *I or II, 3*
Supervised teaching experience in student's major field of interest. *(Lec. 1, Lab. 6) Prerequisite: NUR*

501, 502. Must be taken concurrently with NUR 510. Staff

512 Administration in Nursing Service *I or II, 3*
A seminar in which the student is assisted in the development of the philosophy and processes in administration as they relate to nursing service and nursing education. *(Lec. 3) Prerequisite: NUR 501, 502. Must be taken concurrently with NUR 513.* Staff

513 Practicum in Administration of Nursing Service *I or II, 3*
Directed experience in nursing service in the student's major field of interest. *(Lec. 1, Lab. 6) Prerequisite: NUR 501, 502. Must be taken concurrently with NUR 512.* Staff

OCEAN ENGINEERING (OCE)

CHAIRMAN: Professor F. H. Middleton. Professors G. A. Brown, Nacci, Schenck, Sheets and F. M. White; Associate Professors Haas, Kowalski, Rose and J. Stanislao; Assistant Professors LeBlanc, Moffett and Soltz; Adjunct Professor DiNapoli.

457 Fluidics
See Mechanical Engineering 457.

500 Basic Ocean Eugineering *I and II, 3*
Introduction for non-engineering students to the classic engineering disciplines as they relate to marine affairs. Course is descriptive and deals with current engineering practice. *(Lec. 3) Prerequisite: senior standing. No program credit for graduate engineering students.* Sheets

512 Hydrodynamics of Floating and Submerged Bodies I *I, 3*
Hydrodynamic principles associated with floating and submerged bodies: resistance, propulsion, static and dynamic stability. *(Lec. 3) Prerequisite: MCE 455 or equivalent.* Kowalski

513 Hydrodynamics of Floating and Submerged Bodies II *II, 3*
Continuation of OCE 512. Problems of maneuvering, control, and motions in waves. *(Lec. 3) Prerequisite: OCE 512.* Kowalski

524 Marine Structural Design
See Civil Engineering 524.

531 (or MCE 531) Underwater Power Systems *II, 3*
Low output power systems. Overall considerations appropriate to the determination of power requirements for underwater systems. *(Lec. 3) Prerequisite: MCE 342, 448 or permission of instructor.* Brown and Rose

532 (or MCE 532) Coastal Zone Power Plants *I, 3*
Overall systems consideration for coastal zone power plants. Consideration of factors such as political and legal problems, thermal pollution, and multi-use of plants (aquaculture, etc.). *(Lec. 3) Prerequisite: MCE 342, 448 or permission of instructor.* Brown and Rose

534 Corrosion and Corrosion Control
See Chemical Engineering 534.

535 Advanced Course in Corrosion
See Chemical Engineering 535.

540 (or MCE 540) Environmental Control in Ocean Engineering *II, 3*
Application of the principles of thermodynamics, heat transfer, and fluid dynamics to the requirements of human survival and engineering operations in deep and shallow water. *(Lec. 3) Prerequisite: permission of instructor.* Schenck

561 Introduction to the Analysis of Oceanographic Data *I, 3*
Design of oceanic experiments to determine spatial and temporal sampling rates, precision, accuracy, signal-to-noise ratio, etc. Description of typical ocean data collection and analysis systems. Development of relevant techniques. *(Lec. 3) Prerequisite: MTH 451 or equivalent.* LeBlanc

565 & 566

571 (or ELE 571) Underwater Acoustics I *I, 3*
Wave equation, energy, pressure and particle velocity. Acoustic properties of the sea. Elementary sources, refraction, reflection, ray theory, normal modes and scattering, with emphasis on sound propagation in the ocean. *(Lec. 3)* Moffett, DiNapoli

581 Coastal Engineering Geology
See Geology 581.

587 Submarine Soil Mechanics *I, 3*
Soil mechanics principles as applied to submarine slope stability, heaving, sinkage and anchorage problems with emphasis on effective stress principle and selection of shear strength of marine sediments. *(Lec. 3) Prerequisite: CVE 380 or equivalent.* Nacci

591, 592 Special Problems *I and II, 1-6 each*
Advanced work, under the supervision of a member of the staff and arranged to suit the individual requirement of the student. *(Lec. or Lab. according to nature of problem.) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

605, 606 Ocean Eugineering Seminar *I and II, 1 each*
Seminar discussions including presentation of papers based on research or literature survey. *(Lec. 1) Attendance is required of all students in graduate residence. A maximum of 1 credit per year is allowed and no more than 2 credits are allowed for the entire period of residence.* Staff

610 Engineering Ocean Mechanics *II, 3*
Applied concepts of ocean flow processes; waves due to gravity, wind, and layered media; large and small scale turbulence; prediction of flow instability; wave forces on structures. *(Lec. 3) Prerequisite: CHE 344, MCE 354 or equivalent.* White

651, 652 Advanced Design *I and II, 3 each*
Advanced course coordinating engineering principles and economics in the design of a complete ocean engineering device. Problems investigated individually with the guidance of one or more instructors. *Prerequisite: CHE 351, 352 or IDE 404 or equivalent.* Staff

653, 654 Ocean Engineering System Studies *I and II, 3 each*
Systems engineering study of an advanced ocean engineering problem. Students will operate as a complete engineering team with specific subsystems designs done with individual faculty members. Sheets

672 (or ELE 672) Underwater Acoustics II *II, 3*
Transducers, radiators and receivers, directivity (array structures) equivalent circuits, efficiency; piezoelectricity, magnetostriction, sonar principles, measurements and calibration. *(Lec. 3)* Moffett, DiNapoli

673 Advanced Course in Underwater Acoustic Propagation *I, 3*
Analysis of propagation from a concentrated acoustic source in the ocean by methods such as advanced normal mode theory, numerical integration and fast Fourier transforms. Applications to ocean features such as surface ducts, shadow zones, deep sound channel, etc. *(Lec. 3) Prerequisite: OCE 571 or equivalent.* DiNapoli

691, 692 Special Problems *I and II, 1-6 each*
Advanced work under supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem.) Prerequisite: permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

OCEANOGRAPHY (OCG)

DEAN: Professor J. A. Knauss; ASSISTANT DEAN FOR STUDENTS: Assistant Professor Napora. Professors Dietz, Marshall, McMaster, Pratt, Saila, Sieburth, Smayda, Sprague, Stern, Watkins and Winn; Associate Professors Duce, Jeffries, Kennett, Krause, Pilson, Sastry, Schilling and Sturges; Assistant Professors Kenyon, Kester, Lambert, Nixon, Quinn and Swift; Adjunct Professors deBoer, Eisler, LaRoche, Phelps and Shaw.

401 General Oceanography *I, 3*
General survey course in the major disciplines in oceanography including geological, physical, chemical, and biological aspects integrated into a conceptual approach to the sciences of the sea. *(Lec. 3) Prerequisite: at least one laboratory course in a physical or biological science and junior standing or above.* Staff

501 Physical Oceanography *I, 3*
Basic course covering all aspects of physical oceanography. Physical properties of seawater, heat budget, distribution of variables, dynamics, water masses and general circulation. Waves, tides, history and interrelationships with other marine sciences. *(Lec. 3) Prerequisite: PHY 213, MTH 141.* Knauss and Kenyon

509 Ecological Aspects of Marine Pollution *II, 2*
Biological, chemical, and physical aspects of selected agricultural, industrial, and domestic effluents in the marine and estuarine environment. Case histories emphasizing toxicological effects. The concept of bioassay as an analytical tool is developed through demonstrations and discussion. *(Lec. 2) Prerequisite: OCG 401 or permission of instructor.* Eisler

510 Descriptive Physical Oceanography *II, 3*
Observed distributions of temperature, salinity, currents; methods of deducing deep flow; physical properties of seawater; flow in estuaries; practical work in the analysis of oceanographic data; study of recent literature. *(Lec. 3) Prerequisite: OCG 501. In alternate years, next offered 1971-72.* Sturges

521 Chemical Oceanography *II, 3*
Processes regulating the composition of sea water, and the distribution of chemical species. The interaction of marine chemistry with the ocean floor, atmosphere and marine organisms. *(Lec. 2, Lab. 2) Prerequisite: CHM 103, 104 and 112, PHY 213.* Pilson

540 Geological Oceanography *II, 3*
Survey of marine geology and its relationship to other marine sciences. Beaches and coastal evolution; geomorphology, sedimentary processes, structure, volcanism and tectonics of continental margins, ocean basin floor, and mid-oceanic ridges; origin of ocean basins. Laboratory emphasizes instrumentation, procedures and the interpretation of marine geological data. *(Lec. 2, Lab. 2) Prerequisite: GEL 103 or ESC 105 or permission of instructor.* McMaster

561 Biological Oceanography *I, 3*
Nature of life in the sea; adaptations, patterns of distribution and production of plankton, nekton and benthos, their interrelationships and interaction with the environment. *(Lec. 2, Lab. 2) Prerequisite: ZOO 111.* Pratt

567 Marine Bacteriology *I, 3*
Present concepts of the distribution, nature, and functions of bacteria and related microorganisms in the marine environment. Methodology will include sampling, culture, taxonomy and study in regard to their physical and physiological ecology. *(Lab. 6) Prereq-*

uisite: CHM 104 and BAC 201, or permission of instructor. Sieburth

568 Fishery Biology *II, 3*
Biology of fish populations and methods of fishery research, including influence of environmental factors on morphology, physiology, abundance and distribution of fishes, estimation of stocks, growth, aging, mortality, measurement of fish production and theory of fishery regulation. *(Lec. 3) Prerequisite: permission of instructor. In alternate years, next offered 1971-72.* Saila

571 Benthic Environment *I, 3*
Lectures, readings, seminar presentations, discussion and project work on the physical-chemical properties and the total ecology of the benthic marine environment. Includes tidal marshes, rocky intertidal areas, estuarine shoals, coral reefs and the deep-sea benthos. *(Lec. 2, Lab. 2) Prerequisite: permission of instructor.* Nixon

574 Biology of Marine Mammals *II, 2*
Migration, reproduction, social organization, classification, anatomy, populations, physiology and communications of cetaceans and pinnipeds. *(Lec. 1, Lab. 3) Prerequisite: permission of instructor. In alternate years, next offered 1972-73.* Winn

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

605 Dynamical Oceanography *I, 3*
Simple steady state theories applied to ocean motion. Review of well-known force balances in oceanography, wind driven circulation, thermohaline circulation, the thermocline, oceanic boundary layers, near shore circulation, diffusion. *(Lec. 3) Prerequisite: OCG 501.* Kenyon

611 Geophysical Hydrodynamics *II, 3*
Fluid dynamics of rotating bodies with application to earthy phenomena. Figure of the earth. Conservation laws and rotational constraints. Geostrophic and quasi-geostrophic motion. Hydrodynamic instability applied to generation of surface gravity waves. Laminar and turbulent Ekman boundary layers. Wind-driven ocean circulation. Waves and circulation caused by density variations. *(Lec. 3) Prerequisite: permission of instructor.* Stern

612 Experimental Geophysical Hydrodynamics *I, 3*
Laboratory experiments relating to the motion of oceans and atmospheres. Comparison of effects of rotation and stratification. Selected topics of thermal convection, thermohaline convection, inertial waves, rotational and boundary layer phenomena. Emphasis on experimental research techniques and preparation of technical reports. *(Lec. 2, Lab. 3) Prerequisite: permission of instructor.* Lambert

613 Waves *I, 3*
Generation, propagation and decay of surface waves, internal waves, and Rossby waves in the ocean. *(Lec. 3) Prerequisite: MCE 550 or permission of instructor.* Kenyon

614 Tides *II, 1*
Generation, propagation, and dissipation of ocean tides. Relation between theory and observation. *(Lec. 1) Prerequisite: OCG 501.* Kenyon

621 The Estuary and Coastal Zone *I, 3*
Multi-disciplinary course on the characteristics of estuaries and adjacent coastal waters and the ecological, economic, engineering and other considerations applicable to the development, management, and conservation of such waters. *(Lec. 2, Rec./Proj. 1) Prerequisite: advanced (second year) graduate standing and approval of course chairman.* Marshall and Lampe

623 Physical Chemistry of Seawater *I, 3*
The characterization of dissociation, solubility and redox equilibria in seawater. Partial molar volumes, conductivity and diffusion of ions in seawater. Kinetic studies in seawater and the effects of temperature, salinity and pressure on physicochemical properties in seawater. *(Lec. 3) Prerequisite: OCG 521 and CHM 332 or permission of instructor.* Kester

625 Organic Geochemistry *I, 3*
Chemistry of biological compounds in sedimentary organic matter based on their origin, classification and diagenesis. *(Lec. 3) Prerequisite: CHM* 228. J. G. Quinn

630 Geochemistry *II, 3*
Introduction to the study of the distribution of the elements in the natural environment. Emphasis is placed upon an understanding of the chemical principles and chemical processes which govern this distribution. *(Lec. 3) Prerequisite: CHM 104 or 112 and GEL 103 or permission of instructor.* Schilling

631 Seminar in Marine Chemistry *I and II, 1*
Discussion of problems of current interest in marine chemistry. *(Lec. 1) Prerequisite: OCG 521 or permission of instructor.* Staff

643 Seminar in Deep-sea Geology *I, 3*
Class discussion of selected topics in deep-sea geology based on extensive reading in the scientific literature. A research paper by each student and lectures will supplement the discussions. *(Lec. 3) Prerequisite: permission of instructor.* Krause

644 Thermodynamics of the Earth's Interior *II, 3*
Review and application of thermodynamics to geological problems. Crystal-melt equilibria, phase transitions, hydration reactions; coprecipitation laws and fractionation processes; effect of the geothermal and pressure gradients, convection. *(Lec. 3) Prerequisite: GEL 103 and a course in thermodynamics such as CHM 433, or PHY 420, or CHE 313 and 314, or MCE 341 or permission of instructor.* Schilling

645 Geology of Continental Margins *I, 3*
Geomorphology, sedimentology and structure of continental shelves, borderlands, slopes and rises with consideration of origin and developmental processes of continental margins. *(Lec. 3) Prerequisite: OCG 540, GEL 470 and 550. Offered in fall of odd calendar years.* McMaster

647 Recent Sedimentary Environments *I, 3*
Concentrated study of the sedimentary environments of beach, estuary, continental shelf, slope, and rise, with primary emphasis on the relationships between the sediment properties of each environment and its environmental conditions. *(Lec. 3) Prerequisite: OCG 501, 540, GEL 550. Offered in the fall of even calendar years.* McMaster

648 Marine Paleoecology *II, 4*
Concepts of paleoecology. Review of Pleistocene and Tertiary paleo-oceanography, paleoclimatology and paleoecology. Criteria and methods used in marine paleoecology, especially those related to foraminifera and radiolaria. Deep-sea biogenic sediments and their relation to oceanic processes such as solution, productivity and dilution. *(Lec. 3, Lab. 1) Prerequisite: permission of instructor. Research term paper.* Kennett

661 (or BOT 661) Phytoplankton Taxonomy *I, 3*
Classical and modern systems and techniques for the identification, nomenclature, and classification of planktonic algae, with emphasis on marine forms. Phylogeny will be briefly considered. *(Lec. 1, Lab. 4) Prerequisite: permission of instructor. In alternate years, next offered fall 1972.* Hargraves

662 Ecological Concepts in Marine Research *II, 3*
Advanced course in ecology with emphasis on marine environment. Ecological theory pertaining to population dynamics, energy in ecological systems and the application of quantitative biology in oceanography. Application of experimental methods in ecological research. *(Lec. 3)* Jeffries

663 (or BOT 663) Phytoplankton Physiology *I, 3*
Metabolic processes and methods of their investigation in phytoplankton with primary emphasis on functions pertinent to their ecology. Includes adaption, uptake of nutrients, excretion, rhythms, pigments, and photosynthesis. *(Lec. 3) Prerequisite: permission of instructor.* Swift

664 (or BOT 664) Phytoplankton Ecology *II, 4*
Biology, ecology, methods of investigation and introductory systematics of the pelagic marine microscopic plants; stress on their adaptations, physiological ecology, distribution, succession, production, and regional and seasonal dynamics. *(Lec. 3, Lab. 3) Prerequisite: permission of instructor.* Smayda

666 Zooplankton *I, 3*
Biology of marine zooplankton, dealing with morphology, adaptation, distribution, physiology, production and interrelationships with other members of the marine biota. *(Lec. 1, Lab. 4) Prerequisite: permission of instructor.* Napora

667, 668, 669 (or BOT 667, 668, 669) Advanced Phytoplankton Seminars *II, 2 each*
Specialized and advanced areas of phytoplankton biology and research, including systematics, physiology and ecology. *(Sem. 3) Prerequisite: permission of instructor.* Hargraves, Smayda and Swift

672 Marine Invertebrates and Environment *II, 3*
Physiological responses of marine invertebrates to seasonal and geographical changes in the environment. Survival, metabolism, reproduction and larval development of the populations. Mechanisms in adaptation during all stages in the life cycle will be examined in relation to changes of certain environmental factors. Physiological variation of populations as it relates to the speciation process in the sea. Lectures, reading and discussion from the literature. A research project is expected of each student. *(Lec. 3) Prerequisite: OCG 561 and permission of instructor.* Sastry

673 Advanced Animal Behavior *II, 4*
Animal communication with some emphasis on bioacoustics, circadian rhythms, orientation and related topics. *(Lec. 2, Lab. 4) Prerequisite: permission of instructor. In alternate years, next offered 1972-73.* Winn

683 Quantitative Genetics I
See Genetics 683.

684 Quantitative Genetics II
See Genetics 684.

691, 692 Individual Study *I and II, 1-6 each*
Individual study of assigned topics or special problems, involving literature search and/or original investigation under one or more members of the staff. *(Lec., Lab. TBA)* Staff

693, 694 Special Studies *I and II, 1-4 each*
Studies of specialized topics in the marine sciences. *(Lec., Lab. TBA)* Staff

695 Seminar in Oceanography *I and II, 1 each*
Students to give seminar reports on problems and current research in various areas of oceanography. *(Lec. 1)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

ORGANIZATIONAL MANAGEMENT AND INDUSTRIAL RELATIONS (OMR)

CHAIRMAN: Professor Coates. Professors Geffner and Kaiser; Associate Professors deLodzia, Hoban, Murdough and Schmidt; Assistant Professors Desfosses, Peck and Raffaele; Instructor Overton.

300 (MGT 202) Personnel Administration *I and II, 3*
Methods and techniques for developing and maintaining an efficient working force from the viewpoint of both employer and employee. Selection, placement, testing, training, discipline, morale, wage administration, job evaluation and stabilization. *(Lec. 3) Not open to management majors; no credit if MGT 303 has been taken.* Staff

301 (MGT 203) Principles of Management *I and II, 3*
Managerial action within an organizational structure. Decision-making, communication and motivational activities interrelated in the management process. *(Lec. 3)* Raffaele and Overton

302 (MGT 204) Manufacturing Industries of the United States *II, 3*
Manufacturing processes using the systems approach. *(Lec. 3)* Murdough

303 (MGT 303) Personnel Administration and Organizational Behavior *I, 3*
Employer-employee problems at various internal levels and their impact on society. Recruitment, selection, testing, training, wages, manpower requirements, the growth of organized labor, collective bargaining, pension plans, management development programs, public relations and the role of the federal government. *(Lec. 3)* Schmidt, Kaiser and Staff

304 (MGT 304) Personnel Management and Interpersonal Behavior *II, 3*
Basic problems of the personnel manager arising in human relations in the business concern. Case analysis method used emphasizing technical factors, human factors, time and space considerations and personnel principles and policies. *(Lec. 3) Prerequisite: OMR 303 or permission of department.* Staff

306 (MGT 302) Managerial Economics *II, 3*
Role of risk, product development, marketing and promotional policies, pricing, cost control, planning of capital expenditures, forecasting, the alternative nature of decision-making. *(Lec. 3) Prerequisite: ECN 126.* Staff

321 (MGT 321) Labor Problems *I, 3*
The historical development of labor unions and the changing composition of the labor force. Factors determining wage levels and employment in the firm and market. Analysis of mobility and occupational and regional wage differentials; the power of unions to raise wages; the role of investments in the human agent as a factor in economic growth. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor.* Schmidt

407 (MGT 407) Administrative Practices *I, 3*
Administrator in various departments of the business organization, understanding of work group behavior, barriers to communication, work simplification, degree of centralization, and the administrator as an agent of organizational change. Individual reports on case studies required. *(Lec. 3) Prerequisite: OMR 301 or permission of instructor.* Staff

422 (MGT 422) Labor Legislation *II, 3*
Economics of welfare legislation, particularly old age and unemployment compensation provisions of the Social Security Act, and provisions of the Workmen's Compensation Acts, with particular emphasis on the impact of the acts on the Rhode Island labor force and economy. Effects of wage and hour law, minimum wage law, and child labor laws. *(Lec. 3) Prerequisite: ECN 126 or permission of instructor.* Schmidt

423 (MGT 423) Industrial Relations *II, 3*
Public interest in labor relations and problems involved in effectuating collective bargaining. Major adjustments of management to changes in labor policy of federal and state governments, community and labor unions. *(Lec. 2, Lab. 2) Prerequisite: OMR 301.* Schmidt, Kaiser and Raffaele

431 (MGT 431) Advanced Management Seminar *I, 3*
Integrated approach to problems in major areas of business management with emphasis on administrative and executive viewpoint. *(Lec. 3) Prerequisite: OMR 301.* Kaiser and Raffaele

491, 492 (MGT 491, 492) Special Problems *I and II, 3 each*
Lectures, seminars, and instruction in research techniques, literature and other sources of data in the field of management, with application to specific individual projects. *(Lec. 3) Prerequisite: permission of department.* Staff

504 (MGT 504) Business Policy *II, 3*
Determination of objectives and planning programs of action, creating an organization and launching a program; controlling execution of plans; reappraising objectives. These goals are attained through emphasizing administrative situations as described in cases. *Prerequisite: completion of 42 credit hours in MBA program or permission of department. MBA students only.* Staff

631 (MGT 631) Personnel Management *I and II, 3*
The role of personnel management and its functional relationship within an organization with emphasis on behavioral concepts and their application. Text, cases and research. *(Lec. 3)* Raffaele

632 (MGT 632) Managerial Economics *I and II, 3*
Mathematics, statistics, and econometrics as tools in dealing with typical problems of managerial economics; application of economic concepts to decision-making of the firm. *(Lec. 3) Prerequisite: ECN 900, MGS 980, BST 981, or equivalent.* Staff

638, 639 (MGT 638, 639) Seminar in Industrial Management *I and II, 3 each*
Class discussion of typical cases, original research work in the field of industry with discussion of data

collected and analyzed by individual students. *(Lec. 3) Prerequisite: permission of department.* Staff

930 (MGT 930) Principles of Management *I and II, 3*
Management applied to business; objectives, policies, organization, staffing and control; production personnel, behavioral science applications; the role of quantitative methods. *(Lec. 3) Graduate credit for matriculated MBA students only.* Overton

PHARMACOGNOSY (PCG)

CHAIRMAN: Professor Worthen. Professor Youngken; Assistant Professors Shimizu and Tashiro; Instructor Johnson; Clinical Professor Cannon.

445, 446 General Pharmacognosy *I and II, 4 each*
Natural products of biological origin as important pharmaceuticals. Sources, process of isolation and general fundamental properties. *(Lec. 3, Lab. 3) Prerequisite: CHM 228 and 230, BOT 111, ZOO 111 or equivalent.* Johnson, Youngken and Worthen

459 (359) Public Health *I, 3*
The principles of prevention and control of disease and the application of this information to current health problems. *(Lec. 3) Prerequisite: BAC 201, PCG 446 or permission of instructor.* Worthen and Cannon

497, 498 Special Problems *I and II, 1-3 each*
Methods of carrying out a specific research project in pharmacognosy. Includes literature search, planning, laboratory work and the writing of an acceptable report. *(Lab. TBA) Prerequisite: permission of department.* Staff

521, 522 Seminar *I and II, 1 each*
Seminar discussions including presentation of papers on selected topics in pharmacognosy. *(Lec. 1) Students attend seminar each semester while in graduate residence, but a maximum of 1 credit per year is allowed. Not more than 3 credits allowed for entire period of residence.* Staff

533 Medicinal Plants *I and II, 2*
Problems in drug plant chemotaxonomy with field work in the drug plant gardens. Emphasis is placed on certain alkaloid, glycoside and oil-yielding plants. Weedicides and insecticides as related to measures for control. *(Lec. 1, Lab. 3) Prerequisite: PCG 446 or permission of department.* Staff

536 Antibiotics *II, 3*
Advanced course dealing with the concept of antibiosis, biosynthesis pathways of antibiotic production, testing, chemistry, mechanism of action, medicinal and pharmaceutical uses of antibiotics. Phenomena of sensitivity and resistance with emphasis on those entities of importance in pharmaceutical research and production. *(Lec. 3) Prerequisite: permission of department. In alternate years, next offered 1972-73.* Worthen

548 Physical Methods of Identification
See Medicinal Chemistry 548.

551, 552 Chemistry of Natural Products *I and II, 3 each*
Introduction to the chemistry of certain groups of natural products especially in relation to their chemotaxonomic position in plant classification. Topics limited to secondary metabolites: e.g. terpenoids, phenolic compounds, aromatic compounds, phytosterols, and alkaloids. *(Lec. 3) Prerequisite: CHM 228 and 230. In alternate years, next offered 1971-72.* Shimizu and Tashiro

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

633, 634 Biosynthesis *I and II, 3 each*
Biogenesis of medicinally active principles of biological origin. Emphasis given to organic acids, polysaccharides, glycosides, steroids and certain nitrogenous compounds. *(Lec. 3) In alternate years, next offered 1971-72.* Staff

635, 636 Pharmacognosy Techniques *I and II, 3-4 each*
Physical and chemical factors influencing growth and development of active principles of drug plants. Certain biological analyses of results are performed. *(Lec. 1, Lab. 6-9)* Staff

697, 698 Research in Pharmocognosy *I and II, 1-3 each*
Literature survey, laboratory work and a detailed research report on one or more assigned topics. *(Lab. TBA)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PHARMACOLOGY AND TOXICOLOGY (PCL)

CHAIRMAN: Professor DeFeo. Professor Lal; Associate Professors DeFanti and Fuller; Assistant Professor Carlson; Laboratory Instructor Brubacher.

221 Dental Therapeutics *I, 2*
Medicinal agents, their actions and therapeutic uses with special emphasis on those substances employed in dental practice. For students in Dental Hygiene. *(Lec. 2)* Fuller

225 Pharmaceutical Calculations and Introduction to Pharmacology
See Pharmacy 225.

226 Pharmacology and Therapeutics *II, 2*
Continuation of PCL 225 (PHC 225) with special emphasis on the properties, actions, uses, dosage and

toxicology of drugs used in the treatment of disease. *(Lec. 2) Prerequisite: PCL 225. For students in the College of Nursing.* Fuller

321 The Chemical Environment of Man *II, 3*
Introduction to basic pharmacological concepts used to explain the response of the human body to chemical stimuli including certain medicinally useful drugs and chemicals which are misused or abused. Legislation pertaining to drugs and chemicals. *(Lec. 3) Prerequisite: sophomore standing and permission of department. Designed primarily for non-health science majors.* Staff

336 Principles of Pharmacology *I, 2*
Physico-chemical relationships underlying drug action including the study of those drugs producing a local effect on skin and mucous membranes. *(Lec. 2) Prerequisite: third year standing.* DeFeo and DeFanti

441, 442 General Pharmacology *I and II, 4 each*
Action of drugs on physiological function with reference to responses by tissue systems. Toxic effects, mechanism of action and dosage. *(Lec. 3, Lab. 3) Prerequisite: fourth-year standing or permission of department.* Staff

497, 498 Special Problems *I and II, 1-3 each*
Methods of carrying out a specific research project in pharmacology. Literature search, planning, laboratory work and the writing of an acceptable report. *(Lab. TBA) Prerequisite: permission of department.* Staff

521, 522 Seminar *I and II, 1 each*
Seminar discussions and presentation of papers on selected topics in pharmacology. *(Lec. 1) Students attend seminar each semester while in graduate residence, but a maximum of 1 credit per year is allowed. No more than 3 credits are allowed for the entire period of residence.* Staff

542 Evaluation of Drug Effects *II, 5*
Theory, methods and techniques involved in the determination of qualitative and quantitative activity and relative toxicity of drugs. *(Lec. 2, Lab. 9) Prerequisite: PCL 441 and 442, BST 501, or equivalent and permission of department. In alternate years, next offered 1972-73.* DeFanti and DeFeo

544 Forensic Toxicology *II, 3*
Theoretical and practical aspects of poisoning including the isolation and identification of toxic materials from pharmaceuticals, body fluids and tissues. Isolation and identification of physiological fluids from stains, hairs, and tissue with application to forensic medicine. *(Lec. 2, Lab. 3) Prerequisite: PCL 441, 442 and permission of department. In alternate years, next offered 1972-73.* DeFanti

546 Advanced Toxicology *II, 4*
Toxic effects of selected drugs and other xenobiotics on physiological and biochemical processes. *(Lec. 3, Lab. 4) Prerequisite: PCL 441, 442 or equivalent, and permission of department. In alternate years, next offered 1971-72.* Carlson

550 Operant Analysis of Behavior
See Psychology 550.

562 Psychopharmacology *II, 3*
Effects of drugs on animal and human behavior and on related biochemical processes. *(Lec. 3) Prerequisite: PCL 441 or equivalent and/or permission of department. In alternate years, next offered 1972-73.* Lal

564 Psychopharmacology Laboratory *II, 1-3*
Laboratory exercises to demonstrate effects of drugs on animal and human behavior. To earn more than one credit, the student will engage in original work of limited scope. *(Lab. 3-9) Prerequisite: PCL 441 or equivalent and/or permission of department.* Lal

572 Neural Bases of Drug Action *II, 3*
Review of neuroanatomy, neurochemistry, and neurophysiology as they are related to drug action. *(Lec. 3) Prerequisite: PCL 441 or equivalent and/or permission of department. In alternate years, next offered 1971-72.* Lal

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

641 Biochemical Pharmacology *I, 4*
Theory and application of pharmacological studies at the cellular and subcellular levels and their significance to drug action in the intact organism. *(Lec. 3, Lab. 3) Prerequisite: PCL 441 and 442 and permission of department. In alternate years, next offered 1971-72.* Fuller

643 Advanced Pharmacology and Techniques *I, 4*
Mechanism of action of drugs on living tissues, organs and organisms with particular emphasis on cellular physiology as a basis of explanation of tissue response. Advanced laboratory techniques as employed for pharmacological testing. *(Lec. 2, Lab. TBA) Prerequisite: PCL 442, and permission of department. In alternate years, next offered 1972-73.* DeFeo

697, 698 Research in Pharmacology *I and II, 1-5 each*
Literature survey, laboratory work and a detailed research report on one or more assigned topics. *(Lab. TBA)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PHARMACY (PHC)

CHAIRMAN: Professor Gerraughty. Professors Osborne and Paruta; Clinical Professor L. P. Jeffrey; Asso-

ciate Professor Gloor; Clinical Assistant Professors Fish and Gallina; Clinical Instructor R. Kaufman.

225 (or PCL 225) Pharmaceutical Calculations and Introduction to Pharmacology *I, 2*
Introduction to drugs and mechanism of drug action and the mathematical concepts of dosage and strength. Emphasis on anti-infectives and anti-neoplastic agents is included. For students in the College of Nursing. *(Lec. 2)* Fuller and Gerraughty

333, 334 General Pharmacy *I and II, 4 each*
Mathematical concepts and principles, processes and techniques encountered in preparation of various classes of pharmaceutical preparations. Emphasis on officially recognized and commercially important products in each group. Formulations and methods of preparation are studied in laboratory. *(Lec. 3, Lab. 4) Prerequisite: third-year standing.* Osborne

351 Personal Cosmetics *I and II, 3*
Formulation and manufacture of various types of personal cosmetics and toilet preparations. Examples of types studied are prepared in laboratory. *(Lec. 2, Lab. 3) Prerequisite: PHC 334.* Osborne

353, 354 Physical Pharmacy *I and II, 3 each*
Physico-chemical principles and laws as they apply to pharmaceutical systems: equilibria, solubility phenomena, particle-size technology, rheology, stability testing. *(Lec. 3) Prerequisite: PHC 334.* Paruta

360 Hospital Pharmacy *II, 3*
Introduction to the practice of pharmacy in hospitals, including both professional and administrative activities. Field trips are taken to representative hospital pharmacies. *(Lec. 2, Lab. 3) Prerequisite: PHC 334.* Jeffrey and Gallina

383, 384 Dispensing Pharmacy *I and II, 4 each*
Problems in preparing and dispensing pharmaceuticals, applying principles of pharmacognosy, medicinal chemistry and pharmacology. Practical application of laws and regulations, formulation techniques, prescription specialties and drug information. *(Lec. 2, Lab. 6) Prerequisite: PHC 354.* Gerraughty

425 History of Pharmacy *I and II, 3*
Historical development of pharmacy in this country and abroad emphasizing the background of recent developments in the profession and related health sciences. *(Lec. 3) Prerequisite: fourth- or fifth-year standing.* Osborne

451 Clinical Pharmacy *I, 3*
Clinical orientation to the practice of the health professions and to the patient within the community and in institutional settings, with emphasis on the various clinical services, therapeutics, observation and participation in clinical rounds, conferences, and case studies. *(Lec. 2, Lab. 3) Prerequisite: fifth-year standing.* Jeffrey and Gallina

497, 498 Special Problems *I and II, 1-3 each*
Method of carrying out a specific research project in pharmacy. Literature search, planning, laboratory work and the writing of an acceptable report. *(Lab. 3-10) Prerequisite: permission of department.* Staff

521, 522 Seminar *I and II, 1 each*
Seminar discussions including presentation of papers on selected topics in pharmacy. *(Lec. 1) Students attend seminar each semester while in graduate residence, but a maximum of 1 credit per year is allowed. Not more than 3 credits are allowed for the entire period of residence.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

621, 622 Manufacturing Pharmacy *I and II, 2-5 each*
Theory of and practice in the manufacture of pharmaceuticals and the principles of operation of the equipment used for their production. *(Lec. 2, Lab. 0-9)* Gerraughty, Gloor, and Paruta

625, 626 Hospital Pharmacy Administration *I and II, 3 each*
Hospital organizations, including intra- and interdepartmental relationships, the medical and service staff problems, the administrator, personnel management, pharmaceutical service with relation to patient care, medical and pharmaceutical research. *(Lec. 3)* Gerraughty and Paruta

631 Advanced Physical Pharmacy *I, 3-5*
Application of physical-chemical principles to problems in pharmaceutical research, with emphasis on methods by which properties of new medicinal and pharmaceutical agents are determined. *(Lec. 3, Lab. 3-6) Prerequisite: CHM 332 or permission of department.* Gerraughty, Gloor and Paruta

632 Advanced Physical Pharmacy *II, 2-4*
Application of physical-chemical principles to problems in pharmaceutical research, with emphasis on methods by which properties of new medicinal and pharmaceutical agents are determined. *(Lec. 2, Lab. 0-6) Prerequisite: PHC 631.* Staff

641 Pharmaceutical Formulations *I, 2-4*
Methods of solving problems in pharmaceutical formulations to obtain therapeutically active, stable, and esthetically acceptable dose forms. *(Lec. 2, Lab. 3-6) Prerequisite: PHC 632.* Gerraughty and Gloor

642 Pharmaceutical Formulations *II, 2-5*
Methods of solving problems in pharmaceutical formulations to obtain therapeutically active, stable, and esthetically acceptable dose forms. *(Lec. 2, Lab. 3-9) Prerequisite: PHC 641.* Staff

697, 698 Research in Pharmacy *I and II, 1-3 each*
Literature survey, laboratory work and a detailed research report on one or more assigned topics in pharmacy. *(Lab. TBA)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PHARMACY ADMINISTRATION (PAD)

CHAIRMAN: Associate Professor Campbell. Associate Professors Crombe and Jacoff; Adjunct Assistant Professor Buchalter.

351 Pharmaceutical Law and Ethics *I, 3*
Certain basic principles of law and ethics as applied to federal, state and local acts, regulation and practices encountered in course of professional duties. Specific attention given to liabilities of pharmacists in decisions and actions involving sale of medicinals, poisons, and narcotics. *(Lec. 3)* Jacoff

405 Pharmacy Personnel Administration *I, 2*
Development of attitudes and methods of solving personnel problems in the retail pharmacy. *(Lec. 2) Prerequisite: permission of department.* Staff

406 Pharmacy Retailing *II, 4*
Effect of economic trends and marketing changes on the retail distribution of pharmaceuticals and allied products, particularly as they affect the professional practice of pharmacy. *(Lec. 3, Lab. 2) Prerequisite: permission of department.* Staff

451 Pharmacy Administration Principles *II, 3*
Practical solutions to problems encountered in selection, location and management of pharmacies, their personnel, stock and equipment. *(Lec. 3) Prerequisite: fifth-year standing.* Tindall

453 Drug Marketing Principles *II, 2*
Modern methods of merchandising, agencies involved in marketing drug products; their functions, particularly as they affect the retail phase of professional practice. *(Lec. 2) Prerequisite: fifth-year standing, ECN 123 or 125.* Crombe

497, 498 Special Problems *I and II, 1-3 each*
Methods of carrying out a specific research project in pharmacy administration. Literature search, planning, laboratory work and writing of an acceptable report. *(Lab. 3-10) Prerequisite: permission of department.* Staff

570 Case Studies in Pharmacy Law *II, 3*
Case studies and a detailed analysis of the FDC, Harrison narcotic, hazardous substances, poisons and public health insurance laws. *(Lec. 3) Prerequisite: PAD 351.* Staff

580 Prepaid Drug Plans *I, 3*
Institutional relationships involved in the prescribing, dispensing and prepayment of drugs. Problems of interference with pharmaceutical or medical practice arising from different types of prepayment plans. Actual experience, laws and court decisions, abuse and controls. *(Lec. 3) Prerequisite: PAD 451 and 453.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

621, 622 Seminar *I and II, 1 each*
Seminar discussions and presentation of papers on selected topics in pharmacy administration. *(Lec. 1) Students attend seminar each semester while in graduate residence, but a maximum of 1 credit per year is allowed. Not more than 3 credits are allowed for the entire period of residence.* Staff

651, 652 Health Care Systems I and II *I and II, 3 each*
Arrangements for utilizing pharmaceutical resources in public and private systems of health care in the U.S. and other countries. Variations in quality and distribution of care among socio-economic groups. *(Lec. 3) Prerequisite: PAD 580 and BST 501 or equivalent.* Staff

697, 698 Research in Pharmacy Administration *I and II, 1-3 each*
Literature survey, laboratory work and a detailed research report on one or more assigned topics in pharmacy administration. *(Lab. TBA)* Staff

PHILOSOPHY (PHL)

CHAIRMAN: Professor Freeman. Professor Martin; Associate Professor Young; Assistant Professors Fedoryka, Hanke, Pauley, Peterson, Schwarz and Zeyl; Instructor Starr.

101 Logic: Principles of Reasoning *I or II, 3*
Some of the main fields of knowledge are defined and related in terms of the kinds of evidence and methods that are peculiar to each. Inductive and deductive logic are considered with an analysis of arguments and fallacies with the aim of developing and understanding responsible statement and belief. *(Lec. 3)* Staff

103 Introduction to Philosophy *I or II, 3*
Philosophical problems: how man knows and values; the foundations of morals; the nature of truth; the meaning of human existence. *(Lec. 3)* Staff

112 Ethics *I or II, 3*
Examination of the principles underlying man's moral behavior. The meaning of the good life, duty, right and wrong considered systematically and historically, and in relation to some personal and social problems. The aim is to understand such virtues as temperance, courage, justice, tolerance, prudence, together with the vices and misconceptions associated with them. *(Lec. 3)* Staff

118 The Philosophy of Communism *I or II, 3*
The essence of communism, the intellectual and ideological causes for its existence, and its implications with respect to the moral, religious and political heritage of the West. *(Lec. 3)* Staff

121 History of Ancient Philosophy *I or II, 3*
Survey of major thinkers and schools of thought in Ancient Greece, including selected pre-Socratics, Plato, and Aristotle. *(Lec. 3)* Staff

122 History of Medieval Philosophy *I or II, 3*
Survey of major thinkers and schools of thought in the Middle Ages, including such thinkers as Augustine, Anselm, Aquinas, and Occam. *(Lec. 3)* Staff

123 History of Modern Philosophy *I or II, 3*
Survey of major thinkers and schools in modern times, including Descartes, Locke, Berkeley, Hume, Leibnitz, Spinoza, Kant, and Hegel. *(Lec. 3)* Staff

124 History of Recent Philosophy *I or II, 3*
Survey of the more important philosophical developments during the last century: realism, pragmatism, positivism, analytic philosophy, materialism, existentialism, and certain other philosophical movements. *(Lec. 3)* Staff

125 Biblical Thought *I, 3*
Selected portions of the Old and New Testaments with emphasis on their positive contribution to the philosophy of the Jewish and Christian religions. *(Lec. 3)* Staff

126 The Development of Christian Thought *II, 3*
History of religious and philosophical ideas to acquaint students with the development of the teachings of Christianity. Emphasis to meet needs and interests of students. Historical nature of material suitable for liberal education without regard to student's religious affiliation. *(Lec. 3)* Staff

128 The Philosophy of Religion *I and II, 3*
Nature of religion: Hinduism, Judaism, Christianity, Buddhism, Mohammedanism; the nature of God, relation of faith to reason, problem of evil and human freedom; relation of religion to social movements. *(Lec. 3)* Staff

146 Existentialism *I and II, 3*
Contemporary existentialism, both religious and secular, by examining its historical antecedents, and such major contemporary representatives as Martin Heidegger, Jean Paul Sartre, Gabriel Marcel, and Karl Jaspers. *(Lec. 3)* Staff

251 Symbolic Logic *I or II, 3*
Selected topics in modern symbolic logic including calculus of propositions, predicate calculus and modal logics. Attention will be given to philosophical and mathematical aspects of the subject. *(Lec. 3)* Staff

401, 402 Special Problems *I and II, 3 each*
Course may vary from year to year, allowing one or more advanced students to pursue problems according to their special interests. One or more written papers will be required. Work to be done through the guidance of instructor in conferences. *(Lec. 3) Course may be repeated for credit. Prerequisite: permission of department.* Staff

405 Aesthetics *I or II, 3*
Systematic exploration of the philosophical problems arising from human interest in the beauty of nature and in the products of the fine arts; the nature, and kinds, of arts; aesthetic norms and standards of criticism. *(Lec. 3) Prerequisite: junior standing.* Staff

440 Philosophy of Language *I or II, 3*
Language in its relation to the world, cognitive and non-cognitive functions of language and philosophical issues in the area of communication. The work of Wittgenstein, the Logical Positivists, Linguistic Analysts and other contemporary thinkers will be discussed. *(Lec. 3)* Staff

441 Metaphysics *I or II, 3*
Systematic and historical study of the nature of metaphysics, including such topics as: causation, essence, mind, universal categories, presuppositions, and their relation to the arts and sciences. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Staff

442 Epistemology *I or II, 3*
Systematic and historical study of ways of knowing; kinds of knowledge; the physical and non-physical sciences. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Staff

502, 503, 504, 505 Tutorial in Philosophy *I and II, 3 each*
Discussion by the staff and advanced students of research problems in philosophy. Presentation and criticism of original papers. *(Lec. 3)* Staff

512 Seminar in Ethics and Value Theory *I or II, 3*
Intensive studies of various issues, theories and aspects in the field of values and valuation. The texts of leading moralists will be carefully analyzed. *(Lec. 3) In alternate years.* Staff

530 The Philosophy of Plato *I or II, 3*
Selected dialogues from the later period. Particular attention will be given to the areas of metaphysics, epistemology, cosmology, and ethics. *(Lec. 3) In alternate years.* Staff

531 Philosophy of Aristotle *I or II, 3*
Selected texts with emphasis on the major concepts of Aristotle's metaphysics, theory of knowledge, and ethics. *(Lec. 3) In alternate years.* Staff

540 Philosophy of Augustine *I or II, 3*
Examination of the philosophical background of Augustine's thought and of his doctrines of knowledge and reality with reference to his influence on the subsequent philosophical development in medieval and modern thought. *(Lec. 3) In alternate years.* Staff

541 Philosophy of Aquinas *I or II, 3*
Critical examination of the major contribution of Aquinas to metaphysics, epistemology, and philosophical psychology. *(Lec. 3) In alternate years.* Staff

551 Philosophical Logic *I or II, 3*
Intensive consideration of such issues as the nature, structure and function of propositions, predication and the analysis of the "is" relation. The relation between propositions and facts. The nature of logic and the criterion of the logical and the relation of logic to language, psychology and ontology. *(Lec. 3) In alternate years.* Staff

552 The Philosophy of Science *I or II, 3*
An inquiry into the nature and history of scientific thought, with emphasis on the analysis of fundamental concepts of the physical and biological sciences in the order of human knowledge and on their importance for human existence. *(Lec. 3) Prerequisite: PHL 101 and a year of either physical or biological science or permission of instructor.* Staff

560 British Empiricists *I or II, 3*
Intensive analysis of the work of one or more of the British empiricists: Locke, Berkeley, or Hume. *(Lec. 3) In alternate years.* Staff

561 Continental Rationalists *I or II, 3*
Intensive analysis of the work of one or more of the continental rationalists: Descartes, Spinoza or Leibniz. *(Lec. 3) In alternate years.* Staff

570 Philosophy of Immanuel Kant *I or II, 3*
Intensive analysis of major texts. Special attention will be given to *The Critique of Pure Reason. (Lec. 3) In alternate years.* Staff

580 Nineteenth-Century Philosophy *I or II, 3*
Intensive analysis of the work of a major philosopher or philosophical movement. Attention will be given to such major figures as Hegel, Kierkegaard, C. S. Peirce, or James. The specific subject changes from year to year. *(Lec. 3) In alternate years.* Staff

581 Twentieth-Century Anglo-American Philosophy *I or II, 3*
Intensive analysis of the work of one contemporary British or American philosopher or philosophical movement. The specific subject changes from year to year. *(Lec. 3) In alternate years.* Staff

590 Contemporary European Philosophy *I or II, 3*
Intensive analysis of the works of selected representatives of such schools as neo-Kantianism, phenomenology, neo-positivism, neo-Hegelianism, historicism, and vitalism. *(Lec. 3) In alternate years.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PHYSICAL EDUCATION (PED)

510 Current Problems in Physical Education, Health and Recreation *I, 3*
Current problems in physical education, health, and recreation designed to acquaint the students with conditions that give rise to problems and various techniques used in finding solutions to them. *(Lec. 3) Prerequisite: permission of department.* Staff

520 Curriculum Construction in Physical Education *II, 3*
Analysis of criteria and procedures for curriculum construction in physical education. Standards for the evaluation and revision of elementary and secondary school physical education courses. *(Lec. 3) Prerequisite: permission of department.* Staff

530 Research Methods and Design in Health and Physical Education *I, 3*
Introduction to methodology in experimental, laboratory, curriculum, action, and historical research. *(Lec. 3) Prerequisite: competence in basic statistics and permission of department.* Sonstroem

540 Principles of Recreation Leadership *II, 3*
Modern concepts of responsibilities involved in program planning in schools and community agencies. Leadership of committees and board relations as well as practical program promotional techniques. *(Lec. 3) Prerequisite: permission of department.* Leathers

550 Administration of Physical Education *II, 3*
Problems and procedures for administering a physical education program studied from the viewpoint of the physical education administrator, the school administrator and the faculty. Emphasis is placed upon the study of administrative cases. *(Lec. 3) Prerequisite: PEM 380.* Nedwidek and Polidoro

560 Seminar in Health, Physical Education and Recreation *I, 3*
Selected topics within the three areas, depending on availability of specialized instruction including visiting professorships. *(Lec. 3) Prerequisite: permission of department.* Staff

570 Major Health Problems and Curriculum Planning in Health Education *II, 3*
Major health problems related to personal and community health with emphasis on health education, curriculum planning and evaluation. *(Lec. 3) Prerequisite: permission of department.* DelSanto

575 Perceptual-motor Education *I, 3*
The role of motor activity in enhancing perceptual development and how the physical educator can become involved in cooperation with other school personnel in the implementation and continuing development of perceptual-motor programs. For teachers in elementary schools and in special education who wish to incorporate motor activities into their programs. *(Lec. 3) Prerequisite: PSY 113, 232 and permission of instructor.* McCormick

580 Physical Education for the Mentally Retarded *I, 3*
Introduction to the contributions of physical education to the growth and development of mentally retarded. Basic movement, rhythms, games, sports, stunts, tumbling, gymnastics, apparatus, etc. for both educable and trainable mentally retarded. *(Lec. 3) Prerequisite: PSY 442 and/or permission of department.* McCormick

581 Psychological Aspects of Physical Activity *II, 3*
Scientific principles and research from psychology are studied and related to physical activity. Educational program situations amenable to research and the application of psychological principles are isolated. Major emphasis is utilized to recommend improvements in physical education methodology. *(Lec. 3) Prerequisite: PSY 113, 232 and permission of instructor.* Sonstroem

585 Physical Education for the Atypical Child *I, 3*
Limitations, needs, learning characteristics of the physically and mentally handicapped child which apply to verbal response, body control, kinethesis and neuromuscular acceptance. Research reviewed and synthesized for a practical problem. *(Lec. 3) Prerequisite: ZOO 121, 142, and kinesiology recommended.* Slader

591 Special Problems *I or II, 3*
Requirements are satisfied by writing a paper reporting the in-depth investigation of a pertinent problem in the field, including a review of relevant literature, analysis and solution of the problem based on scientific methodology, and recommendations for improved practices. *Limited to and required of all master's degree candidates in physical education who elect the non-thesis option.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PHYSICAL EDUCATION FOR MEN (PEM)

CHAIRMAN: Associate Professor Zarchen; CORDINATOR: Associate Professor Nedwidek. Professors Cieurzo and Slader; Associate Professors Calverley, Cole, Leathers, Maack and Russell; Assistant Professors Arnold, DelSanto, Falk, McCormick, J. S. Norris, T. L. Norris, O'Leary, Piez, Polidoro, Sherman and Sonstroem; Instructor Cooke; Lecturers Campanelli, Carmody, Gregory, Henni, Muir, Pascale, Posadowski and Rankin.

101, 102 Basic Physical Education *I and II, 1 each*
Tests and activities to improve the physical fitness of men. Lectures in health education. A uniform appropriate to the activity is required. *(Practicum, three periods)* Staff

103 Participation in the University Marching Band *I, 1*
Maximum of 4 credits. Open to men and women. May not be substituted for required physical education courses. Staff

105, 106 Competition in Intercollegiate Athletics and in Basic Instructional Courses *I and II, 1 each*
Freshman year. The student must be listed on the coach's roster to receive credit. *(Practicum, minimum of four hours per week)* Staff

121 Soccer and Physical Conditioning *I, 1*
Theory and techniques of soccer and physical conditioning. *(Lab. 3)* Sherman and Henni

122 (or PEW 211) Aquatics *II, 1*
Inventory-testing provides instruction in watermanship from beginning through Water Safety Instructor Certification. Small craft and waterfront safety information provided in accordance with Rhode Island life guard policy. *(Lab. 3)* Slader

123 Foundations of Health
See Physical Education for Women 260.

124 History and Principles of Physical Education *II, 2*
Historical overview of physical education. Principles of physical education teaching stressed for professional orientation. *(Lec. 2)* Sherman

125 Tumbling and Stunts *I, 1*
Techniques of performing and teaching elementary through advanced tumbling, stunts and trampolining. *(Lab. 3)* Sherman and Henni

126 Basic Gymnastics *II, 1*
Fundamentals of apparatus, with emphasis on nomenclature, safety, skill and teaching progressions. *(Lab. 3)* Sherman and Henni

172 (or PEW 172) First Aid *I or II, 1*
Basic instruction and practice in accident prevention and first aid procedure. Students successfully meeting requirements will receive a Standard First Aid Certificate. *(Lec. 1)* Cooke and Norris

203, 204 Basic Physical Education *I and II, 1 each*
Recreational activities available to adults are stressed. Includes golf, volleyball, badminton and tennis. Equipment: same as in 101, 102. *(Practicum, three periods)* Staff

207, 208 Competition in Intercollegiate Athletics and in Basic Instructional Courses *I and II, 1 each*
Sophomore year. The student must be listed on the coach's roster to receive credit. *(Practicum, minimum of four hours per week)* Staff

241 Golf and Wrestling *I, 1*
Theory and technique of golf and wrestling. *(Lab. 3)* Cieurzo, Leathers and O'Leary

242 Badminton and Tennis *II, 1*
Theory and techniques of badminton and tennis. *(Lab. 3)* Maack and Norris

243 Prevention and Care of Athletic Injuries and First Aid *I, 3*
Conditioning, use of physiotherapy equipment, massaging, taping and bandaging techniques. Latest American Red Cross procedures with the opportunity to receive standard certification. *(Lec. 2, Lab. 2) Prerequisite: intended for physical education majors.* Cole and Cooke

244 Physical Education for the Elementary School *II, 2*
Emphasis on developing physical education programs for boys and girls according to physical criteria (age, height, weight, sex, health status) as well as grade level. *(Lec. 1, Lab. 2)* DelSanto

247 Athletic Officiating *I, 2*
Theory, practice and techniques of officiating football and basketball. Practical experience in intramural athletics. *(Lec. 2)* Piez

248 Athletic Officiating *II, 2*
Theory, practice and techniques of officiating volleyball, soccer and baseball. *(Lec. 2, Lab. 2)* Piez

272 Advanced First Aid *I or II, 1*
Special skills relative to particular activities, i.e., skiing, aquatics, etc. A follow-up course to Standard First Aid. *(Lec. 1) Prerequisite: a current Standard Certificate.* Slader, Norris

309, 310, 311, 312 Competition in Intercollegiate Athletics and in Basic Instructional Courses *I and II, 1 each*
Junior and senior years. The student must be listed on the coach's roster to receive credit. *(Practicum, minimum of four hours per week)* Staff

339 Advanced Gymnastics *I, 1*
Continuation of instruction in apparatus skills employing more advanced techniques with positive emphasis on breakdown of complex movements. *(Lab. 3)* Sherman and Henni

351 Understanding Motor-development of the Elementary School Child *I, 3*
Associated physical factors involved in teaching skills to elementary school children. Emphasis placed upon types and sequence of activities along with teaching and learning facts appropriate to skill level. *(Lec. 3)* Slader

352 Movement Education in Elementary Physical Education *II, 3*
Specialized movement in physical education in both graded and adaptive activities from kindergarten to upper elementary age. Particular attention is given to the analysis of physical development in specific skills and space orientation. *(Lec. 3) Prerequisite: ZOO 121 and 141, or permission of department.* Slader

354 Curriculum Designs in Elementary Physical Education *II, 3*
Curriculum planning for the primary, intermediate and middle school with attention to the organization and implementation of elementary physical education programs. *(Lec. 3)* DelSanto

356 Methods and Materials in Health Education *I and II, 3*
Curricular materials for school and public health education; evaluation of techniques and current methodology for use in elementary and secondary schools. *(Lec. 3)* DelSanto

357 Principles of Community Health *II, 3*
Principles of community health with emphasis on problems of health departments, public and private agencies and schools in the community health education program. *(Lec. 3)* DelSanto

358 Current Problems of Safety and First Aid *I, 3*
Major emphasis on content, methods, procedures and techniques of teaching safety. Reports on the latest developments in teachers' liability and responsibilities for accidents to school children. *(Lec. 3)* Slader

359 Field Work in Health *II, 3*
Directed participation in community health education in cooperation with community health organizations. Weekly seminars. *(Lab. 6)* DelSanto

360 (or PEW 210) Rhythm and Dance *II, 1*
Presentation of basic rhythms, folk and square dance. Techniques of teaching dance and experience in calling included. *(Lab. 3)* Slader and Leathers

362 Coaching of Track and Field *II, 2*
Theory, techniques and practice in coaching of track and field. *(Lec. 2, Lab. 2)* Sherman

363 Principles of Athletic Coaching *I, 3*
Principles of exercise physiology, leadership, and psychology applied to athletic coaching. Includes material on administration of athletics. *(Lec. 3)* Polidoro, Sherman

364 Coaching of Baseball *II, 2*
Theory, techniques and practice in coaching baseball. *(Lec. 2, Lab. 2)* J. Norris

365 Physical Education Observation and Assisting *I, 2*
Student assists faculty member in organizing and teaching in the physical education curriculum. Includes weekly discussion of experiences. *(Lec. 1, Lab. 3)* Polidoro

366 Physical Education Assisting *II, 1*
Student assists faculty member in organizing and teaching in the required physical education curriculum. *(Lab. 3)* Polidoro

367 (or EDC 367) School Health Program *I, 3*
Organization of the school health program in relation to the community health program. Emphasis on study

of health instruction, health services and healthful school environment. *(Lec. 3)* DelSanto and Slader

368 (or EDC 368) Methods and Materials in Physical Education *II, 2*
Lecture and discussion of learning theory applied to methods of teaching physical education. Includes role of teacher in various stages of the learning process. Sources of resource materials included. *(Lec. 2)* Cieurzo, O'Leary

369 (or PEW 351) Tests and Measurements in Physical Education *I and II, 3*
The place of testing in the physical education curriculum. Includes analysis of data, marking systems and overview of existing tests and measures. *(Lec. 3)* Sonstroem

370 Applied Anatomy and Kinesiology *II, 3*
Anatomical relationships which deal primarily with physical principles of leverage, angles, stance and locomotion. Includes mechanical and kinesiological analysis of human motion. *(Lec. 3) Prerequisite: ZOO 121.* Slader, Cooke

372 Instructor's First Aid *I or II, 1*
For students and teachers who have completed the advanced course within two years, and desire to certify pupils in Junior, Standard and Advanced First Aid courses. *(Lec. 1)* Slader

374 Audiovisual Aids *II, 2*
Presentation of the values and uses of audiovisual materials in the teaching-learning situation. Practice in operating equipment and preparing various teaching aids is included. *(Lec. 1, Lab. 2)* Slader

380 Curriculum and Administration of Physical Education *I, 3*
Physical education curriculum design in elementary and secondary schools. Includes role of teacher as administrator of his classes and member of school faculty. *(Lec. 3)* Cieurzo

382 Community Recreation *I, 2*
Principles and objectives of recreational program planning with a consideration of facilities, equipment and personnel. Particular attention directed toward development of recreation leadership. *(Lec. 2)* Leathers

383 Introduction to Outdoor Recreation *I, 3*
Outdoor recreation as a distinct and separate concept, land and water resources, the various activities, and the necessary facilities. Considerable attention to the concern and role of governmental agencies and private enterprise. *(Lec. 3)* Leathers

384 Coaching of Football *I, 2*
Theory, techniques and practice in coaching football. *(Lec. 2, Lab. 2)* O'Leary

386 Coaching of Basketball *I, 2*
Theory, techniques and practice in coaching basketball. *(Lec. 2, Lab. 2)* Carmody

410 Adaptive and Corrective Physical Education *I, 3*
Introductory survey course in which the student investigates selected physical, intellectual, and emotional impairments that necessitate adaptations in programs of physical education. *(Lec. 3) Prerequisite: senior standing or permission of department.* Slader

Note: Student teaching includes practicum in both elementary and secondary schools under supervision of the department staff. See EDC 484 and 485.

PHYSICAL EDUCATION FOR WOMEN (PEW)

CHAIRMAN: Professor Massey. Associate Professors Crooker and Mandell; Assistant Professors Bloomquist, Clegg, Cohen, Gardner, Plunkett and Robinson; Instructors Bricker and Nugent; Special Instructors I. Marsden and M. Marsden.

101, 102 Physical Education *I and II, 1 each*
Activity course including archery, badminton, basketball, bicycling, bowling, canoeing, classical ballet, diving, fencing, field hockey, folk dance, golf, gymnastics, lacrosse, lifesaving, modern dance, square dance, swimming, tennis and volleyball. May be elected by any woman student. *(Practicum, three one-hour periods)* Staff

172 First Aid
See Physical Education for Men 172.

203, 204 Physical Education *I and II, 1 each*
Continuation of PEW 101, 102. *(Practicum, three one-hour periods)* Staff

210 Rhythm and Dance
See Physical Education for Men 360.

211 Aquatics
See Physical Education for Men 122.

212 to 214 Physical Education *I and II, 1 each*
Continuation and addition of activities listed in PEW 101 through PEW 104. Additional activities include stunts and tumbling, outdoor education and camping, track and field. *(Practicum, three one-hour periods.) Required of physical education majors; others by permission of department chairman.* Staff

260 (or PEM 123) Foundations of Health *I and II, 3*
Development of attitudes and practices that lead to more healthful living. Personal and community health problems are studied. *(Lec. 2, Discussion 1)* Staff

270 Introduction to the History and Philosophy of Physical Education *II, 3*
Survey of historical development of physical education as an integral part of education and as a profession from ancient times to the present. Emphasis on development of educational philosophies within physical education and basic to current interpretations of

the theory and practice of physical education for women. *(Lec. 3) Prerequisite: EDC 102.* Massey

285 Principles of Teaching Physical Education *II, 2*
Principles of teaching elementary and secondary school physical education as an integral part of the total education of the student. Through an understanding of the basic concepts, general principles to guide the effective planning of physical education programs will be formulated. *(Lec. 2)* Crooker

290 Recreation Programs and Leadership *I, 2*
Principles and practice of leadership in social recreation situations. Overview of school and community programs; planning and conducting activities for children, youth and adults; developing personal resources for creativity. *(Lec. 1, Lab. 2)* Mandell

295 Physical Education in Elementary Schools *II, 2*
Techniques used in conducting a program of physical education for elementary school children. Types of activities found in the basic program and progressions in planning for various age groups will be stressed. *(Lec. 1, Lab. 2)* Mandell

300, 301 The Theory of Teaching Team Sports *I and II, 2 each*
Analysis of methods and principles involved in teaching various team sports. Class organization, teaching progression, and coaching techniques in sports. Practice in officiating and tests for sport ratings will be given. *(Lec. 1, Lab. 2)* Robinson

320 Kinesiology *II, 3*
Analysis of human motion based on anatomical, physiological and mechanical principles. Emphasis on application of these principles to fundamental movements and physical education activities. *(Lec. 3) Prerequisite: ZOO 143.* Staff

324 Rhythmic Analysis and Accompaniment *II, 2*
Special emphasis on rhythmic and kinesthetic factors in movement. Study and use of various types of instruments for dance accompaniment with practical experience in the accompaniment of dance. *(Lec. 1, Lab. 2)* Cohen

328, 329 Theory and Teaching of Individual and Dual Sports *I and II, 2 each*
Analysis of methods and principles involved in teaching various individual and dual sports. History, techniques, strategy, teaching methods, and progression for various sports. Equipment, rules and etiquette. Students will be given supervised practical experience in each sport. *(Lec. 1, Lab. 2)* Clegg

331 Theory and Teaching of Dance *I, 2*
Methods, materials and techniques used in teaching dance. Theory and practical experience in developing the movement vocabulary. Emphasis on teaching progression, lesson planning and dance demonstration. *(Lec. 1, Lab. 2)* Cohen

351 Tests and Measurements in Physical Education
See Physical Education for Men 369.

380 Organization and Administration of Physical Education *I, 3*
Techniques, methods, and systems used in organizing and administering physical education programs. Special emphasis on various phases of women's programs in both public and private institutions. *(Lec. 3)* Massey

410 Corrective and Adaptive Physical Education *I, 3*
Evaluation and planning of programs in physical education adapted to needs of atypical individuals. Application of anatomical and mechanical principles in detection and correction of faulty development and body mechanics. Emphasis on relationship to the medical field. *(Lec. 3) Prerequisite: senior standing or permission of department.* Staff

495 Directed Study *I and II, 3*
Honors thesis or equivalent project, relating to physical education major. With faculty guidance, the student will determine problem and develop plan of study. Project may be completed in either one to two semesters, maximum credit three. *Prerequisite: admission to the honors program of the Department of Physical Education for Women.* Massey

Note: Student teaching includes practicum in both elementary and secondary schools under the supervision of the department staff. See EDC 484 and 485.

PHYSICS (PHY)

CHAIRMAN: Professor F. H. Fisher. Professors Baum, Dietz and Quirk; Associate Professors Desjardins, Hartt, Letcher, Malik and Stone; Assistant Professors Choudry, Cuomo, Kaufman, Kirwan, Northby, Penhallow and Willis.

102 Fundamental Physics *I, 3*
Fundamental principles of physics primarily for students of nursing. Non-mathematical qualitative course. Will not serve as a basis for advanced study in physics. *(Lec. 2, Lab. 2)* Stone

104 General Physics *II, 5*
Introductory course designed to present basic physics for the student enrolled in the Commercial Fisheries Program. *(Lec. 4, Lab. 3) Limited to students in the Fisheries and Marine Technology Program. Not offered 1971-72.* Staff

109 Introduction to Physical Science *I and II, 4*
Designed to give the non-science major an appreciation of the physical universe and an introduction to the principles and theories of contemporary physics. *(Lec. 3, Lab. 2)* Willis and Staff

111, 112 General Physics *I and II, 4 each*
PHY 111: mechanics, heat and sound. *PHY 112:* optics, electricity, magnetism and modern physics. Non-calculus presentation of fundamental physics. Suitable for prospective teachers, pre-medical and pre-dental students. *(Lec. 3, Lab. 2)* Quirk and Staff

213, 214 Elementary Physics *I and II, 3 each*
PHY 213: mechanics, heat and wave motion. *PHY 214:* electricity, magnetism and optics. This course is intended for students planning to major in one of the sciences. It is recommended that MTH 141 and 142 be taken concurrently. Registration in PHY 285, 286 is required. *(Lec. 3)* Staff

223 Introduction to Acoustics and Optics *I and II, 3*
Intended primarily for students in the College of Engineering. Fundamentals of acoustical and optical phenomena, systems and instruments. *(Lec. 3) Prerequisite: MCE 162 and 263 to be taken concurrently.* Staff

285, 286 Physics Laboratory *I and II, 1 each*
Selected groups of laboratory exercises applying to PHY 213 and 214. *(Lab. 3) Prerequisite: for PHY 286, PHY 213.* Staff

322 Mechanics *II, 3*
Introduction to Newtonian statics and dynamics using vector analysis. Application to various topics in physical mechanics. *(Lec. 3) Prerequisite: PHY 112* or *214.* Staff

331 Theory of Electricity and Magnetism *I, 3*
Intermediate course covering topics in fields of electricity and magnetism. *(Lec. 3) Prerequisite: PHY 112 or 214 (calculus may accompany it).* Stone

334 Optics *II, 3*
Geometrical and physical optics: thick lens optics, interference, diffraction, polarization. *(Lec. 3) Prerequisite: PHY 112 or 214.* Stone

340 Introduction to Modern Physics *I and II, 3*
Origin, development and current status of some of the more important concepts and theories of modern physics. Conduction of electricity through gases, properties of electrons, thermionic and photo-electric effects, elementary, quantum theory, atomic structure and atomic spectra, isotopes and nuclear physics. *(Lec. 3) Prerequisite: PHY 112 or 214. For students majoring in physics who wish a broad view of the current status of physics before beginning specialized courses or others who wish an extended knowledge beyond the usual elementary courses.*

341 Modern Physics I *I and II, 3*
Kinetic theory, special relativity, wave and particle properties of matter and radiation, atomic structure and spectra. *(Lec. 3) Prerequisite: PHY 223.* Staff

342 Modern Physics II *I and II, 3*
Basic concepts and theories of solid state and nuclear physics. *(Lec. 3) Prerequisite: PHY 341.* Staff

381, 382 Advanced Laboratory Physics *I and II, 2 each*
Experiments in electrical measurements and electronics. *PHY 381:* classical experiments such as the Millikan Oil Drop and the measurement of e/m. Students are introduced to the careful handling and reduction of data. Special attention is given to precision of measurements and the accuracy of the results obtained. *PHY 382:* the fundamentals of vacuum tubes and transistors are considered. Attention given to basic electronic circuits, including rectifiers, amplifiers, cathode followers, multivibrators, etc. *(Lab. 6) Prerequisite: PHY 112 or 214.* Cuomo

401, 402 Seminar in Physics *I and II, 1 each*
Preparation and presentation of papers on selected topics in physics. *(Lec. 1) Required of all graduate students in physics and recommended for all senior physics majors.* Staff

406 Introduction to Atmospheric Physics *I, 3*
Application of basic classical physics to the study of atmospheric processes. *(Lec. 3) Prerequisite: PHY 112 or 214.* Penhallow

420 Introduction to Thermodynamics and Statistical Mechanics *I, 3*
Emphasis on the laws of thermodynamics and the properties of thermodynamic systems, kinetic theory of gases, molecular velocity distributions, transport phenomena, Maxwell-Boltzmann statistics. *(Lec. 3) Prerequisite: PHY 112 or 214, MTH 141 and 142.* Staff

421 Introduction to Theoretical Physics *I, 3*
Classical mechanics; motion of a particle, Lagrange's and Hamilton's equations, rigid bodies, elasticity and hydrodynamics. *(Lec. 3) Prerequisite: permission of department.* Dietz

425 Acoustics *I, 3*
Mathematical theory of vibrating systems; harmonic wave motion. Among topics discussed are transmission and absorption of sound waves, microphones, psychoacoustics, underwater acoustics and ultrasonics. *(Lec. 3) Prerequisite: permission of department.* Cuomo

431 Introduction to Theoretical Physics *II, 3*
Introduction to electromagnetic theory and Maxwell's equations with applications to radiation and optics. *(Lec. 3) Prerequisite: permission of department.* Dietz

451 Atomic and Nuclear Physics *I, 3*
Special relativity, black body radiation, photo effect, electron waves, Compton scattering, X-rays, atomic and nuclear magnetism, angular momentum and introductory Schrodinger wave mechanics. *(Lec. 3) Prerequisite: differential and integral calculus and PHY 340, or permission of department.* Staff

452 Nuclear Physics *II, 3*
Nuclear stability and binding energies, semi-empirical mass formula, radioactive decay, nuclear two-body problem including ground state of the deuteron and neutron-proton scattering, methods of acceleration and detection of nuclear particles, theory of the compound nucleus and low energy nuclear reactions with emphasis on the interaction of neutrons with nuclei,

liquid drop model of nuclear fission, chain reactors, survey of high energy nuclear physics and meson theory of nuclear forces. *(Lec. 3) Prerequisite: PHY 451 or permission of instructor.* Staff

455 Introduction to Solid State Physics *II, 3*
Structural properties of crystal lattices; thermal, electrical and magnetic properties of solids; free electron theory of metals, band theory of solids, semi-conductors, imperfections in crystals. *(Lec. 3) Prerequisite: permission of department.* Staff

483, 484 Laboratory and Research Problems in Physics *I and II, 3 each*
Thorough understanding of the instruments and methods of research in experimental physics. Experiments drawn from various fields such as spectroscopy, optics, astronomy, nuclear physics, acoustics, thermodynamics, ultrasonics, mechanics, etc. Student is encouraged to develop initiative by independent performance. Special attention given to data analysis and preparation of reports. *(Lec. 1, Lab. 6)* Cuomo and Willis

491, 492 Special Problems *I and II, 1-6 each*
Advanced work under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem) Credits not to exceed a total of 12. Prerequisite: permission of department.* Staff

510, 511 Mathematical Methods of Physics *I and II, 3 each*
Definition of a vector, vector algebra and calculus, scalar and vector fields, linear vector operators, coordinate transformations, vector operations in curvilinear coordinates, dyadics, tensors, simple applications of the theory of finite groups. Partial differential equations of physics and their solutions; diffusion equation, wave equation, Schrodinger equation, Klein-Gordon equation, elements of the theory of probability. *(Lec. 3) Prerequisite: permission of department.* Hartt

520 Classical Dynamical Theory I *I, 3*
Lagrange's equations, holonomic and non-holonomic constraints, applications to dynamical systems, non-inertial systems, alternate formulations of mechanics, theory of small vibrations, variational principles, Hamiltonian formulation of dynamics, canonical transformations. *(Lec. 3) Prerequisite: PHY 421, 510.* Staff

521 Classical Dynamical Theory II *II, 3*
Poisson's brackets, infinitesimal contact transformations, Hamilton-Jacobi equation, action-angle variables, transition to quantum mechanics, special problems in dynamics. *(Lec. 3) Prerequisite: PHY 520.* Staff

522 Topics in the Physics of the Earth *II, 3*
Physics of the earth. Topics chosen from: elasticity, seismology, and the structure of the earth; terrestrial electricity, gravity, heat flow, magnetism, radioactivity, and tides; physics of the upper atmosphere. *(Lec. 3) Prerequisite: permission of department. In alternate years, next offered 1971-72.* Dietz

530 Electromagnetic Theory I *I, 3*
Coulomb's law, Gauss' law, scalar potential, boundary value problems, multipole expansion, dielectrics, magnetic field due to stationary currents, scalar and vector potential, magnetic materials, Faraday's law, Lorentz force, conservation laws, Maxwell's equations. *(Lec. 3) Prerequisite: PHY 431, 510.* Staff

531 Electromagnetic Theory II *I, 3*
Scalar and vector wave equations and their solutions, retarded and advanced potentials, Lienard-Wiechert potentials, radiation from an arbitrarily moving charge, multipole radiation, wave guides, cavity resonators, plasma oscillations, theory of relativity. *(Lec. 3) Prerequisite: PHY 511, 530.* Staff

550 Physical Acoustics *I, 3*
Physical properties of gases, liquids and solids as revealed by the propagation of acoustic waves. Ultrasonic generation and measurement techniques, irreversible thermodynamics, mechanisms for absorption and dispersion of acoustic waves. *(Lec. 3) Prerequisite: permission of department.* Letcher

570 Quantum Mechanics I *I, 3*
Wave packets, Schrodinger equation, one-dimensional problems, hydrogen atom, harmonic oscillator, WKS approximation, operator formalism and matrix mechanics, angular momentum, perturbation theory, scattering and partial wave analysis, semiclassical treatment of the radiation field. *(Lec. 3) Prerequisite: permission of department.* Staff

571 Quantum Mechanics II *II, 3*
Dirac equation, spin orbit energy, theory of positrons, Feynman diagrams, Compton scattering, pair production and bremsstrahlung. Second quantization and application to selected topics. *(Lec. 3) Prerequisite: PHY 570.* Staff

580 Graduate Laboratory *I and II, 3*
Laboratory experiments designed to be performed by beginning graduate students. The laboratory will consist of a limited number of classic experiments to be completed with precision and thoroughness. Experiments will be selected primarily from the areas of atomic, nuclear and solid state physics. *(Lab. 6) Prerequisite: permission of department.* Quirk

585 Acoustic Measurements *II, 1-2*
Techniques for the measurement and analysis of sound in fluids and solids. *(Lab. 3-6) Prerequisite: permission of department.* Staff

590, 591 Special Problems *I and II, 1-6 each*
Advanced work under the supervision of a member of the staff and arranged to suit the individual requirements of the student. *(Lec. or Lab. according to nature of problem) Credits not to exceed 12. Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

620 Statistical Mechanics *I and II, 3*
Kinetic theory of matter, Maxwell-Boltzmann distribution, collision and mean free path, the H-theorem, Ergodic theorem, entropy, Nernst heat theorem, fluctuations and distributions, quantum statistics, ensemble theory, applications in nuclear physics, fluidity, condensation, electron theory of metals and relativistic gas. *(Lec. 3) Prerequisite: PHY 511, 570.* Staff

630 Electromagnetic Theory III *I, 3*
After developing the covariant formulation of electrodynamics, selected topics of current interest in electromagnetic theory such as accelerator design, etc., will be discussed. *(Lec. 3) Prerequisite: PHY 531.* Staff

650, 651 Solid State Physics *I and II, 3 each*
Quantum theory of electrons, phonons and other elementary excitations, Hartree-Fock approximation, many body problem, super conductivity, band theory and Fermi surface. *(Lec. 3) Prerequisite: PHY 455, 570.* Staff

660, 661 Nuclear Physics *I and II, 3 each*
General properties of the nucleus. Two body problem at low, intermediate and high energy. Three and four body problems, nuclear forces, special models, nuclear spectroscopy and reactions, decay of nuclei, many body problem, structure of nucleons. *(Lec. 3) Prerequisite: PHY 511, 571.* Staff

670, 671 Advanced Quantum Theory *I and II, 3 each*
Relativistic quantum field theory, free and interacting fields, the S-matrix and the perturbation expansion, quantum electrodynamics, dispersion relations, symmetry operations and invariance properties. *(Lec. 3) Prerequisite: PHY 571.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PLANT AND SOIL SCIENCE (PLS)

CHAIRMAN: Professor E. C. Roberts. Professors Bell, Shutak, Skogley and Wakefield; Associate Professors Griffiths, Hindle, Hull, Larmie and Wilson; Assistant Professors McGuire, McKiel and Shaw.

Note: the following courses include all those previously listed under Agronomy, Horticulture, and Mechanized Agriculture.

101 (HOR 101) Home Grounds *I and II, 3*
Principles and practices in the culture and maintenance of flowers, lawns, shrubs, trees, fruits and vegetables, including plant propagation and labor-saving suggestions for the home property. *(Lec. 3) Not for major credit for students in the College of Resource Development.* Hindle

104 (AGR 104, HOR 104) Plants, Man, and the Environment *II, 3*
Plants in their economic, esthetic and survival relationship to man and other animals. Basic information on the ecology, production, improvement, distribution and use of economic plants. *(Lec. 3) Prerequisite: BOT 111 or BIO 101.* Griffiths and Wakefield

105 Plants, Man, and the Environment Practicum *II, 1*
Practical aspects of the culture, ecology, improvement and use of plants in the environment of man. *(Lab. 2) Prerequisite: concurrent registration in PLS 104 or permission of instructor.* Griffiths and Wakefield

137 (HOR 137) Floral Selection and Arrangement *I, 1*
Lectures, demonstrations and practical experience in selection, care and arrangement of flowers and plants. *(Studio 2)* Larmie

201 (MAG 201) Wood-working Methods *I, 3*
Principles and practice in various phases of carpentry to stimulate innovative thinking in use of wood in practices and processes related to plants, soils and resource development. Concrete work, sketching, lumber selection, wood fastening, painting, finishing, layout for rafters and stairs, and care and use of work-working tools. *(Lec. 1, Shop 4)* Wilson

202 (MAG 202) Metal-working Methods *II, 3*
Principles and practice in working with various kinds of metals to stimulate innovative thinking in their use related to machinery and apparatus used with plants, soils and in resource development projects. Shop equipment, soldering, brazing, forging, welding, cutting, shaping, drilling, threading, tapping, and turning. *(Lec. 1, Shop 4)* Wilson

212 (AGR 212) Soils *II, 3*
Physical, biological and chemical properties of soils and their practical application in plant science. Origin and classification of soils in Rhode Island based on their morphology. *(Lec. 2, Lab. 2)* Bell

233 (HOR 233) Floral Arrangement *I, 3*
Theory and practice in the art of flower and plant arrangement for the home, show and special occasions. History, elements and principles of design and color. *(Lec. 1, Studio 4)* Larmie

234 (HOR 234) Flower Garden Management and Floral Design *II, 3*
Culture and use of annuals and perennials in the home flower garden. Theory and practice of floral arrangement and garden layout and design with emphasis on shows and special uses. *(Lec. 1, Studio 4)* Larmie

242 (HOR 242) Appreciation of Landscape Design *I and II, 3*
Introduction to theory and principles of landscape design as applied to the home. Property selection and climate control. Modern methods of property planning including the individual components of the completed landscape plan. *(Lec. 3)* Hindle

282 World Crops *II, 3*
Influence of climate, soils and cultural factors on the production of crops used for man and livestock. Ecological distribution of important world crops. *(Lec. 3) Prerequisite: PLS 104.* Wakefield

306 (HOR 306) Nursery Principles and Practice *I, 3*
Principles of woody plant production with emphasis on cultural practices. Consideration of growing, pruning, transplanting; including methods of digging, grading, storing, and marketing of plants. *(Lec. 2, Lab. 2) In alternate years, next offered 1972-73.* McGuire

311 (HOR 311) Fruit Science *I, 3*
Principles of fruit production with emphasis on home gardens. Topics include propagation, planting, soils, fertilization, cultural practices, pruning and storage of tree and small fruits and dwarf or semidwarf stocks. *(Lec. 3)* Shutak

322 (MAG 222) Power Units *II, 3*
Principles of operation, maintenance and adjustment of power units including gasoline and diesel engines and electric motors. Emphasis on tractors and other power units important in farm, nursery, greenhouse and grounds maintenance operations. *(Lec. 2, Lab. 2)* McKiel

324 (HOR 324) Vegetable Science *II, 3*
Management, culture, varieties and harvesting of vegetables in the home garden and for fresh market and roadside sales. Soil characteristics and environment control in vegetable production. Vegetables for processing and production of seed. *(Lec. 2, Lab. 2)* Griffiths

331 (HOR 331) Floriculture and Greenhouse Management *I, 3*
The greenhouse environment and its relation to the culture of specific plants. Principles governing the production and culture of plants under controlled temperature, humidity, light and modified atmospheres. Greenhouse construction and environmental control. *(Lec. 2, Lab. 2)* Shaw

341 (AGR 341) Lawn Management *I, 3*
Grasses and other vegetation suitable for use on lawns where ground cover of turf quality is essential. Fundamental aspects of turfgrass science including identification, propagation, fertilization, pest control, and other soil-plant relationships. *(Lec. 2, Lab. 2)* Skogley

343 (HOR 343) Techniques in Landscape Design *I, 3*
Exercises in the presentation of landscape concepts in graphic form. Emphasis is on drawing landscape plans for residential property, on arrangement of unit areas, and on ornamental plants suitable for specific landscape situations. *(Lec. 1, Studio 4)* Hindle

351 (AGR 351) Soil and Water Conservation *I, 3*
Principles and practices of erosion control, soil improvement and watershed protection in development of soil and water resources. Study of soil and water conservation under field conditions. *(Lec. 2, Lab. 2) Prerequisite: PLS 212 or permission of instructor.* Bell

352 (HOR 352) Herbaceous Plants *II, 3*
Identification, growth characteristics and use of annuals, biennials, and perennials including plants propagated from seeds, bulbs and cuttings, and used as foliage and flowering plants in and out of doors. *(Lec. 2, Lab. 2) In alternate years, next offered 1972-73.* Larmie

353 (HOR 353) Fundamentals of Ornamental Plant Classification *I, 3*
Classification and identification of ornamental plants by floral and vegetative characteristics. Introduction to their use, growth characteristics, and culture in various landscape situations. *(Lec. 1, Lab. 4)* Hindle

362 (MAG 242) Power Equipment *II, 3*
Functional components of machines (exclusive of the power unit) used for turfgrass maintenance and the production of specialized crops. Principles and techniques of selection, operation, adjustment and maintenance of machinery. *(Lec. 2, Lab. 2) In alternate years, next offered 1971-72.* McKiel

401, 402 (HOR 501, 502) Plant and Soil Science Seminar *I and II, 1 each*
Presentation and discussion of current topics of concern to producers and consumers of plants and plant products including soil-plant relationships. *(Lec. 1) Prerequisite: senior standing.* Staff

405 (HOR 305) Propagation of Plant Materials *II, 3*
Theoretical and practical study of propagation including grafting, budding, cuttage and seedage. *(Lec. 2, Lab. 2) Prerequisite: PLS 104, BOT 111 or BIO 101.* McGuire

420 (AGR 420) Crop Ecology *I, 3*
Environmental factors affecting growth of crop plants. Influence of management, climate and soil factors on energy relationships, inter-plant competition, crop adaptation, persistence and productivity. Student project required. *(Lec. 3) Prerequisite: BIO 101 or BOT 111, PLS 104.* Wakefield

432 (HOR 432) Commercial Floriculture *II, 3*
Growing commercial greenhouse crops including production, timing and marketing. Each student is assigned a greenhouse project. *(Lec. 2, Lab. 2) Prerequisite: PLS 104 and 331 and junior standing.* Larmie

442 (AGR 442) Professional Turfgrass Management *II, 3*
Establishment and maintenance practices for specialty turfgrass areas such as golf courses, lawn tennis courts, bowling greens, athletic fields, public parks, industrial and institutional grounds, airports and roadsides. Design and construction specifications, and construction and maintenance budgets. *(Lec. 3) Prerequisite: PLS 341 or equivalent.* Skogley

444 (HOR 444) Environmental Aspects of Landscape Design *II, 3*
Relationships between principles of landscape design and elements of the environment that contribute to the development of ecologically based plans. Residential areas used for emphasis. Client conferences and specifications for woody ornamental plants. *(Lec. 1, Studio 4) Prerequisite: PLS 343 and 353 or permission of instructor.* Hindle

451 (MAG 451) Soil Conservation Technology *I, 3*
Principles and practices involved in mechanical protection, improvement and development of soil and water resources. Design of conservation features and structures are considered. *(Lec. 2, Lab. 3) Prerequisite: MTH 109 or equivalent.* McKiel

454 (HOR 354) Identification of Basic Ornamental Plants *II, 3*
Identification, growth characteristics, culture and use of basic landscape plants. Materials include trees (with emphasis on evergreens), shrubs, vines and ground covers used in general landscaping. *(Lec. 1, Lab. 4) Prerequisite: PLS 353 or permission of instructor.* Hindle

461 (AGR 561) Weed Science *II, 3*
Ecological and agronomic aspects of weed problems, physiology of herbicide action, selected problem areas in weed control and plant identification. *(Lec. 2, Lab. 2) Prerequisite: PLS 212, organic chemistry, plant physiology desirable. In alternate years, next offered 1972-73.* Hull

470 (AGR 472) Soil Fertility *II, 3*
Principles of soil science as interdependent factors related to soil productivity. Emphasis on the importance of controlled fertilizer use in production of economic plants. Basic principles governing the availability of plant nutrients and their movement in soils. *(Lec. 2, Lab. 2) Prerequisite: PLS 212.* Bell

472 (HOR 472) Plant Improvement *II, 3*
Breeding of economic crops with major emphasis on vegetables and flowers. Objectives and techniques of pollination, pure line and hybridization breeding, measures of variability, seed production, and applications of genetic principles to breeding problems. *(Lec. 2, Lab. 2) Prerequisite: genetics or permission of instructor. In alternate years, next offered 1972-73.* Griffiths

475 (HOR 475) Plant Nutrition *I, 3*
Basic concepts of energy relations within the plant system including essential elements, salt uptake, translocation, photosynthesis, organic nutrition, mineral metabolism and soil-plant interactions. Laboratory involves soilless plant culture, radioisotopes, ion interaction, deficiency symptoms and analysis. Special emphasis on plants of economic importance. *(Lec. 2, Lab. 2) Prerequisite: BOT 111 or equivalent and organic chemistry. In alternate years, next offered 1971-72.* Hull

484 (MAG 384) Structures *II, 3*
Principles of design and construction of buildings and structures related to culture of plants, managing soils and resource development. Planning, materials, construction components, environmental control and waste disposal. *(Lec. 3) Prerequisite: MTH 109 or equivalent and permission of instructor. In alternate years, next offered 1972-73.* McKiel

491, 492 (HOR 491, 492) Special Projects and Independent Study *I and II, 1-3*
Laboratory, library, studio, greenhouse and field facilities are available for special projects on storage, research methodology, mineral nutrition, plant propagation, growth and development, and garden design and site planning. *(Lab. 3-9) Prerequisite: permission of department.* Staff

500 (HOR 500) Growth and Development of Economic Plants *II, 3*
Factors affecting vegetative and reproductive growth and development of plants. Topics include growth regulators, auxins, environmental factors, dormancy, juvenility, vernalization and flowering. Term paper required. *(Lec. 3) Prerequisite: BOT 442. In alternate years, next offered 1972-73.* Shutak

501, 502 (AGR 501, 502) Graduate Seminar in Plant and Soil Science *I and II, 1 each*
Presentation of technical reports and discussion of current research papers concerned with plant and soil science. *(Lec. 1)* Staff

573 (HOR 573) Post-harvest Physiology of Economic Crops *I, 3*
Factors affecting post-harvest physiology of fruits, vegetables, flowers, ornamentals and turf. Influence of preharvest factors on post-harvest condition. Principles of preservation and storage. Individual or group projects. *(Lec. 3) Prerequisite: BOT 442 or equivalent. In alternate years, next offered 1972-73.* Shutak and Staff

576 (HOR 576) Physiology of Plant Productivity *II, 3*
Critical analysis of contemporary views on energy conversion and transformation in primary plant production. Topics include photosynthesis, phosphorylation, photorespiration, transport mechanisms, carbohydrate and lipid metabolism, nitrogen assimilation and symbiosis. *(Lec. 3) Prerequisite: organic chemistry, plant physiology, biochemistry recommended. In alternate years, next offered 1971-72.* Hull

591, 592 (AGR 591, 592) Non-thesis Research in Plant and Soil Science *I and II, 1-3*
Advanced work under supervision of research staff to expand research experience into areas other than those related to thesis research. Arranged to suit individual requirements. *(Lab. 3-9) Prerequisite: permission of department.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PLANT PATHOLOGY-ENTOMOLOGY (PLP)

ACTING CHAIRMAN: Assistant Professor Field. Professors Beckman and Kerr; Associate Professors Jackson, Mueller and Stessel; Adjunct Professors Kaplan and Tarzwell.

336 Fungi in the Environment and Economy *II, 3*
Case studies of agricultural and industrial problems involving the degradation of organic materials by fungi; wood decay, paper slimes, and textile mildewproofing. Activities of soil fungi and mycorhizae. Industrial processes involving fungi: e.g., antibiotics, organic acids, foods, and mushrooms. *(Lec. 2, Lab. 2) In alternate years, next offered 1971-72.* Staff

371 Insects of Turfgrasses, Trees and Ornamental Shrubs *I, 3*
Identity, injury, life cycle and methods of control of the principal insects attacking these groups of plants. *(Lec. 2, Lab. 2) In alternate years, next offered 1972-73.* Kerr

377 (or CVE 377) Biological Aspects of Water Quality *I, 3*
Basic concepts of water quality and use. Lectures, discussions and case histories of the causes of pollution. The methodology for qualitative and quantitative determination and toxicity bioassay. Water quality requirements, monitoring, and abatement. *(Lec. 2, Lab. TBA) Prerequisite: permission of instructor.* Staff from Civil and Environmental Engineering and Plant Pathology-Entomology

391, 392 Special Projects *I and II, 1-3 each*
Special work to meet individual needs of students in various fields of plant pathology and entomology, nematology, virology, agricultural or industrial mycology, biological aspects of water quality, biodegradation and related subjects. *(Lec. and/or Lab. according to nature of the project) Prerequisite: permission of department.* Staff

442 (342) Diseases of Turfgrasses, Trees and Ornamental Shrubs *II, 3*
Disease diagnosis, epidemiology, and control measures pertinent to these categories of plants. *(Lec. 3) Prerequisite: BOT 332 or equivalent or permission of instructor.* Jackson

561 Plant Virology *I, 3*
Nature and properties of plant viruses, survey of plant diseases caused by viruses and experience in basic techniques. *(Lec. 3) Prerequisite: BOT 332 or equivalent. In alternate years, next offered 1971-72.* Mueller

582 Nematology *II, 3*
Morphology, taxonomy, bionomics and physiology of plant parasitic, soil, and aquatic nematodes. Emphasis on host-parasite relationships, laboratory techniques, and principles of control. *(Lec. 2, Lab. 2) Prerequisite: ZOO 111, BOT 332. In alternate years, next offered 1972-73.* Stessel

591, 592 Research Problems *I and II, 1-3 each*
Individual or group study supervised by a faculty member in the fields of plant virology, nematology and disease mechanisms, economic entomology or plant pathology, agricultural and industrial mycology and related subjects. Written reports required for credit. *(Lec. 1-3, Lab. 2-6)* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

611 The Nature of Plant Disease *I, 3*
Analysis of the nature of plant disease, the concepts of infection and pathogenesis, and the interaction of plant, pathogen, and environment in the disease process. *(Lec. 3) Prerequisite: BOT 332 or equivalent. In alternate years, next offered 1972-73.* Beckman and Mueller

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

Note: For other related courses see BOT 332, 432, 434 and ZOO 481, 482, 581, 586.

POLITICAL SCIENCE (PSC)

CHAIRMAN: Professor Warren. Professors Stitely, S. B. Wood and Zucker; Associate Professors Leduc, Milburn and Stein; Assistant Professors Grossbard, Killilea, and Sack.

113 American Politics *I and II, 3*
Survey of the basic principles of the government of the United States: constitutionalism, separation of powers, federalism, civil liberties; politics; legislative, executive and judicial organization; functions of government. *(Lec. 3)* Warren and Staff

116 International Politics *II, 3*
Nature of the state system, foundations of national power, means of exercising power in the interaction of states. Attention will be given to current international problems. *(Lec. 3)* Warren and Staff

301 Comparative European Politics *I and II, 3*
Analysis of concepts and methodologies relative to the study of comparative politics. Utilizing a structural-functional approach, survey of the formal and informal features of the political systems of Great Britain, France, Germany, U.S.S.R. and one other country. *(Lec. 3)* Milburn

341 Political Theory, Ancient and Medieval *I, 3*
Political theorists from Plato to Machiavelli as central to the development of the notions of justice and individuality and the ancillary political forms generated by differing views of these concepts. Exposition of the individual's political theory in terms of the relationship of his epistemology, psychology, axiology and politics. *(Lec. 3) Required for majors in political science.* Killilea

342 Political Theory, Modern and Contemporary *II, 3*
Continuation of PSC 341. Machiavelli to Marx and Freud. *(Lec. 3) Required for majors in political science.* Killilea

353 Scope and Methods of Political Science *I, 3*
Development of political science as a discipline with explanation and analysis of fundamental political concepts and theories. *(Lec. 3) Prerequisite: PSC 113 and 116.* Leduc

365 Political Parties and Practical Politics *I, 3*
Analysis of the American party process with some attention to comparative party systems. History, organization, functions, methods, problems, and prospects for reform. *(Lec. 3) Prerequisite: PSC 113.* Zucker

368 Public Opinion and Propaganda *II, 3*
Examination of public opinion and formative influences upon it; analysis of propaganda techniques. Role and implications of public opinion and propaganda in governmental processes. *(Lec. 3) Prerequisite: PSC 113.* Sack

369 Legislative Process and Public Policy *II, 3*
Analysis of American legislative bodies, particularly Congress, with some attention to comparative legislatures. Structure, organization, and functions of Congress analyzed in relation to its role in determining public policy. *(Lec. 3) Prerequisite: PSC 113.* Zucker

402 Government and Politics in the Middle East *I, 3*
Analysis of formal social structures in terms of functions performed or created in transitional situations, in relation to economic viability and political stability, political leadership and political integration, socio-emotional and instrumental structures, and nationalism and communism. *(Lec. 3) Prerequisite: PSC 113 or 116.* Staff

403 Government and Society of India and Pakistan *I, 3*
Emphasis on South Asia, particularly India, focusing on historical, cultural and societal factors which shape and influence politics. Readings include autobiographies and novels by Indian writers, South Asian newspapers and journals, and studies of rural and urban problems. *(Lec. 3) Prerequisite: some other course in non-Western area or strong interest in India recommended.* Stein

404 Government and Politics of South East Asia *I, 3*
Analysis of formal social structures in terms of functions performed in transitional milieux, in relation to economic viability and political stability, political leadership and political integration, socio-emotional and instrumental structures, and nationalism and communism. *(Lec. 3) Prerequisite: PSC 113 or 116.* Staff

407 The Soviet Union: Politics and Society *II, 3*
Analyses of the politics and society of the Soviet system; emphasized topics include the role of the Communist party, economic planning, ethnic minorities, the intelligentsia and the "new Soviet man." *(Lec. 3) Prerequisite: PSC 116 or Russian history course recommended. In alternate years, next offered 1971-72.* Stein

408 African Governments and Politics *I, 3*
Political developments in the new nations of sub-Saharan Africa. The main stress is functional: the role of parties as integrative forces; democratic centralism; one party states; African political thought and common developmental problems. *(Lec. 3) Prerequisite: PSC 113 and 116.* Milburn

411 The United States and China *II, 3*
Focuses on U.S.-China policy since World War II. Special attention will be given to American attitudes toward Nationalist China and Communist China; the role of public opinion in the making of foreign policy; interest groups and China; China and the United Nations, and major policy alternatives. *(Lec. 3) Prerequisite: PSC 113 and 116.* Sack

417 African Ideologies and International Relations *II, 3*
Seminar devoted to an examination of the twin foci of African ideological frameworks and the stance of sub-Sahara African nations on the international scene. *(Lec. 3) Prerequisite: PSC 113 and 116.* Milburn

420 Radical Change in the Modern Era *II, 3*
Colloquium on various forms of socio-political change in the twentieth century, with emphasis on the causes and dynamics of radical change, ideological trends, and movements, in Western and non-Western societies. *(Lec. 3) Prerequisite: upperclass or graduate standing and permission of instructor.* Stein

422 State and Local Government *II, 3*
Survey of the American state and local government, with emphasis on forms of government; politics; the

organization of legislative, executive and judicial branches; metropolitan government and federalism. *(Lec. 3) Prerequisite: PSC 113.* Leduc

431 International Relations *I, 3*
Analysis of the various theories of international relations and study of the major forces and events shaping the politics of the Great Powers. *(Lec. 3) Prerequisite: PSC 116.* Warren

432 International Government *II, 3*
General development and basic principles of international government, with particular attention to structure, methods, and operations of the League of Nations, the United Nations, and related agencies. Problems of security, conflict resolution, and social and economic issues. *(Lec. 3) Prerequisite: PSC 116.* Warren

434 American Foreign Policy *II, 3*
Analysis of the institutions, techniques and instruments of policy-making and the execution of foreign policy. Some attention to the historical context and the role of international organization to foreign policy. *(Lec. 3) Prerequisite: PSC 116.* Sack

443 Twentieth-Century Political Theory *I, 3*
Important political theorists of this century, particularly as they interpret the basis of political obligation and weigh the question of violent political change. Theorists considered include Freud, Camus, Arendt, Niebuhr, Marcuse, Lassewell, Gandhi, and Mao Tsetung. *(Lec. 3) Prerequisite: PSC 341 and 342, or permission of department.* Killilea

454 Advanced Political Research *II, 3*
Advanced techniques of sociological and political research, with application by participation in a group research project. *(Lec. 3) Prerequisite: PSC 353 or permission of department.* Staff

456 Directed Study or Research *I and II, 3*
Special work arranged to meet the needs of individual students who desire advanced work in political science. May be used for honors thesis. *(Lec. 3) Prerequisite: permission of department.* Staff

460 Urban Politics *I, 3*
Urban problems and policy-making. Urban ecology, political behavior, and strategies of leadership in relation to the "crisis" of the cities and the rise of megalopolis. Governmental structures and financing, poverty and physical deterioration, racial discrimination and crime, education and transportation. *(Lec. 3) Prerequisite: PSC 113 or 116.* Wood, Zucker

461 The American Presidency *II, 3*
Analysis of presidential leadership and decision-making, with emphasis on the growth in power and prestige of the presidency, the exercise of presidential influence in the conduct of government during crisis and non-crisis periods, and executive initiative in the formulation and development of national policies and priorities. *(Lec. 3) Prerequisite: PSC 113 or 116.* Wood

462 American Constitutional Law *I, 3*
Examination of the Supreme Court as a political institution in American democracy. A systematic analysis of leading constitutional decisions exploring the adaptation of governmental powers to changed conditions of society, the development and function of judicial review, and the dynamics of decision-making in the Supreme Court. *(Lec. 3) Prerequisite: PSC 113.* Wood

463 American Civil Liberties *II, 3*
Examination of the fundamental rights guaranteed to the individual by the American Constitution. Emphasis on freedom of expression, religious liberty, racial equality, fair criminal procedure, and the protection of privacy. *(Lec. 3) Prerequisite: PSC 113.* Wood

464 International Law *II, 3*
Problem method used to stimulate creative reports on hypothetical international crises, against background discussions on sources of rules, laws of peace and war, statehood, treaties, territory and the sea, as examined in the Korean, Vietnamese, Cuban and other crises. *(Lec. 3) Prerequisite: PSC 116.* Staff

470 Problems and Principles in the American Political Process *II, 3*
Theories and problems of contemporary politics with emphasis on power and policy formulation in the American political process. *(Lec. 3) Prerequisite: PSC 113, 116.* Zucker

472 Problems in International Relations *I, 3*
Examination of such major current problems in international relations as control of atomic energy, the flowering of nationalism in Asia, the role of the United Nations, western European problems, the problem of Germany and the role of ideologies in international relations. *(Lec. 3) Prerequisite: PSC 431 or permission of department.* Staff

481, 482 Political Science Seminar *I and II, 3 each*
Intensive studies in various important fields in political science. Class discussion of assigned readings and student reports. Emphasis will be placed on independent research. *(Lec. 3) Prerequisite: 6 credits in political science beyond PSC 113, 116.* Staff

483
~~484~~ **The Middle East in World Affairs** *II, 3*
Analysis of the events of June, 1967, taken as symptomatic of the relations among Middle Eastern states and between them and the world-at-large, in light of the history of the perceptions which motivated Middle Eastern leaders from 1915 onwards. *(Lec. 3) Prerequisite: PSC 113 or 116.* Staff

491 Principles of Public Administration *I, 3*
Principles of public administration, structure and organization, financial management, administrative responsibility and the relation between the administra-

tion and other branches of government. *(Lec. 3) Prerequisite: PSC 113.* Stitely

498 Public Administration and Policy Formulation *II, 3*
Identification and analysis of factors which affect the formulation of public policy, including the roles of the executive, the bureaucracy, the legislature, and special interest groups. A special field of interest will be the evolution of the policy process, particularly at the state and local levels of government. *(Lec. 3) Prerequisite: PSC 491 or permission of department.* Staff

501 Administrative Theory *I and II, 3*
Various theoretical constructs and models in the field of public administration, in particular the theories of Weber, Riggs, Dorsey, Simon, Presthus, as well as lower-level models in subfields of organization, communications, and decision-making. Students relate task-oriented subject matter such as personnel administration, budget administration and program administration to the theoretical formulations which seek to explain these activities. *(Lec. 3) Prerequisite: PSC 491 or permission of department.* Grossbard

502 Techniques of Public Management *I and II, 3*
Principles, methods and techniques employed in the technical administration of the staff activities of the public service such as administrative planning, personnel management, and fiscal administration. Project programming, personnel classification and design of pay plans, budgeting, and fiscal management. *(Lec. 3) Prerequisite: PSC 491 or permission of department.* Grossbard

505 Politics of Developing Areas *II, 3*
Analysis of developments in newly independent, "third world" nations, particularly of Asia. Emerging political structures in relation to the processes of social, economic, and psychological change. *(Lec. 3) In alternate years, next offered 1973-74.* Stein

506 The U.S.S.R. and China in World Affairs *I, 3*
Comparative study of the foreign policies of the Communist nations. Examines continuity and change of Soviet policy in historic perspective, competitive coexistence with the West in the post-Stalin era, China's outlook on the world, the Sino-Soviet dispute, policy toward developing areas, international organization and arms control. *(Lec. 3) Prerequisite: PSC 407 or permission of instructor.* Stein

513 Seminar in Marine Science Policy and Public Law *II, 3*
Multi-disciplinary teams of faculty and selected graduate students tackle unresolved problems in creating rules or institutions to cope with new uses of the marine environment, e.g., freedom of the seas, fisheries regulation, deep-sea mining, or weather modification. Team meetings at team convenience; plenary sessions; backup studies for team meetings plus final report. *Prerequisite: permission of department.* Staff

523 Seminar in Comparative and International Public Administration *I and II, 3*
Selected areas of the theory, practice, organization and operation of the English and French administrative systems and their influence on the newly established countries. Administration of international agencies such as I.L.O., W.H.O. and the administrative problems of headquarters and field. Use of models, structure-function analysis and ecological analyses. *(Lec. 3) Prerequisite: PSC 491, 501 or permission of department.* Staff

524 Seminar in Problems of Public Administration *I and II, 3*
Exploration in depth of selected problems of policy formation, and basic research in public administration, and the application of research to administration situations. Students apply the techniques of science and administration to a single problem or set of problems, designated for each seminar. Reports, embodying the results of conceptual exercises, experimentation, library research and field investigations, are required. *(Lec. 3) Prerequisite: PSC 491, 501, 502, or permission of department.* Staff

544 Democracy and Its Critics *I, 3*
Seminar examining the roots of modern democracy in the social contract theorists and analyzing the quality and limits of self-determination in these theories in the light of contemporary politics. *(Lec. 3) Prerequisite: PSC 341, 342, or permission of department.* Killilea

553 Scope and Methods of Political Science *I, 3*
Development of political science in relation to other social sciences. Political concepts, theories, and analytic systems surveyed in relation to methodology. Latest trends and interests in the discipline. Research papers and reports explore individual problems. Required for graduate students. *(Lec. 3)* Sack

556 Directed Study or Research *I and II, 3*
Special work arranged to meet the individual needs of graduate students in political science. *(Lec. 3) Prerequisite: permission of department.* Staff

565 Seminar in Political Processes *II, 3*
Advanced study involving special investigations of the American political process. Analysis and application of methodology in such areas as voting behavior, interest group activities, and the legislative process. Use of case study techniques. *(Lec. 3) Prerequisite: PSC 365 or permission of department.* Zucker

566 American Political Theory *II, 3*
Examination of origins and development of American political thought, with reference to the European backgrounds and an intensive study of the political ideas of representative American thinkers. *(Lec. 3) Prerequisite: PSC 113. In alternate years, next offered 1971-72.* Staff

567 American Jurisprudence *II, 3*
An introduction, from the perspective of contempo-

rary political science, to the philosophy of law, treating the sources, the nature, and the consequences for American life and law of major systems of legal thought. Emphasis on the relationship between legal reasoning and the results of the judicial process. *(Lec. 3) Prerequisite: one course in business law or constitutional law. In alternate years, next offered 1971-72.* Wood

573 Advanced Research in Political Science *II, 3*
Fundamental concepts and techniques in political science with emphasis on advanced quantitative and qualitative analysis and the application of these methods to individual research projects. *(Lec. 3) Prerequisite: PSC 553 or permission of department.* Staff

590 Internship in Public Administration *I and II, 3-6*
Participation in the activities of an administrative agency under the joint supervision of the agency head and a member of the faculty gives the student direct knowledge of such fields as planning, personnel management, research organization, budgeting, interdepartmental relations, and the informal liaisons that are the hallmark of effective administration. *May be taken as one 6-credit unit or two 3-credit units. Prerequisite: permission of Bureau of Government Research.* Staff

595 Problems of Modernization in Developing Nations
See Economics 595.

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

PORTUGUESE (POR)

CHAIRMAN: Associate Professor Kossoff (Languages). Instructor McNab.

101, 102 Elementary Portuguese *I and II, 3 each*
Communication at an elementary level through the aural, oral and written skills of Portuguese by means of class experience and language laboratory. *(Lec. 3)* Staff

103, 104 Intermediate Portuguese *I and II, 3 each*
Communication at an intermediate level through the aural, oral and written skills of Portuguese by means of class experience including the reading of Portuguese and Brazilian representative authors and language laboratory. *(Lec. 3) Prerequisite: POR 102 or equivalent.* Staff

497, 498 Directed Study *I and II, 3 each*
Designed for the advanced student in Portuguese. Individual study and reports on problems of special interest. *(Lec. 3) Prerequisite: POR 104 or equivalent, acceptance of a project by a member of the staff and departmental approval. Not for graduate degree program credit.* Staff

PSYCHOLOGY (PSY)

CHAIRMAN: Professor Berger. Professors E. J. Archer, A. Lott and Merenda; Associate Professors Biller, Camp, Grebstein, B. Lott, Silverstein, N. Smith, Vosburgh and Willoughby; Assistant Professors Berman, L. S. Cain, I. Gross, Makokian, McKinney and Prochaska; Clinical Professors J. Mohrnheim, Musiker, and Redmon; Clinical Associate Professors Farnum, Groden and Silverman; Clinical Assistant Professors Richardson and Weiner; Clinical Associate Antonelli; Adjunct Professor Gold; Adjunct Clinical Professors Ersavim, Karkales, and Nicotra; Adjunct Lecturer Zubrinski.

103 Towards Self Understanding *I and II, 3*
Individual and social problems of normal persons. Problems of personality development, social behavior and wholesome adjustive reactions. *(Lec. 2, Rec. 1) May not be used to fulfill requirements of a major in psychology.* Grebstein, Prochaska and Staff

113 General Psychology *I and II, 3*
Introductory survey course of the major facts and principles of human behavior. Prerequisite for students interested in professional work in psychology or academic fields in which an extended knowledge of psychology is basic. *(Lec. 2, Rec. 1)* Camp, Lott and Staff

232 Developmental Psychology *I and II, 3*
Comprehensive understanding of human development and growth from birth to senescence. *(Lec. 2, Rec. 1) Prerequisite: PSY 113, sophomore standing.* Staff

235 Theories of Personality *I and II, 3*
Critical survey of the major theories of personality. Emphasis will be placed mainly upon the "normal" personality. *(Lec. 3) Prerequisite: PSY 113, sophomore standing.* Staff

254 Behavior Problems and Personality Disorders *I and II, 3*
Evaluation of the more serious behavioral disorders as found in the major forms of character disorders, psychoneuroses, and psychoses. Theories of causation, development and effects of anxiety and defense mechanisms and interpretation of symptoms and methods of treatment. *(Lec. 3) Prerequisite: PSY 113, sophomore standing.* Staff

300 Quantitative Methods in Psychology I *I and II, 3*
Study of basic concepts and techniques of quantification in psychology. Emphasis on application of certain statistical tools in the analysis of psychological measurements of behavior. *(Lec. 3) Prerequisite: PSY 113, at least one course in mathematics at the college level, and sophomore standing.* Cain, Merenda, and Staff

301 Introduction to Experimental Psychology *I and II, 3*
Lectures, demonstrations and laboratory experiments designed to introduce the student to the fundamental

principles of experimental techniques applied in psychological research. *(Lec. 2, Lab. 2) Prerequisite: PSY 113, 210. PSY 301 is a prerequisite for all courses in psychology numbered above 301, unless exemption is granted by the department.* N. Smith and Staff

310 History and Systems of Psychology *I and II, 3*
Rise and development of psychological research, psychological systems and specialized areas within psychology. *(Lec. 3) Prerequisite: PHL 103, PSY 301.* Silverstein

334 Introduction to Clinical Psychology *I and II, 3*
Emphasis on scope of the field, functions of the clinical psychologist, methods used, and problems encountered, both scientific and professional. *(Lec. 2, Lab. 2) Prerequisite: PSY 254, 301, 434, junior standing and permission of department.* Staff

361 Learning *II, 3*
Data, methods and principles involved in the experimental evaluation of the learning process in human and infrahuman organisms. *(Lec. 3) Prerequisite: PSY 301.* N. Smith and Staff

371 Laboratory in Learning *II, 1*
Laboratory experiments in learning designed to parallel course material in PSY 361. *(Lab. 2) Prerequisite: PSY 301.* N. Smith and Staff

381 Physiological Psychology *I and II, 3*
Physiological mechanisms operative in human behavior. Sensory, neural, endocrine and response systems as related to sensation, perception, emotions, motivation, learning and thinking. *(Lec. 3) Prerequisite: junior standing, and PSY 301. In alternate years.* Staff

388

391 Theories of Learning *I and II, 3*
Study of the major psychological theories developed for explanation of experimental data in the area of learning. Topics include the evaluation of learning theories, their basic concepts and analysis of various behaviors in terms of the theoretical frameworks. *(Lec. 3) Prerequisite: junior standing, PSY 301 and 361 or 310 or permission of instructor. Alternate years.* Staff

399 Honors Seminar *I, 3*
Survey of recent advances in major divisions of psychology with emphasis on the integration of the various content areas in terms of theoretical positions and approaches. *(Lec. 3) Prerequisite: PSY 301, senior majors, permission of department, 3.0 GPA.* Staff

410 Quantitative Methods in Psychology II *I and II, 3*
Utilization of quantitative procedures in studying psychological problems. Study of application of such techniques as one-way analysis of variance, topics in regression, correlation and non-parametrics. *(Lec. 3) Prerequisite: PSY 301, permission of department.* Cain and Staff

432 Advanced Development Psychology *II, 3*
Discussion of major issues in developmental psychology. Emphasis on research of Piaget, Erikson, Bruner, Kagan and Moss. Includes such topics as effects of infant care, sex typing, parental discipline and developmental aspects of intellective and perceptual growth. *(Lec. 3) Prerequisite: PSY 232, 301. Alternate years.* Staff

434 Introduction to Psychological Testing *I and II, 3*
Major techniques used in measurement of intelligence, aptitudes, abilities, achievement, interest and personality. Laboratory will familiarize students with the nature and content of objective and projective tests. The reliability and validity of the various tests will be carefully considered. *(Lec. 2, Lab. 2) Prerequisite: EDC 310 and/or PSY 301, or permission of instructor, junior standing.* Staff

435 The Psychology of Social Behavior *I and II, 3*
Concepts and principles of the behavior of individuals in the relation to social environment with emphasis on behavioral processes in the development of socialization. Special attention to motivation, language behavior, formation and changes of attitudes and the norms established by various kinds of social groups. *(Lec. 3) Prerequisite: PSY 301. Alternate years.* A. Lott

445 Group Processes and Individual Behavior *I and II, 3*
Systematic analysis of theories and research on the individual in the small face-to-face group; focus on interpersonal processes, group structure and dynamics. *(Lec. 3) Prerequisite: PSY 113, 300, 301 or permission of instructor.* A. Lott

452 Aging and the Individual *II, 3*
Psychological aspects of the aging process. Age changes in motivation, values, and functional efficiency. The psychopathology of old age. *(Lec. 3) Prerequisite: PSY 301.*

460 The Psychology of Violence and Aggression *I and II, 3*
Causal factors involved in understanding aggressive behavioral reaction from clinical, physiological, and social viewpoints. Methods used to deal with and change violent or aggressive behavior. *(Lec. 3) Prerequisite: PSY 113, 301, SOC 204, or permission of instructor.* Berman and Staff

461 Social and Psychological Aspects of Alcoholism *I and II, 3*
Causes and effects of alcoholism. Needs of those working with alcoholics, treatment and/or prevention of alcoholism. *(Lec. 3) Prerequisite: PSY 113, 301, junior standing and permission of instructor.* Willoughby

463 Psychology of Personal Meaning *I and II, 3*
Experiential and academic examination of the sources of meaning of human existence. Exploration of

modes for finding such meaning. *(Lec. 3) Prerequisite: PSY 113, junior standing.* Atyas

479 Contemporary Problems for Modern Psychology *II, 3*
Topics chosen by lectures which have emerged as central issues in the field of psychology. Topics will be jointly analyzed by instructors representing divergent viewpoints. Exploration of experimental and theoretical literature. *(Lec. 3) Prerequisite: PSY 301, permission of department.* Staff

489, 499 Problems in Psychology *I and II, 3 each*
Advanced work in psychology. Courses will be conducted as seminars or as supervised individual projects. *(Lec. or Lab. TBA) Prerequisite: PSY 301, senior or graduate standing, permission of department.* Staff

510 Intermediate Quantitative Methods *I, 3*
Complex statistical techniques useful in practical psychological research including analysis of variance and co-variance, multiple correlation, regression analysis, and introductory multivariate analysis methods. *(Lec. 2, Lab. 2)* Merenda and Cain

520 Psychometric Methods *I and II, 3*
Techniques for investigating the areas of attitude and opinion research, morale and leadership, personality and perception. Includes scalogram analysis, attitude scales and "Q" techniques. *(Lec. 3) Prerequisite: PSY 434.* Staff

530 Seminar in Phenomenology and Psychology *I and II, 3*
Phenomenology as a method of psychological study. Emphasis upon current relationship between phenomenology and contemporary psychological issues—cognition, behaviorism, psychoanalysis. Special areas of interest (e.g., emotions, interpersonal relations, values) will be subjected to a phenomenological analysis. *Prerequisite: PHL 101 and permission of department.* Staff

534 Clinical Interpretation of Standardized Psychological Tests *II, 3*
Test profile integration and pattern analysis. Practice given in the critique of personal evaluation reports based on standardized test results, and the preparation of such reports. Standardized psychological group tests discussed in relation to interpretation of the test profiles and protocols. *(Lec. 3) Prerequisite: PSY 434 and permission of department.* Staff

542 The Exceptional Child *I and II, 3*
Definition and proper classification of types of exceptional children, and the social, psychological, and physical factors involved. Problems of rehabilitation and psychological treatment of the exceptional child. Types of exceptional children such as superior, retarded, physically handicapped, and those suffering from developmental aberrations. *(Lec. 3) Prerequisite: PSY 232, 254 and permission of department.* Staff

550 (or PCL 550) Operant Analysis of Behavior *I, 3*
Introduction to the principles of operant conditioning with emphasis on the use of these principles in the analysis of behavior. *(Lec. 3) Prerequisite: permission of department.* Lal and Smith

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

600 Advanced General Psychology *I or II, 1-15*
A series of courses that provide incoming graduate students with intensive preparation in the major areas of general psychology: a) psychophysiology, b) sensation and perception, c) learning, d) cognition, e) social behavior, f) development of behavior, g) personality, h) psychopathology. During their first year, students take one credit in each area in which they have no previous graduate training. *(Lec. 1) Prerequisite: permission of department. Students who have taken PSY 305 may not take 600 a or b; students who have taken PSY 306 may not take 600 c or d.* Staff

610 (or EST 610) Factor Analysis *II, 3*
Study of and comparison among various procedures of factor analysis including tetrad differences, bi-factor, group centroid, principal components and canonical methods. Interpretation of factors. Estimation of factor loadings and specific variances. Methods for factor rotation. Estimation of factor scores. *(Lec. 3) Prerequisite: EST 541.* Merenda

611 Methods of Psychological Research and Experimental Design *I and II, 3*
Provides the student of psychology with a knowledge of research methodology and the techniques of experimental designs. It prepares for the development of thesis problems of graduate students in psychology and related disciplines. *(Lec. 3) Prerequisite: PSY 510.* Merenda

615 Seminar: Advanced History and Systems of Psychology *I and II, 3*
Intensive and critical consideration of major problems in the strategies of data collection, interpretation and theory construction. Particular attention to the historical roots of these problems and the criteria of empirical adequacy. *(Lec. 3) Prerequisite: PSY 301, 310. Not offered 1971-72.* Staff

616 Methodology and Design in Research in School Psychology *I and II, 3*
Models of research design and methodology particularly applicable to the school situation are explored. *(Lec. 3) Prerequisite: PSY 434, 510, 611, and permission of department.* Staff

617 Methodology and Design in Research in Clinical Psychology *I and II, 3*
Models of research design and methodology particularly pertinent to the area of clinical psychology with emphasis on mental designs appropriate to research

problems, using specific experiments and original research. *(Lec. 3) Prerequisite: PSY 434, 510, 611, and permission of department.* Staff

620 Seminar: Classical Conditioning *I and II, 3*
History and nature of the conditional reflex, with emphasis placed on understanding the role of the conditional reflex and contemporary behavioral research and theory. *(Lec. 3) Prerequisite: permission of department. Not offered 1971-72.* Staff

621 Seminar: Human Learning and Memory *I and II, 3*
Experimental analysis of major problem topics of learning and retention studies in humans. Emphasis on systematic studies of verbal habits, dimensional analysis of the critical variables influencing these habits, and the interference theory of forgetting. *(Lec. 3) Prerequisite: permission of department. Alternate years.* Staff

640 Personality Dynamics I (Advanced Personality) *I, 3*
Readings from the original sources of the major contemporary personality theorists. Emphasis on the possible integration of these theories, and the development of syncretic theory according to individual preferences. *(Lec. 3) Prerequisite: PSY 235.* Staff

660 Personality Dynamics II (Advanced Psychopathology) *I and II, 3*
Study of empirical literature with regard to etiological factors involved in the formation of pathological character trends and deviations. Evaluation of clinical theory and classification systems as related to the psycho-therapeutic process. *(Lec. 3) Prerequisite: PSY 254, 640.* Staff

661 Psychological Services I (Administration and Interpretation of Cognitive Tests) *I, 3*
Instruction and practice in the administration and interpretation of cognitive tests; individual intelligence tests of both general and specific abilities. Seminar underlying rationale research evidence and clinical application of such tests as Stanford-Binet, Wechsler, Bender-Gestalt, Lister International. *Laboratory practicum. (Lec. 2, Lab. 2) Prerequisite: PSY 232, 235, 254, 434, and permission of department.* Staff

662 Psychological Services II (Administration and Interpretation of Personality Tests) *II, 3*
Instruction and practice in the administration and interpretation of instruments used in the assessment of personality. Emphasis upon projective tests such as Rorschach, TAT. Seminar underlying rationale, research evidence and clinical application. *(Lec. 2, Lab. 2) Prerequisite: PSY 661 and permission of department.* Staff

663 Seminar to Accompany Field Experience in Psychological Services *I and II, 3*
All students meet in seminar to discuss and investigate specific diagnostic, therapeutic, research problems emerging in connection with internship experience. *(Lec. 3) Prerequisite: PSY 670.* Staff

664 Advanced Diagnostic Problems *I and II, 3*
Use and interpretation of cognitive, projective, and neural psychological tests. Focus on integrated data into meaningful description of total personality functioning. Use of the diagnostic interviewer. *(Lec. 3) Prerequisite: PSY 640, 660, 661, 662 and permission of instructor.* Berman

665 Seminar: Behavior Disorders in Childhood *I and II, 3*
Emphasis on etiological factors, diagnostic and treatment consideration, and experimental research findings related to the psychological maladjustments in infancy and childhood; treatment procedures, resources and methods used in dealing with behavior and personality problems. Lectures, discussions, and case demonstrations. *(Lec. 3) Prerequisite: PSY 660.* Silverman and Staff

666 Seminar: The Professional Psychologist in the Community *I and II, 0*
Ethical and professional standards related to the practice of psychological services. Discussion and guest lectures by members of related disciplines. Special emphasis upon the role of the professional psychologist in the community. *(Lec. 1) Prerequisite: permission of department.* Staff

670 Field Experience in Psychological Services Internship *I and II, 6-12*
Internships for advanced graduate students are available in a variety of institutional, agency and school settings under supervision which must be acceptable to the department. *(TBA) Prerequisite: equivalent of 1 year full-time graduate work, psychological service sequence, permission of department.* Staff

671 Clinical Practices I (Diagnostic) *I and II, 3*
Supervised practice in the assessment of problem behavior. Emphasis on the integration of data from psychological tests, case histories, and other sources in the assessment of personality. Practicum facilities available in several agencies. *(Lec. 2, Lab. 2) Prerequisite: PSY 661, 662, and permission of department.* Staff

672 Individual Clinical Practicum *I and II, 3-6*
Introductory experience in dealing with clinical problems in a variety of clinical settings. Individual supervision to be arranged. *(Lec. 2, Lab. 2) Prerequisite: PSY 661, 662, and permission of department.* Staff

673 Seminar: Introduction to Clinical Psychotherapy *I and II, 3*
Theories and techniques of psychotherapeutic procedures involving directive and nondirective and play therapies. Theoretical rationale and empirical research with special emphasis on the child area. *(Lec. 3) Prerequisite: permission of department.* Staff

674 Clinical Practices II (Therapy) *I and II, 3*
Specialized practices and techniques of clinical interviewing, counseling, and psychotherapy with children and adults. Observations, readings, and model tapes supplement critical discussion of the student's own supervised therapy sessions. *(Lec. 2, Lab. 2) Prerequisite: PSY 640, 660, 673, and permission of department.* Staff

675 Experimental Psychopathology *I and II, 3*
Relates recent experimental methodology and findings to prevalent theoretical positions. Emphasis on reviewing experimental literature in specialized clinical areas. *(Lec. 3) Prerequisite: PSY 510, 611, and permission of department. Alternate years.* Staff

676 Neurological Correlates of Psychopathology *I and II, 3*
Functioning and physiology of central nervous system with particular attention to determining how neurological disruption and injury are manifested in behavioral disorder. Techniques used to evaluate and interpret neuropsychological functioning. *(Lec. 3) Prerequisite: permission of instructor. Alternate years.* Berman

680 School Practices I (Diagnostic) *I and II, 3*
Testing procedures and devices in the diagnosis of organicity, personality problems, special learning problems, visual, auditory, and memory problems; includes administration, interpretation, and special adaptation of tests in the school situation. *(Lec. 2, Lab. 2) Prerequisite: PSY 434, 661, 662, and permission of department.* Staff

681 Special Problems in School Psychology *I and II, 3-6*
The role of the psychologist in the school setting. Several theoretical and practical issues concerned with the value of psychological theory, administrative philosophy, and school organization are explored. *(Lec. 2, Lab. 2) Prerequisite: PSY 680 and permission of department.* Staff

682 Individual Practicum in School Psychology *I and II, 3-6*
Designed to accompany the student's internship in the school setting. Techniques for adapting psychological services to function within the school system. Individual supervision to be arranged. *(Lec. 2, Lab. 2) Prerequisite: permission of department.* Staff

683 Psychology of the Exceptional Child *I, 3*
Social, psychological and educational factors that constitute the matrix of concerns with the exceptional individual in the school and community. Attention given to recent innovations in public and private education and habilitation. Research issues and legislation discussed will evolve into student studies. *(Lec. 3) Prerequisite: permission of department.* Gross

684 Learning Disabilities *I, 3*
Introduction to developments in the field of disorders of learning in the school-age child, stressing recent conceptualizations of underlying psychological parameters essential to basic processes involved in learning. Interdisciplinary approaches to diagnosis discussed and the innovation of precriptive teaching introduced. *(Lec. 3) Prerequisite: PSY 683 and/or permission of instructor. Alternate years.* Gross

685 Psychology of Mental Retardation *II, 3*
Etiological factors, including biogenetic, physiological and social origins of mental retardation. The epidemiology and ecological aspects considered as they interact with social and cultural forces. Historical and current philosophy of habilitation and education of school-age children and adults. *(Lec. 3) Prerequisite: PSY 683 and/or permission of instructor.* Gross

686 Psychology and Education of the Emotionally Disturbed *II, 3*
Current thinking on treatment and education of residential and day-care programs for the emotionally disturbed. Meaning of the various concepts of schizophrenia, autism and hyperkinetic impulse disorder for treatment. Application of operant techniques for shaping socially appropriate behavior. Overview of origins of current operant methods in hospitals and schools. *(Lec. 3) Prerequisite: PSY 683 and/or permission of instructor. Alternate years.* Gross

690 Seminar: Contemporary Issues in Psychology *I and II, 3-12*
Recent developments and current issues. Rigorous exploration of experimental and theoretical literature. Study limited each semester to one of the following areas: developmental, clinical, motivation, perception, psychophysics, and scaling problem solving and thinking. *A maximum of 4 seminars may be taken. (Lec. 3) Prerequisite: permission of department. Alternate years.* Staff

691 Individual Practicum in Teaching Psychology *I and II, 1-6*
Supervised experience in the teaching of psychology at the undergraduate level. Students will be involved in laboratory and discussion groups under didactic supervision of a faculty teaching committee. 1 credit per semester. *(Lab. 2) Prerequisite: permission of department.* Staff

692, 693 Directed Readings and Research Problems *I and II, 3 each*
Directed readings and advanced research work under the supervision of a member of the staff arranged to suit the individual requirements of the students. May be taken for up to 6 credits. *Prerequisite: permission of department.* Staff

694 Special Problems in Clinical Psychology *I and II, 3*
Instruction and clinical practicum training in unique problem areas of clinical psychology. Development of specialized evaluation instruments and procedures. *(Lec. 2, Lab. 2) Prerequisite: PSY 661, 662, and permission of department.* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

RESOURCE DEVELOPMENT (RDV)

100 Natural Resource Conservation *I, 3*
Introduction to man's use and management of his natural resources; land, food, forests, wildlife, water, minerals and air, with a survey of contemporary resource-use problems in environmental pollution. *(Lec. 3)* Kupa and Staff

101 Natural Resource Conservation Practicum *I, 1*
A field course designed to acquaint students with the broad resource problem areas in Rhode Island. Required of freshmen in Natural Resources. *(Lab. 2) Prerequisite: concurrent registration in RDV 100 and/or permission of instructor.* Kupa

300 Seminar in Contemporary Resource Problems *II, 2*
Selected local resource-use problems analyzed from the several viewpoints represented by the training of the students involved. *Prerequisite: senior standing in Natural Resources.* Owens and Staff

RESOURCE ECONOMICS (REN)

CHAIRMAN: Professor Norton. Professors Dirlam, Holmsen, Lampe, Rorholm and Spaulding; Associate Professors Bromley, Owens and Wallace; Assistant Professors Gates, Mattox, Paulaha and Seay; Instructor Mlotok.

105 Economics in Food Production and Distribution *I and II, 3*
Economic organization of food production and distribution; its relative importance in the U.S. economy. The impact of developing technology on resource demands. Discussion and analysis of important problem areas. Elementary production and pricing principles as guides to decision-making by the firm. *(Lec. 3)* Owens

135 Fisheries Economics *I, 5*
Analysis of supply and demand for fish and fishery products. Cost and return in harvesting and processing. Crew remuneration systems. Fisheries policy and management. *(Lec. 5) Prerequisite: permission of instructor. Designed for two-year fisheries program.* Holmsen

140 Marketing Agricultural Products *II, 3*
Examination of role of marketing principles in dairy, poultry and horticultural industries. *(Lec. 3) Prerequisite: REN 105.* Wallace

210 Man and Resource Use *I, 3*
Physical, institutional and organizational factors governing man's economic decisions to use resources. Relationships of rural (forest, wildland), urban (water, recreation), marine and mineral resources to the economy as economic institutions resolve resource use conflicts. Economic dimensions of public policy alternatives. *(Lec. 3) Prerequisite: ECN 126.* Mattox

220 Resource Conservation in the Modern Economy *II, 3*
Economic forces influencing the use of natural resources by the private sector. Concepts of property and their relevance to conservation decisions. Role of public in conservation; direct and indirect methods of policy implementation. Origins, responsibilities and effectiveness in resource conservation of selected public agencies. *(Lec. 3) Prerequisite: REN 210 or permission of instructor.* Staff

301, 302 Senior Seminar *I and II, 1 each*
Important current problems in resource economics and in research methods. *(Lec. 1) Prerequisite: senior standing.* Staff

335 Production Economics *I, 3*
Use of economics in planning resource combinations at the firm level. Factor-product, factor-factor, product-product relationships are covered. Also risk, uncertainty and planning techniques. *(Lec. 3) Prerequisite: REN 105.* Rorholm

350 Contemporary Resource Use Conflicts *II, 3*
Economic factors affecting natural resource use. Application of basic economic theory to specific problems of a modern industrial society in managing its natural resources. Economic aspects of environmental quality. Various techniques for conflict resolution. *(Lec. 3) Prerequisite: ECN 428.* Staff

441 Economics of Food Marketing *I, 3*
The development of marketing systems for food products; institutional considerations; marketing methods and services; costs and margins; market prices and price determination; marketing and pricing efficiency; types of competition; appraisal of alternative systems. Application of economic principles in analyzing marketing and pricing problems. *(Lec. 3) Prerequisite: REN 105 and permission of instructor. In alternate years, next offered 1971-72.* Owens

442 Advanced Food Marketing *II, 3*
Market and industry structure; impact of technological change on structure and efficiency implications; pricing practice of marketing firms; non-price competition, advertising, market strategies. Emphasis is placed on training the student to make sound economic decisions. *(Lec. 3) Prerequisite: REN 441. In alternate years, next offered 1971-72.* Owens

450 Resource Policy and the Environment *II, 3*
Economic aspects of current resource policy problems in detail. Economic effects of recent changes in public attitudes, legislation, agencies and functions. Current research and its role in decision-making. *(Lec. 3) Prerequisite: permission of department.* Staff

491, 492 Special Projects *I and II, 3 each*
Advanced theory of agricultural marketing, agricultural and public policy, advanced production economics, advanced resource economics and advanced theory of choice. *Prerequisite: permission of department.* Staff

514 Economics of Marine Resources *I, 3*
The role of economics in development of marine resources. Particular attention to problems of multiple use of resources and to the conflicts between private and public goals. *(Lec. 3) Prerequisite: MMA students or permission of instructor.* Rorholm

527 Macroeconomic Models
See Economics 527.

528 Microeconomic Models
See Economics 528.

531 Land Economics
See Community Planning 531.

534 Economics of Resource Development I *II, 3*
Economic theory applied to the development of human and natural resources with topics drawn from current resource use problems. Analytical techniques treated are simulation techniques, cost-benefit analysis, input-output models, growth models, Cobb-Douglas functions, and Markov chains. *(Lec. 3) Prerequisite: REN 531 and EST 412 or equivalent, or permission of instructor.* Gates

543 Economic Structure of the Fishing Industry *I, 3*
Analysis of U.S. and world fishing industries from standpoint of activity and efficiency. Problems related to common property resources, government policy, labor, and legal and institutional factors will be covered. *(Lec. 3) Prerequisite: ECN 427 and 428 or permission of instructor.* Holmsen

576 (or EST 576) Econometrics I *I, 3*
Application of statistics and mathematics to economic analysis. The implications of assumptions required by statistical methods for testing economic hypotheses will be fully explored. Current research applications of econometric methods examined and discussed. *(Lec. 3) Prerequisite: REN 528 and EST 412 or equivalent.* Lampe

577 (or EST 577) Econometrics II *II, 3*
Continuation of Econometrics I. *(Lec. 3) Prerequisite: REN 576.* Lampe

595 Problems of Modernization in Developing Nations
See Economics 595.

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

602 Research Methodology *I and II, 3*
Evaluation of alternative research methods and techniques. Development of specific research projects. *(Lec. 3)* Staff

610 Advanced Studies *I and II, 3*
Advanced topics in resource economics. Mathematical models in resource management. May be repeated for different topics. *(Lec. 3)* Staff

634 Economics of Resource Development II *II, 3*
Concepts of economic efficiency applied to natural resources with emphasis on marine resources. Application of welfare and institutional economics to resource development; analysis of optimum allocation among users. *(Lec. 3) Prerequisite: REN 534 and ECN 428.* Mattox

635 Marine Resources Policy *II, 3*
Analysis of public policy problems relating to the development and management of marine resources, including fisheries, minerals, petroleum, water and recreation. *(Lec. 3) Prerequisite: REN 534, ECN 427 and 428.* Norton

675 Mathematical Economics *II, 3*
Application of mathematical tools to problems in micro- and macroeconomics. Mathematical treatment of models of consumption, production, market equilibrium and aggregate growth. *Prerequisite: ECN 627 and 628.* Norton

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

RUSSIAN (RUS)

CHAIRMAN: Associate Professor Kossoff (Languages). Assistant Professor Aronian.

101, 102 Elementary Russian *I and II, 3 each*
Fundamentals of grammar and pronunciation; exercises in reading, writing, and conversation. *(Lec. 3)* Staff

103, 104 Intermediate Russian *I and II, 3 each*
Development of facility in reading texts of moderate difficulty; supplemented by further work in grammar, conversation, and composition. *(Lec. 3) Prerequisite: RUS 102.* Staff

205, 206 Conversation and Composition *I and II, 3 each*
Development of facility in speaking, understanding, and writing Russian, oral reports on articles read in newspapers and periodicals and frequent written compositions. *(Lec. 3) Prerequisite: RUS 104.* Staff

325, 326 Readings in Russian Literature *I and II, 3 each*
Selected readings in poetry and the short story from the late eighteenth century to the present. Authors studied include Karamzin, Pushkin, Lermontov, Tyutchev, Gogol, Turgenev, Cvetaeva, Mayakovsky, Za-

myatin, Olesha, Zoshchenko and Pasternak. *(Lec. 3) Prerequisite: RUS 104. In alternate years, next offered 1971-72.* Aronian

391, 392 Masterpieces of Russian Literature *I and II, 3 each*
Russian literature of the nineteenth and twentieth centuries with emphasis on the development of the Russian novel. Readings in translation. *(Lec. 3) May not be used for credit toward major or minor in Russian.* Driver

460, 461 The Russian Novel *I and II, 3 each*
Development and technique of the novel in the works of Pushkin, Lermontov, Gogol, Goncharov, Turgenev, Tolstoy, Dostoevski, Leskov, Sologub, Sholokhov and Pasternak. *(Lec. 3) Prerequisite: RUS 104. In alternate years, next offered 1972-73.* Staff

901, 902 Graduate Reading Course in Russian *I and II, 0*
Two-semester course prepares the graduate student in other fields to use Russian to further research in his major field. Attention is given primarily to acquiring a reading knowledge with little emphasis on the spoken language. Assumes no prior knowledge of Russian. Staff

SOCIAL WELFARE (SWF)

311 Introduction to Social Work *I and II, 3*
Growth and development of social work concepts, philosophies and procedures under voluntary and public auspices. *(Lec. 3) Prerequisite: SOC 202 or 204, sophomore standing.* Maynard

313 Social Welfare Services *I and II, 3*
Organized efforts to meet the welfare needs of individuals and groups through federal, state and local institutions and agencies, with particular reference to Rhode Island. *(Lec. 3) Prerequisite: SWF 311 and one of the following: ECN 123, HIS 142, PSC 113, junior standing.* Maynard

317 Social Work Methods *I and II, 3*
Principles and methods of casework, with emphasis on understanding and aiding individuals and families faced with personal-social difficulties. Nature and varieties of group work. *(Lec. 3) Prerequisite: SOC 204 and SWF 313, PSY 235 or 254, or CDF 390, permission of department.* Maynard

SOCIOLOGY (SOC)

CHAIRMAN: Professor Rosengren (Sociology and Anthropology). Professors England and Spaulding; Associate Professor R. V. Gardner; Assistant Professors Bouvier, Gersuny, McNevin and Rydell; Instructors Bassis, Needleman, Sennott and Travisano.

202 General Sociology *I and II, 3*
Introductory description and analysis of the structure and dynamics of human society. Social norms, groups, intergroup relations, social change, stratification, and institutions. *(Lec. 3)* Staff

204 Social Psychology *I and II, 3*
Examination of social basis of personality development and behavior. Man's symbolic environment, the self and the group motivation, attitudes and beliefs, social roles. *(Lec. 3)* Staff

206 Development of Human Societies *I and II, 3*
A sociological perspective in which whole societies are the unit of analysis. The succession of hunting and gathering, horticultural, agrarian and industrial societies. Social change is central to this approach and focus is on the place of technology in the changing socio-cultural pattern. *(Lec. 3)* Gersuny

208 Issues and Problems in Contemporary American Society *I and II, 3*
Theoretical analysis of contemporary issues and societal trends and their impact on social organization. Social developments occurring after World War II analyzed and assessed according to their import and implications for social change. Emphasis on a sociological understanding of current issues. *(Lec. 3)* McNevin

310 Rural Sociology *II, 3*
Population and culture in rural United States; emphasis on analyzing the life of people in a rural environment as an integral part of contemporary organized society. *(Lec. 3) Prerequisite: SOC 202.* Spaulding

312 The Family *I, 3*
The family as a social institution, featuring its uniformity and variability in historical time and social space. Particular emphasis on contemporary American family. Variation in the institutional patterns by rural-urban residence, region, race and social class. Issues and conflicts in the contemporary family scene. *(Lec. 3) Prerequisite: SOC 202.* McNevin

314 Juvenile Delinquency *II, 3*
Causes of delinquency; juvenile courts and probation; correctional institutions; programs of prevention. *(Lec. 3) Prerequisite: SOC 202.* England

324 Medical Sociology *I, 3*
Problems of health, illness, and medicine in relation to the social order; organization of medical institutions and professions; distribution of illness in societies; social psychological factors in illness. *(Lec. 3) Prerequisite: 6 credits in sociology or anthropology including SOC 202 or APG 203.* Rosengren

330 Criminology *I, 3*
Nature and extent of crime; past and present theories of crime causation; criminal behavior in American society and its relation to personal and cultural conditions. *(Lec. 3) Prerequisite: SOC 202.* England

336 Social Stratification *II, 3*
Dimensions and dynamics of inequality in society; concepts of class and status; processes of social mobility. *(Lec. 3) Prerequisite: SOC 202.* Gersuny

338 Population Problems *I, 3*
Problems in the growth, decline, and composition of populations. Effects of fertility, mortality, migration, etc. Special attention to American society. *(Lec. 3) Prerequisite: SOC 202 or APG 203.* Bouvier

340 Minority and Majority Relations *II, 3*
Relations between the various ethnic, religious, racial and political minorities and majorities, with special reference to the United States. *(Lec. 3) Prerequisite: SOC 202.* Staff

370, 371 Seminars *I and II, 3 each*
Designed to cover areas of special research interests of graduate and undergraduate students not covered in other courses. May be taken as honors courses. *(Lec. 3) Prerequisite: permission of department.* Staff

408 Industrial Sociology *I, 3*
Work and the organizations of industry, work roles, work groups, and authority structures; labor-management relations; some aspects of industrialization. *(Lec. 3) Prerequisite: 6 credits in sociology or anthropology, including SOC 202 or APG 203.* Gersuny

410 Complex Organizations in Modern Society *II, 3*
Role of large formal organizations in contemporary society: schools, hospitals, welfare institutions, administrative agencies, and others dealing with clients. Structure of organizations, their relations to one another and to their community settings. *(Lec. 3) Prerequisite: 6 credits in sociology or anthropology, including SOC 202 or APG 203.* Rosengren

412 Occupations, Professions, and Social Structure *I and II, 3*
Historical changes in work patterns, variability in the nature of work among occupations and between occupations and professions, career and mobility patterns, reciprocal relations between an individual's occupational status and his participation in other societal institutions. *(Lec. 3) Prerequisite: one 200-level and one 300-level sociology course.* Rydell

414 Demography *I and II, 3*
Vital statistics and their consequences for social structure and social change. Analysis of demographic techniques as applied to the measurement of fertility, mortality, morbidity and migration. Development of methods for estimating population projections. *(Lec. 3) Prerequisite: SOC 338 or permission of department.* Bouvier

416 Seminar in Criminology *II, 3*
Critical survey of criminological/penological theories and research, with emphasis upon the work of contemporary sociologists. Relevance of this work to correctional and preventive programs. Discussions, oral and written reports. *(Lec. 3) Prerequisite: SOC 330 or permission of instructor.* England

430 Social Pathology and Social Change *I, 3*
Pathological characteristics as aspects of social change; social structure analyzed as relevant to development of slums, migration, crime, delinquency, divorce, poverty, alcoholism, suicide, drug addiction, and mental deficiency and disorder. *(Lec. 3) Prerequisite: SOC 202, 204.* Spaulding

432 Ecology of the Community *I or II, 3*
Spatial and temporal organization of communities. Consideration of the relations between man and his environment, as well as a survey of community, ecological and power structure studies. *(Lec. 3) Prerequisite: SOC 202.* Staff

434 Urban Sociology *I, 3*
Patterns of urban development, taking into account sociological characteristics of urban life. Problems of urban redevelopment and planning. *(Lec. 3) Prerequisite: SOC 202.* Staff

436 Sociology of Politics *II, 3*
Social and cultural contexts of contemporary politics. Functions and problems of mass, class and power group participation in politics. Conditions and outlook for democracy in large societies. *(Lec. 3) Prerequisite: SOC 202.* Gardner

438 Aging and Society *I, 3*
Sociological features of the aging process. The physiological and psychological bases of aging. The major social institutions and the impact of significant social trends. This course, together with PSY 182, Aging and the Individual, constitutes a sequence in gerontology. *(Lec. 3) Prerequisite: SOC 202; SOC 312 desirable.* Staff

440 The Sociology of Mental Illness *I and II, 3*
Sociological theory and data on the socio-cultural aspects of mental illness. The phenomenon of mental illness considered in historical and cross-cultural perspective. Social correlates of different types of frequencies of mental illness and recent sociological research on mental illness as a social role. *(Lec. 3) Prerequisite: SOC 202 or 204 and one 300-level course.* Travisano

492 History of Sociological Thought *I, 3*
Development of sociology as reflected in writings of American and European scholars: Plato, Aristotle, Rousseau, Vico, Spencer, Durkheim, Marx, Weber, Veblen, R. Merton, Parsons, and others. *(Lec. 3) Prerequisite: 12 credits of sociology.* Gardner

494 Theory and Methods of Sociology Research *I, 3*
Use of the scientific method in sociological research. Formulation of research designs, quantitative and qualitative analysis, validity and reliability of data. Sampling, interviewing and observation; use of documents, schedules, questionnaires, scaling, surveys. *(Lec. 3) Prerequisite: 12 credits of sociology or permission of department.* Bouvier

496 Advanced Sociological Research *II, 3*
Advanced techniques of sociological research and their application by participation in a research proj-

ect. *(Lec. 3) Prerequisite: SOC 494 or permission of department.* Staff

502 Contemporary Sociological Theory *II, 3*
Critical examination of the theories and systems of contemporary sociologists. *(Lec. 3) Prerequisite: 12 credits of sociology or permission of instructor.* Gardner

508 Individual and Social Organization *I or II, 3*
Sociology of the individual as the creator, preserver, and participant in society. Emphasis upon symbolic interaction in the growth of personal idiom, the development of social structure, and of the content of social change. *(Lec. 3) Prerequisite: permission of department.* Staff

510 Seminar in Deviance *I or II, 3*
Deviation from social expectations analyzed as a social phenomenon. Emphasis on deviation theories and research pertaining to individuals, subcultures, and social systems. Discussions, oral and written reports. *(Lec. 3) Prerequisite: permission of department.* Staff

512 Concepts of Social Structure *I or II, 3*
Examination of key spheres in social organization such as stratification, institutions, communities from a variety of perspectives including consensus and coercion models, pluralist versus elitist images of power structure, and the pros and cons of functionalism. *(Lec. 3) Prerequisite: permission of department.* Staff

571, 572 Seminars *I and II, 3 each*
Designed to cover areas of special research interests of graduate students not covered in other courses. *(Lec. 3) Prerequisite: permission of department.* Staff

595 Problems of Modernization in Developing Nations
See Economics 595.

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

SPANISH (SPA)

CHAIRMAN: Associate Professor Kossoff (Languages). Associate Professor Hutton; Instructors Bourquin, T. A. Bryan, Freedman, Maisterra and Navascués.

101, 102 Elementary Spanish *I and II, 3 each*
Involvement of the student at an elementary level in the spoken and written use of the Spanish language through class experience and language laboratory. *(Lec. 3)* Staff

103, 104 Intermediate Spanish *I and II, 3 each*
Involvement of the student at an intermediate level in the spoken and written use of the Spanish language through class experience and language laboratory, combined with the reading of Spanish and Hispanic-American representative authors. *(Lec. 3) Prerequisite: SPA 102 or equivalent.* Staff

205, 206 Advanced Spanish *I and II, 3 each*
Emphasis on correct and mature expression in conversation and composition in Spanish with continued emphasis in the skill of reading. *(Lec. 3) Prerequisite: SPA 104 or equivalent.* Staff

325, 326 Introduction to Literary Studies in Spanish *II, 3*
Basic courses examining Hispanic literature through works representative of significant literary and cultural movements and specifically Spanish themes and mythic figures. Elements of critical methods. *(Lec. 3) Prerequisite: SPA 206, or may be taken concurrently with SPA 205 or 206 by permission of instructor.* Navascués

391, 392 Masterpieces of Spanish Literature *I and II, 3 each*
Course offered in English. Reading and analysis of Spain's most significant contributions to world literature encompassing poetry, novel, drama and essay. All works read in English translation. Works through the seventeenth century in the first semester; those of the nineteenth and twentieth in the second. *(Lec. 3) May not be used for credit toward a concentration in Spanish.* Freedman

407 Intensive Practice in Conversation *I, 3*
Intensive practice in spoken Spanish and an introduction to Hispanic-American culture. *(Lec. 3) Prerequisite: SPA 206. May be taken concurrently with SPA 205 or 206 by permission of instructor. Recommended for students in the General Teacher Education curriculum concentrating in Spanish. In alternate years, next offered 1972-73.* Bourquin

408 Conversation and Teaching Materials *I, 3*
Practice in spoken Spanish and an introduction to Spanish culture. Review of materials and textbooks available for effective teaching. *(Lec. 3) Prerequisite: SPA 206. May be taken concurrently with SPA 205 or 206 by permission of instructor. Recommended for students in the General Teacher Education curriculum concentrating in Spanish. In alternate years, next offered 1971-72.* Hutton

409 History of the Spanish Language *II, 3*
Linguistic development of Castilian from the earliest documents to the present. Ibero-Romance dialects. New World Spanish. Hispano-Judaic dialects. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408. In alternate years, next offered 1971-72.* Bryan

430 Castilian Literature of the Sixteenth and Seventeenth Centuries *II, 3*
Literary significance of the Renaissance and Baroque periods and an analysis and critical examination of the works of the principal writers of this Golden

Age of Castilian literature. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407 or 408, or permission of instructor.* Hutton

450 Neo-Classicism and Romanticism *I, 3*
Transformation of national traditions and the introduction of neo-classicism in eighteenth-century Spain, and the significant works of the Romantic movement, particularly in the theater, lyric poetry and *costumbrista* literature in nineteenth-century Spain. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1971-72.* Kossoff

451 The Spanish Novel of the Nineteenth Century *I, 3*
Development of Realism and Naturalism in the novel of the second half of the nineteenth century in Spain. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1971-72.* Kossoff

461 The Generation of 1898 *I, 3*
Major literary work of the Generation of 1898 including those of Benavente, Unamuno, Valle-Inclán, Baroja, Antonio Machado, and Azorín. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of department. In alternate years, next offered 1972-73.* Bryan

462 Contemporary Spanish Literature *II, 3*
Generation of 1898; García Lorca and the Generation of 1927; Cela and the post-Civil War novel; Spain's major contemporary figures and their works. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of department. In alternate years, next offered 1972-73.* Freedman

471, 472 Introduction to Hispanic-American Literature *I and II, 3 each*
Reading and critical study of the major literary works of Hispanic America, from the historians of the Spanish colonial era to the contemporary writers of the independent, Spanish-speaking American nations. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. SPA 472 recommended for students with a concentration in Spanish. In alternate years, next offered 1972-73.* Bourquin

481 Don Quijote *I, 3*
Understanding of the life and times of Miguel de Cervantes Saavedra and the reading and critical interpretation of his work, *El ingenioso hildalgo Don Quijote de la Mancha. (Lec. 3) Recommended for students with a concentration in Spanish. Prerequisite: SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1972-73.* Hutton

483 The Origins of the Novel in Spain *I, 3*
Development of forms of prose fiction from the period of the Reconquest to Cervantes; the sentimental, picaresque and pastoral novels, the novels of chivalry, and the translations and imitations of the Greek romances of adventure. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1972-73.* Kossoff

485 The Modern Spanish Novel *II, 3*
Representative works from the Generation of '98 to the most recent authors: Valle-Inclán, Baroja, Perez de Ayala, Cela. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1971-72.* Kossoff

488 The Drama of the Golden Age *II, 3*
Spanish theater from the early Renaissance through the Baroque with special attention to the works of Lope de Vega and Calderón and their schools. *(Lec. 3) Prerequisite: one of the following; SPA 325, 326, 407, 408, or permission of instructor. In alternate years, next offered 1972-73.* Kossoff

497, 498 Directed Study *I and II, 3 each*
Designed particularly for the advanced student. Individual research and reports on problems of special interest. *Prerequisite: one of the following; SPA 325, 326, 407, 408; acceptance of a project by a member of the staff and departmental approval.* Staff

511, 512 Castilian Literature from Its Origins through the Fifteenth Century *I and II, 3 each*
Castilian literature from its origins to the early period of the Renaissance with the reading and critical analysis of the works of outstanding representative authors encompassing all the genres of literary activity. *(Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1971-72.* Navascués

573 Modern Hispanic-American Poetry *I, 3*
Hispanic-American poetry from the last two decades of the nineteenth century to the present day: a critical study with special attention to Martí, Dario, González Martínez, Gabriela Mistral, Ibarbourou and Neruda. *(Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1971-72.* Bourquin

574 Hispanic-American Novel *II, 3*
Hispanic-American novel with particular emphasis on its trends in the twentieth century. The works of such writers as Isaacs, Cambaceres, Azuela, Arguedas, Gallegos, Mallea, Asturias and Fuentes will be analyzed. *(Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1971-72.* Bourquin

582 Cervantes: Theater and Novels *II, 3*
The reading and critical interpretation of selections from *Comedias and Entreses, Las novelas ejemplares, La Galatea, Persiles y Sigismunda. (Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1972-73.* Hutton

583 The Spanish Baroque *I, 3*
Study and analysis of *Culteranismo* and *Conceptismo* in Gongora, Quevedo and Gracián. *(Lec. 3) Prerequi-*

site: graduate status or permission of instructor. In alternate years, next offered 1972-73. Kossoff

584 Spanish Essay from the Eighteenth Century to the Present *II, 3*
Progression of Spanish intellectual and spiritual thought as seen in the writings of outstanding authors from the eighteenth century to the contemporary period. In particular the essayists: Feijóo, Cadalso, Jovellanos, Larra, Menendez y Pelayo, Giner de los Rios, Ganivet, Unamuno, Ortega y Gasset, Menendez Pidal and Américo Castro. *(Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1972-73.* Hutton

591 Introduction to Research and Criticism *I, 3*
Introduction to scholarly research and literary criticism. Required as the first course for all candidates for the M.A. in Spanish. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Hutton

592 The Mystics and Mysticism *II, 3*
Significance of spiritual values in Spanish literature and, in particular, the phenomenon of mysticism and its literary productivity; critical study of the principal mystics and their works. *(Lec. 3) Prerequisite: graduate status or permission of instructor. In alternate years, next offered 1971-72.* Hutton

594 Seminar in Spanish Literature *I and II, 3*
Research and analysis of a particular author or problem of Spanish or Hispanic-American literature. *(Lec. 3) Prerequisite: graduate status or permission of instructor.* Staff

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

SPEECH (SPE)

CHAIRMAN: Professor Toubbeh. Professors Beaupre and Doody; Associate Professor FitzSimons; Assistant Professors J. L. Anderson, Bailey, Devlin and Grzebien; Instructors Brownell, Caldwell, Loxley, and Roth.

101 Fundamentals of Oral Communication *I and II, 3*
Development and integration of skills and attitudes essential to effective and responsible participation in typical communication situations. Emphasis on clear diction, proper use of voice, reading aloud, and the fundamentals of speech organization and presentation. Students demonstrating initial proficiency may petition for alternate placement beyond the fundamentals level. *(Lec. 3)* Staff

102 Public Speaking *II, 3*
Adaptation of traditional rhetorical doctrines to contemporary speaking situations: informative, persuasive, and special occasion. Practice in the preparation and delivery of impromptu, extemporaneous, and manuscript speeches. *(Lec. 3) Prerequisite: permission of instructor.* Staff

105 Parliamentary Procedures *I, 2*
Those rules governing the conduct of a meeting. The drafting of a constitution and by-laws for local organization. *(Lec. 2)* Roth

111 Principles of Voice and Diction *I and II, 3*
Characteristics of good speech: correct phrasing, intonation and stress patterns, clear and pleasant voice quality, distinct and acceptable pronunciation. Attention given to elimination of minor voice and speech problems. *(Lec. 2, Lab. 2) Prerequisite: departmental examination to be given one week prior to first day of registration.* Staff

112 Voice and Diction for the Theatre Major *I and II, 3*
Principles and esthetics of voice for the stage. Functioning of the vocal mechanism, vocal and articulation techniques, breath control, expressiveness and vocal variety, projection; tension control, posture, spatial relationships, dialects, accents. Practice sessions for reinforcement of theory. *(Lec. 3) Prerequisite: theatre major or permission of instructor.* Caldwell

210 Elements of Persuasion *I, 3*
Analysis of logical, emotional and ethical appeals in persuasive speaking. Study and practice of factors motivating audience belief and acceptance of speaker's ideas. *(Lec. 3) Prerequisite: permission of department.* Bailey

215 Argumentation and Debate *I, 3*
Argumentative speech, with special emphasis on debate. Analysis of the proposition, construction of a case, use of evidence and reasoning, rebuttal and the technique of brief-drawing. Analysis of important economic and political questions. *(Lec. 3)* Devlin

216 Intercollegiate Debating *I and II, 1 each*
Intercollegiate tournament debating. Open to those students who are actively engaged in the intercollegiate debate and forensics program. May be repeated for a maximum of 4 credits. *Prerequisite: permission of the director of forensics.* Devlin

220 Group Discussion *II, 3*
Conference, symposium, panel and open-forum variants of group discussion in contexts of exploratory, policy-making, and problem-solving situations. Emphasis on analysis and consensual resolution of significant contemporary problems. *(Lec. 3) Prerequisite: permission of department.* Devlin

231 Oral Interpretation of Literature *I and II, 3*
Recognition and appreciation of content and communication of thought and emotion through oral reading. Practice in the analysis and interpretation of poetry, prose and drama. *(Lec. 3) Prerequisite: permission of department.* Caldwell

260 Speech Development and Correction *I and II, 3*
Normal development of human speech, causes of

speech and hearing disorders and techniques of speech and hearing rehabilitation. For those in teaching, nursing, guidance, psychology and education of the physically handicapped and mentally retarded. *(Lec. 3) Prerequisite: SPE 111 or permission of instructor.* FitzSimons

261 Survey of Hearing and Deafness *I and II, 3*
Introduction to the science of audiology. Study of pathologies of the hearing mechanism, basic methods of audiometry, interpretation of the audiogram, hearing aids, and rationale and methods in hearing conservation programs. Observations and practice in the Rhode Island Hospital Hearing and Speech Center. *Prerequisite: permission of instructor.* Staff

310 Contemporary Oral Communication *I, 3*
Analysis of contemporary rhetorical theories as they relate to speaking in the fields of business, civil rights, education, government, labor, law and religion. Each semester the course will focus on a critical contemporary issue. *(Lec. 3)* Staff

320 Oral Communication for Management *II, 3*
Oral communication for management personnel as individual speakers or leaders and participants in conference groups. Corporate oral communication, oral interaction leading toward decisions in group situations, and manuscript and extemporaneous speaking. *(Lec. 3) Prerequisite: SPE 111 and permission of department.* Staff

331 Contemporary Approaches to Prose Fiction *I, 3*
Oral interpretation of prose fiction with emphasis on the short story and the novel. Contemporary approaches to the oral study of literature such as dramatistic and rhetorical analyses and an introduction to Chamber Theater. *(Lec. 3) Prerequisite: SPE 231 or permission of department.* Staff

332 Oral Interpretation of Poetry *II, 3*
Practice in the oral interpretation of poetry through oral performance and written analysis. Emphasis on British and American poets. *(Lec. 3) Prerequisite: SPE 231 or permission of department.* Staff

372 Auditory and Speech Mechanisms *II, 3*
Structure and function of the organs of hearing and speech as they relate to normal and pathological communication; theories of cortical involvements, central and peripheral nervous systems relevant to rehabilitation procedures. *(Lec. 3) Prerequisite: junior standing and permission of department.* Staff

373 Phonetics *I, 3*
International Phonetic Alphabet; analysis of phonetic and phonemic elements in major American English dialects; practice in transcription of standard and defective speech. *(Lec. 3) Prerequisite: junior standing.* Beaupre and Staff

374 Communication Processes *II, 3*
Psychocommunication processes basic to speech; theories of language learning; psychology of hearing and deafness; interrelationships between speech and personality. *(Lec. 3) Prerequisite: junior standing.* Beaupre

375 Language Development *I, 3*
Developmental phenomena in speech and language; causal factors of delayed speech and language; survey of evaluative and habilitative programs for children with deviant language development. *(Lec. 3) Prerequisite: junior standing.* FitzSimons

400 Rhetoric *I, 3*
Inquiry into the standards for the evaluation and improvement of instrumental discourse. Detailed considerations of invention, disposition and style in oral and written communication. *(Lec. 3) Prerequisite: permission of department.* Bailey

410 Semantics *II, 3*
Role of language and other symbol systems in thought and communication behavior. Informative, valuative, incitive, and systematic uses of signs: the linguistic bases of productive and pathological communicative behavior. *(Lec. 3) Prerequisite: permission of department.* Bailey

491, 492 Special Problems *I and II, 1-3 each*
Selected areas of study pertinent to oral communication. Instruction may be offered in class, seminar, or tutorial environments according to specific needs and purposes. *Prerequisite: permission of department.* Staff

504 Speech and Hearing Research *I and II, 3*
Types of research in speech pathology, audiology, and communication science; critiques of representative models with special emphasis on experimental research; individual pilot projects or masters thesis. *(Lec. 3) Prerequisite: admission to graduate programs in speech.* Beaupre, Doody, and Staff

551 Measurement of Hearing *I, 2-3*
History of hearing evaluation techniques; methods and practicum in basic audiological assessment; types of hearing losses and their implications for rehabilitation. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Staff

552 Advanced Measurement of Hearing *II, 2-3*
Speech audiometry; recruitment phenomena; functional hearing losses; education and rehabilitation problems associated with electronically assisted hearing. *(Lec. 2, Lab. 3) Prerequisite: SPE 551 or equivalent.* Staff

553 Pedoaudiology *I, 2-3*
Hearing evaluation problems associated with infants and preschool children; instrumentation and procedures; behavioral characteristics of hearing-impaired children. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Staff

554 Auditory Training and Speechreading *II, 2-3*
Rationale and techniques for auditory training programs; speechreading as a communication system; evaluation of methodologies for developing speech-

reading skills; practicum with children and adults. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Staff

555 Electronically Assisted Hearing *I, 2-3*
Principles of selective amplification and acoustical control; evaluation of various devices including wearable hearing aids; methods of instruction in the use of acoustical instruments. *(Lec. 2, Lab. 3) Prerequisite: SPE 551.* Staff

556 Automatic Audiometry *II, 2-3*
Bekesy principle; continuous, discrete, and pulsetone measurements; diagnostic implications of various type tracings; research findings and current issues; practicum. *(Lec. 2, Lab. 3) Prerequisite: SPE 552 and permission of department.* Staff

561 Disorders of Articulation *I, 2-3*
Types and causes of articulation disorders; rationale for case selection; S-R-L syndrome; special emphasis on rehabilitation procedures associated with individual involvements; practicum. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Staff

562 Disorders of Voice *I, 2-3*
Types and causes of voice disorders; rationale for case selection; medical implications; special emphasis on rehabilitation procedures associated with individual involvements; practicum. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Beaupre

563 Disorders of Rate and Rhythm *II, 2-3*
Types and causes of rate, rhythm and stress disorders; rationale for case selection; survey of stuttering theories, special emphasis on rehabilitation procedures associated with individual involvements; practicum. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* FitzSimons

564 Disorders of Symbolization *II, 2-3*
Types and causes of language symbolization disorders; rationale for case selection; childhood aphasia and autism; special emphasis on rehabilitation procedures associated with individual involvements; practicum. *(Lec. 2, Lab. 3) Prerequisite: senior standing and SPE 260.* Staff

565 Diagnostic Procedures: Voice and Articulation *I, 2-3*
Instrumentation, tests, and procedures for evaluating individuals with voice and articulation disorders; practicum in speech and hearing centers; principles of differential diagnosis and report writing. *(Lec. 2, Lab. 3) Prerequisite: senior standing and permission of department.* Staff

566 Diagnostic Procedures: Rhythm and Symbolization *II, 2-3*
Instrumentation, tests, and procedures for evaluating individuals with disorders of rate, rhythm and symbolization; problems in differential diagnosis; practicum in speech and hearing centers. *(Lec. 2, Lab. 3) Prerequisite: senior standing and permission of department.* Staff

567, 568 Clinical Practicum in Speech and Hearing *I and II, 1-3 each*
Practice in diagnosis and therapy of disorders of speech and hearing. *(Lab. 2-6) Prerequisite: graduate status and permission of instructor.* Staff

571 Audiometric Screening and Surveying Techniques *I, 3*
Rationale, instrumentation, and techniques for selecting and administering group and individual screening tests; records and interpretations; current research and professional issues. *(Lec. 3) Prerequisite: admission to graduate program in audiology.* Staff

572 Medical Audiology *II, 3*
Diagnostic implications of audiometry for various organic disorders; supportive audiological information relevant to medical and surgical interventions; differential data associated with otosclerosis, Meniere's disease, VIIIth cranial nerve tumors, and malingering. *(Lec. 3) Prerequisite: admission to graduate program in audiology.* Staff

573 Contemporary Problems in Audiology *I, 3*
Critical review of current research and controversial issues within the profession; student selects one topic for independent study. *(Lec. 3) Prerequisite: admission to graduate program in audiology and permission of department.* Staff

574 Environmental Audiology *II, 3*
Hearing problems in industry, in the military, and other high noise level environments; medico-legal aspects of hearing loss; hearing conservation programs in public schools. *(Lec. 3) Prerequisite: admission to graduate program in audiology and permission of department.* Staff

575 Speech and Language for Deaf or Hard of Hearing Child *I, 3*
The audiologist as hearing therapist in public school settings, medical clinics, and pre-school programs; responsibilities as part of the educational, psychological and medical team for active intervention with speech and language problems. *(Lec. 3) Prerequisite: admission to the graduate program in audiology and permission of department.* Staff

576 Speech and Language for Deaf or Hard of Hearing Adult *II, 3*
The audiologist as hearing therapist and consultant for adults with agenerative or degenerative hearing deficits; responsibilities as part of the rehabilitation team for active intervention with speech and language problems. *(Lec. 3) Prerequisite: admission to graduate program in audiology and permission of department.* Beaupre

581 Cerebral Palsy *I, 3*
Identification of types of cerebral palsy by location of lesion, motor symptomatology and additional handicaps; role of the speech clinician on the team; types

of speech therapy with emphasis on the Bobath approach; current research and controversial issues. *(Lec. 3) Prerequisite: admission to graduate program in speech pathology.* Staff

582 Stuttering and Cluttering *II, 3*
Analysis of the various etiological theories of stuttering and tachyphemia; techniques and implications of the several therapies; developing a rationale for intervention and case selection. *(Lec. 3) Prerequisite: admission to graduate program in speech pathology.* FitzSimons

583 Cleft Palate and Other Orafacial Deformities *I, 3*
Relationship of prosthetic, surgical, and orthodontic intervention to speech rehabilitation; role of speech clinician on the cleft palate team; assessment of therapeutic approaches; current research and controversial issues. *(Lec. 3) Prerequisite: admission to the graduate program in speech pathology and permission of department.* Staff

584 Delayed Speech and Language *II, 3*
Problems in differential diagnosis for deafness, aphasia, autism, and learning disorders; demonstrations and critiques of clinical interventions with children who have speech and language learning deficits including dyslexia and acalculia. *(Lec. 3) Prerequisite: admission to the graduate program in speech pathology.* FitzSimons

585 Aphasia and Allied Language Disorders *I, 3*
Types of adult aphasia; central and peripheral dysarthrias; role of speech clinician on the rehabilitation team; other degenerative disorders such as Parkinsonism and dystonia; current research and controversial issues. *(Lec. 3) Prerequisite: admission to graduate program in speech pathology and permission of department.* Staff

586 Alaryngeal Speech *II, 3*
Voice and speech rehabilitation for individual without a functional larynx; social, emotional and medical considerations; clinical procedures for esophageal, pharyngeal and buccal speech; implications for use of artificial larynx; current research. *(Lec. 3) Prerequisite: admission to graduate program in speech pathology.* Beaupre

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

STATISTICS

Business Statistics (Organizational Management and Industrial Relations)
201, 202 Business Statistics
375 Bayesian Statistics in Business
501, 502 Design and Analysis of Experiments
981 Fundamental Business Statistics

Experimental Statistics (Computer Science and Experimental Statistics)
411 Statistical Methods in Research I
412 Statistical Methods in Research II
500 Nonparametric Statistical Methods
511 Linear Statistical Models
520 Fundamentals of Sampling and Applications
532 (or ASC 532) Experimental Design
541 Multivariate Statistical Methods
576 (or ECN 576, REN 576) Econometrics I
577 (or ECN 577, REN 577) Econometrics II
591, 592 Problems in Experimental Statistics
610 (or PSY 610) Factor Analysis
635 (or IDE 635) Response Surfaces and Evolutionary Operations

Industrial Engineering
411 Engineering Statistics I
412 Engineering Statistics II
633 Advanced Statistical Methods for Research and Industry
634 Design and Analysis of Industrial Experiments
635 (or EST 635) Response Surfaces and Evolutionary Operations

Mathematics
451 Introduction to Probability and Statistics
452 Mathematics Statistics
456 Probability
550 Advanced Probability
551 Advanced Mathematical Statistics I
552 Advanced Mathematical Statistics II

Psychology
210 Quantitative Methods in Psychology I
410 Quantitative Methods in Psychology II
510 Intermediate Quantitative Methods in Psychology
610 (or EST 610) Factor Analysis

TEXTILES AND CLOTHING (TXC)

CHAIRMAN: Professor V. V. Carpenter. Associate Professor Fry; Assistant Professors Harabin, Helms, James and Weeden; Instructors Avery and S. A. Thomas; Junior Assistant Dansie.

103 Consumer Problems in Textiles and Clothing *I and II, 3*
Consumer purchase, use, and care of clothing as related to aspects of sociology, psychology, economics, and physiology. Various physical tests of fabrics. *(Lec. 2, Rec. 1)* Staff

205 Introductory Clothing *I and II, 3*
Principles of clothing construction based upon interrelationship of fabric, pattern, and form. Aesthetic, economic and managerial aspects of selection. Application of quality standards to construction and ready-to-wear. *(Lec. 1, Lab. 4)* Staff

206 (HMG 330) Home Furnishings *I and II, 3*
Discussions and problems to develop discrimination and creative ability in selection of adequate and well-designed home furnishings. *(Lec. 3)* Fry

224 Clothing and Human Behavior *I and II, 3*
Consideration of clothing in relation to physiological, psychological, sociological and economic needs of family members. Projects in planning and selecting clothing. *(Lec. 3)* Weeden

238 Textile Design *I and II, 3*
Nature, origin, and development of handicraft methods of applying design to textiles, stressing modern applications and utilization of craft techniques. Laboratory experimentation with original creations in various media. *(Lec. 1, Lab. 4)* James

303 General Textiles *I and II, 3*
Current textiles and textile products. Emphasis on fabrication which includes fibers, yarns, fabrics and finishes. Field trips. *(Lec. 2, Lab. 2) Prerequisite: TXC 103 or permission of instructor.* Thomas

305 Intermediate Clothing *I and II, 3*
Flat pattern designing with emphasis upon relationship of flat pattern principles to fit. Application of principles in modifying and executing a design. *(Lec. 1, Lab. 4) Prerequisite: TXC 205 or Placement Test satisfactorily passed.* Staff

306 (HMG 335) Home Furnishings *I and II, 3*
Emphasis on laboratory experimentation with furnishings for the home. *(Lab. 6) Prerequisite: TXC 206.* Fry

322 Fashion Merchandising *I and II, 3*
Fashion as a social force—its influence on the ready-to-wear market, production, distribution, and consumption of clothing. Retailing of apparel goods studied. *(Lec. 2, Lab. 2)* Staff

327 Apparel Design *I and II, 3*
Principles of design as applied to contemporary costume with special emphasis on creative presentation. Laboratory work concentrated on original "croquis" and illustrative techniques. *(Lec. 1, Lab. 4) Prerequisite: TXC 205 or permission of instructor.* James

340 Historic Costume *I, 3*
Sociological, economic, religious, and political facets affecting the history of costume and resulting fashion changes: national and folk costumes. Use of department's historic costume collection. *(Lec. 3)* James

361, 362 Special Problems in Textiles and Clothing *I and II, 1-4*
Open to qualified juniors and seniors who wish to do advanced work including field work. Total credits not to exceed 6. *Prerequisite: permission of department.* Staff

390 Senior Seminar *I, 1*
Current professional trends, consideration of experiences in employment and opportunities for graduate study in textiles and clothing. *S/U credit.* Carpenter

403 Advanced Textiles *I and II, 3*
Analysis of fabrics; methods and techniques of testing fabrics; evaluation of fabric data in relation to end-use performance and to existing quality standards. *(Lec. 2, Lab. 2) Prerequisite: TXC 303.* Harabin and Thomas

405 Advanced Clothing *I and II, 3*
Application of design to dress expressed through draping techniques. Designs draped in fabrics on half and full-size dress forms. *(Lec. 1, Lab. 4) Prerequisite: TXC 305 or permission of instructor.* Weeden

406 (HMG 345) Housing Planning *I, 3*
Fundamental principles of house planning concerning orientation, space relationships, function, flexibility, aesthetic and economic factors. *(Lec. 2, Lab. 2) Prerequisite: HMG 340. In alternate years, next offered 1971-72.* Fry

424 Seminar in Textiles and Clothing *I and II, 3*
Literature in the field of textiles and clothing, review of research for textiles and clothing problems. *(Lec. 3)* Carpenter

433 Textiles and Clothing Industry *I and II, 3*
Development of production and distribution of textiles and clothing. Economic aspects of the textile and clothing industry. *(Lec. 3) Prerequisite: ECN 102 or 123 and TXC 103 or permission of instructor.* Harabin

440 Historic Textiles *I, 3*
Chronological study of the development of textiles, emphasizing socio-economic, religious, and political influences. Contributions of designers, inventors, trade groups, industrialists, and primitive cultures. *(Lec. 3) Prerequisite: TXC 103 or permission of department.* James

502 Seminar in Textiles and Clothing *I and II, 3*
Original investigations in the area of clothing problem. *(Lec. 3)* Carpenter

533 Textile and Clothing Economics *I and II, 3*
The economic development of production and distribution of textiles and clothing. *(Lec. 3)* Staff

540 Special Problems in Textiles and Clothing *I and II, 3*
Supervised independent study in specific areas of textiles and clothing. Staff

550 Seminar and Practicum *I and II, 3*
Professional role of the textiles and clothing specialist. *Prerequisite: permission of department.* Staff

560 Special Problems in Textiles and Clothing *I and II, 3*
Supervised independent study in specific areas of textiles and clothing. Staff

570 Seminar in Textiles and Clothing Research *I and II, 3*
Critical study of research literature and research techniques. *Prerequisite: permission of department.* Staff

580 Research Methods in Textiles and Clothing *I and II, 3*
Development and execution of research in textiles and clothing following the historical, descriptive, and experimental methods. Analysis of current research in the field. *(Lec. 2, Lab. 2)* Carpenter

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

THEATRE (THE)

CHAIRMAN: Associate Professor Ranelli. Professor Will; Assistant Professors Emery, Hippley, Smoker, Spanabel and Wheelock; Special Instructors Creasley, Shields and Swift.

100 Introduction to Theatre *I and II, 3*
Designed to stimulate a taste for theatre, improve standards of critical judgment, consider theatre's relation to allied arts and provide an understanding of the part it plays in the development of civilization. *(Lec. 2, Rec. 1) Not open to theatre majors.* Staff

101 Introduction to Theatre *I, 3*
Basic elements of theater and dramatic production. *(Lec. 3) Prerequisite: open to theatre majors only.* Staff

The following courses in Theatre Practice offer production and performance training in various areas of dramatic arts. They may be elected concurrently with related theatre courses, or independently. See course descriptions for maximum number of credits which may be elected in each.

110 Introduction to Acting *I and II, 2*
An introductory course for non-theatre majors with an interest in acting. *(Studio 4)* Staff

111 Fundamentals of Acting *I, 3*
Introduction to the basics of and creation of character and emotions; fundamental rehearsal procedures, stage terminology, and the actor-director relationship. *(Studio 6) Theatre majors only.* Smoker

112 Fundamentals of Acting *II, 3*
Development of the technique approach to characterization, the Stanislavski creation of honest emotion, discipline of body movement, and integration of these through improvisation. *(Studio 6) Prerequisite: THE 111.* Smoker

151 Makeup *I and II, 2*
Principles and techniques of stage makeup. Practical experience in the studio and crew work for studio and major productions. *(Studio 4) Prerequisite: permission of instructor.* Spanabel

161 Stagecraft *I and II, 3*
Scenic design, stage carpentry, painting and lighting. Practical experience in mounting at least one play for public experience. *(Lec. 2, Lab. 2)* Staff

200 Technical Theatre Practices *I and II, 1*
Experience in actual production preparation and performance through specific project assignments in connection with current productions. Areas include: costumes, scenery, properties, lighting, and sound. *(Studio 3) Prerequisite: written permission of appropriate instructor in the area involved. (Max. 4 credits.)* Staff

211 Intermediate Acting I *I, 3*
Improvisation/scene study. Roles chosen to parallel actor's age, type, values. Emphasis on bridging the gap between exercise/improvisation and a preconceived script. *(Studio 6) Prerequisite: THE 111, 112 and permission of instructor.* Staff

212 Intermediate Acting II *II, 3*
Continued scene study chosen from the modern realistic period. Problems of characterization emphasized. *(Studio 6) Prerequisite: THE 111, 112, 211 and permission of instructor.* Staff

215 Movement and Mime *I and II, 2*
Exercises to free the body and develop it for meaningful stage movement; discipline of the body to communicate feeling and character without words. *(Studio 4) Prerequisite: permission of instructor.* Staff

221 Stage Management/Directing Workshop *I and II, 2*
Introduction to stage management and directing. Students will work closely with staff directors and stage managers. *(Studio 4) Prerequisite: permission of staff. (Max. 4 credits.)* Staff

250 Costuming *I and II, 2*
Principles of costume construction. Practical experience in building costumes for studio and major productions. *(Studio 4) Prerequisite: permission of instructor.* Spanabel

251 Advanced Stage Makeup *II, 1*
Advanced techniques in theatrical makeup with emphasis on character delineations and special effects. *(Lab. 2) Prerequisite: THE 151.* Spanabel

265 Theatre Graphics *II, 2*
Methods and procedures of reading and execution of the specialized descriptive and informational drawings required for theatrical production. *(Lab. 4) Prerequisite: THE 161.* Emery

281 (201) Principles of Theatre *II, 3*
Approaches to theatre concepts are studied in relation to their influence on theatre practice. The following areas are emphasized: the dramatic composition, acting, directing, design. *(Lec. 3) Prerequisite: THE 100 or 101.* Staff

305 (or EDC 305) Fundamentals of Theatre Practices *II, 3*
Introduces the potential secondary school teacher of dramatics and those expecting to work in community theatre to the problems of play selection; stagecraft, scene design, and lighting; theatre management; and

other problems of production in the non-professional theatre. *(Lec. 3) Prerequisite: permission of department. May not be used for credit toward a major in theatre.* Staff

311 Advanced Acting *I, 3*
Scene study. Problems of style, ensemble choral work, Shakespeare, and Restoration. Style considered as symbolic action. *(Studio 6) Prerequisite: THE 111, 112, 211, 212 and permission of instructor.* Wheelock

312 Advanced Acting *II, 3*
Continued scene study in style. Avant-garde ensemble techniques, style of the non-English theatre. Style of the non-verbal theatre. *(Studio 6) Prerequisite: THE 111, 112, 211, 212, 311 and permission of instructor.* Wheelock

321 Directing *I, 3*
Director's part in the creative processes of theatre Techniques, procedures, and solution of problems in directing, from analysis of script to performance. *(Lec. 3) Prerequisite: THE 201 or equivalent.* Staff

322 Advanced Directing *II, 3*
Continuation of THE 321 with emphasis on particular problems of the director in rehearsal and production situations. *(Lec. 2, Studio 2) Prerequisite: THE 321.* Staff

331 Playwriting *I, 3*
Analysis and evaluation of written material supplemented by play readings and workshop tryouts of student plays. *(Lec. 3) Prerequisite: permission of instructor. Open only to students who can demonstrate an aptitude for creative composition and a genuine interest in the theatre.* Staff

341 Theatre Management *I and II, 2*
Analysis of the economics of theatre, promotion techniques, union regulations, laws of literary property, philanthropy, and producing aspects of theatre. *(Lec. 1, Lab. 2) Prerequisite: permission of instructor.* Smoker

351 Principles and Theories of Theatrical Costuming I *I, 3*
Analytical study of fashions, modes and manners in western civilization as required for modern theatrical production, Greek through the Renaissance. *(Lec. 3) Prerequisite: junior standing or permission of instructor.* Spanabel

352 Principles and Theories of Theatrical Costuming II *II, 3*
Continuation of THE 351, the Renaissance to the present. *(Lec. 3) Prerequisite: THE 351 or permission of instructor.* Spanabel

361 Theatre Technology *II, 3*
Theatre architectural forms and their influence on production. Details of mechanical staging systems, the shop as a production unit, modern technological materials and processes. *(Lec. 2, Lab. 2) Prerequisite: THE 161.* Staff

365 Scenic Design I *I, 3*
Theories and techniques of scenic design, emphasizing conceptualization and development of stage setting through project designs for various stage forms, production styles, and periods. *(Lec. 2, Lab. 2) Prerequisite: THE 161 and 265 or equivalent.* Emery

366 Scenic Design II *II, 3*
Application of scenic design theories and techniques to modern staging, emphasizing differing production types and styles, new stage forms, and non-traditional materials. *(Lec. 2, Lab. 2) Prerequisite: THE 365.* Emery

371 Stage Lighting I *I, 3*
Theories and techniques of lighting for the stage with concentration on instrumentation and equipment characteristics and their uses in designed lighting for theatrical productions. *(Lec. 2, Lab. 2) Prerequisite: THE 161 and 265 or equivalent.* Staff

372 Stage Lighting II *II, 3*
Theatrical lighting design practices, creation of special effects, and in-depth study of stage lighting equipment and materials. *(Lec. 2, Lab. 2) Prerequisite: THE 371.* Staff

381 History of Theatre through the Eighteenth Century *I, 3*
Development of the theatre from its origins through the neo-classical movement including its people, technical elements, theories and styles of productions. *(Lec. 3) Prerequisite: junior or senior standing.* Will

382 History of Theatre since the Eighteenth Century *II, 3*
Development of the modern theatre from the revolt against neo-classicism to post-World War II. Particular emphasis on the new European stagecraft and the contributions of Duke George, Antoine, Appia, Craig and Stanislavski. *(Lec. 3) Prerequisite: junior or senior standing.* Will

400 Individual Problems in Theatre Studies *I and II, 1-3*
Advanced individual theatre work of an approved project under supervision of a staff member. *Prerequisite: permission of staff. (Max. 3 credits.) Not for graduate degree program credit.* Staff

401 Special Group Studies *I and II, 1-3*
Advanced group theatre work in production projects under approval and supervision of a staff member. *Prerequisite: permission of staff. (Max. 3 credits.) Not for graduate degree program credit.* Staff

410 Advanced Acting *I and II, 1-3*
Special projects for the advanced student capable of stage involvement, character development, stage discipline. Assigned projects to meet specific acting prob-

lems; supervision by staff and/or advanced student directors. *(Studio 2-6) Prerequisite: THE 111, 112, 211, 212, 311, 312 or equivalent. Senior standing and permission of department.* Staff

420 Advanced Directing Practice *I and II, 1-3*
Special projects for the advanced directing student. Student directors will assume complete production responsibilities for all aspects of their projects, including a critical analysis upon completion. *(Studio 2-6) Prerequisite: THE 321, 322 or equivalent, junior standing, and permission of department.* Staff

440 Advanced Stage Management *I and II, 1-3*
Individual projects of stage management in at least one major production. *(Studio 2-6) Prerequisite: THE 221 and permission of department.* Staff

450 Advanced Costuming *I and II, 1-3*
Individual projects in costume design for studio or major productions. Styles and theory related to projects; costume sketches and construction. *(Studio 2-6) Prerequisite: THE 250, 351, 352 and permission of instructor.* Spanabel

451 Stage Costume Technology *I, 2*
Construction methods and techniques appropriate to stage costuming with emphasis on major theatrical periods and productions. *(Lec. 1, Lab. 2) Prerequisite: THE 351 or 352 and permission of instructor. Not for graduate degree program credit.* Spanabel

460 Advanced Scene Design *I and II, 1-3*
Individual projects in designing scenery for studio and major productions. *(Studio 2-6) Prerequisite: THE 161, 365, and permission of instructor.* Emery

470 Advanced Stage Lighting *I and II, 1-3*
Individual projects in lighting design and control for studio and major productions. *(Studio 2-6) Prerequisite: THE 371, 372 and permission of department.* Staff

481 American Theatre History *I, 3*
Origins and development of American theatre from the wilderness to Broadway of 1940's, including the evolution of the musical play. Analysis of special contributions made by the grassroots movement, the university theatres, the Federal Theatre Project. *(Lec. 3) Not for graduate degree program credit.* Will

482 Contemporary Theatre *I, 3*
Theatre practices since World War II. Analysis of present conditions in the areas of playwriting, direction, design, architecture, and business. *(Lec. 3)* Wheelock

ZOOLOGY (ZOO)

CHAIRMAN: Professor Chipman. Professors Crenshaw, DeWolf, Hammen, R. W. Harrison, K. E. Hyland, Saila, Winn and Zinn; Associate Professors Goertemiller, Hill, Mathewson and Shoop; Assistant Professors Bischoff, Cobb, Heppner and Krueger; Special Instructor Doolittle; Adjunct Professors Bass, Carriker, Dowling, Gibbs, Hutchison, LaRoche, Roderick and Schaefer.

111 General Zoology *I and II, 4*
Physiology, development, genetics, ecology and study of types of animals, with emphasis on evolution. Introduction to further studies in zoology for both potential professional and non-professional students. *(Lec. 3, Lab. 2) Not open to students who have passed BIO 102.* Staff

121 Human Anatomy *I, 4*
Elementary anatomy of the organ systems, studied with the aid of charts, models and dissection of the cat. *(Lec. 2, Lab. 4) Limited to students in Physical Education, Dental Hygiene, Nursing, and Ventilation Therapy.* DeWolf

142 Introduction to Human Physiology *II, 3*
General elementary study. Mechanisms of physiological processes are illustrated by experiments on vertebrate animals. *(Lec. 2, Lab. 3) Limited to students in Physical Education, Dental Hygiene, Nursing, Home Economics, Medical Technology, and Ventilation Therapy. Prerequisite: ZOO 111, 121, or BIO 102.* Harrison

143 Physiology of Muscular Activity *I, 3*
Human physiology with emphasis on muscular activity and associated phenomena. Mechanisms by which muscular contractions are elicited and coordinated. Particular attention to adjustments of the circulatory and respiratory systems during muscular exercise. *(Lec. 2, Lab. 3) Prerequisite: ZOO 142.* Harrison

210 Histology *II, 4*
Detailed study of the structure and function of normal vertebrate tissues, and an introduction to modern histologic technique including histochemistry, autoradiography and electron microscopy. *(Lec. 3, Lab. 3) Prerequisite: ZOO 111 or BIO 102 and CHM 112, 114. In alternate years, next offered 1971-72.* Goertemiller

262 (or BOT 262) Introductory Ecology *I, 3*
Structure and function of ecosystems; limiting factors; population dynamics; population interactions and community relationships. Selected habitats and general ecological effects of man. *(Lec. 3) Prerequisite: two semesters of biology, botany or zoology, or any combination thereof.* Shoop and Halvorson

311 Animal Micrology *I, 3*
Preparation of histological, cytological, embryological and parasitological material for microscopic study. Plastics are briefly considered. Occasional field trips to representative institutions. *(Lab. 6) Prerequisite: ZOO 111 or BIO 102.* Zinn

313 Embryology *I, 4*
Comparative analysis of animal development with emphasis on frog, bird, and mammal, and selected inver-

tebrate forms. Morphological and chemical aspects of development are considered and classical theories introduced. *(Lec. 3, Lab. 3) Prerequisite: ZOO 111 or BIO 102 and CHM 112, 114.* Goertemiller

316 (216) Comparative Anatomy of Vertebrates *II, 5*
Brief taxonomical consideration of the Phylum Chordata followed by a comparative anatomical study of the body form, integument, skeleton, muscles and organ systems in the various vertebrate classes. *(Lec. 2, Lab. 8) Prerequisite: ZOO 111 or BIO 102.* DeWolf

331 Parasitology *I, 3*
Structure, life cycles, ecology and economic relationships of the parasitic protozoa, helminths and arthropods. Origin and biological significance of parasitism and host-parasite relationships are stressed. Laboratory encompasses experimental work on life cycles of selected species, and on collection and identification of local parasitic forms including those from the marine fauna. *(Lec. 2, Lab. 3) Prerequisite: ZOO 111 or BIO 102.* Hyland

345 Basic Animal Physiology *I, 3*
Fundamental physiological processes of animals with emphasis on homeostatic mechanisms. Nature of osmosis, membranes, water and electrolyte balance, irritability and the functioning of selected organ systems. *(Lec. 2, Lab. 3) Prerequisite: ZOO 111 or BIO 102.* Hill

354 Invertebrate Zoology *II, 4*
Representative types of invertebrate animals, laboratory dissections, observations and experiments. Occasional field trips. Lectures emphasizing progressive specialization of structure and function. *(Lec. 2, Lab. 6) Prerequisite: ZOO 111 or BIO 102.* Zinn

381 (481) General Entomology *I, 3*
Anatomy, physiology, life cycles, classification of orders and the more important families and species of insects. Field studies on biology, ecology, collecting and survey methods. *(Lec. 1, Lab. 4) Prerequisite: ZOO 111 or BIO 102.* Mathewson

391, 392 Assigned Work *I and II, 1-3 each*
Special arrangements for undergraduates for advanced work in anatomy, endocrinology, physiology, histology, embryology, entomology, taxonomy, ecology, marine biology and certain related subjects. Individual or group work by arrangement with a member of the staff and with permission of the chairman. *(Lec. 1-3 or Lab. 2-6)* Staff

395, 396 Seminar in Zoology *I and II, 2 each*
Introduction to sources of zoological literature. Presentation of reports of scientific papers by students, with discussion by the class. *(Lec. 1) Required of seniors majoring in zoology. Attendance is required at weekly Department of Zoology colloquiums.* Staff

418 Experimental Embryology *II, 3*
Comprehensive study of unsolved problems in embryogenesis. Laboratory techniques in the experimental analysis of development with opportunity for individual projects. *(Lec. 1, Lab. 6) Prerequisite: ZOO 313 or equivalent and permission of instructor. In alternate years, next offered 1972-73.* Goertemiller

421 Principles of Taxonomy *I, 3*
Principles and methods of identification, including study of rules of zoological nomenclature. Practice on selected animal groups. Visits to representative museums in New England. *(Lec. 2, Lab. 3) Prerequisite: ZOO 111 or BIO 102. In alternate years, next offered 1972-73.* Zinn

441 General (Cellular) Physiology *I, 3*
Fundamental processes occurring in living matter, especially functions at the cellular level with emphasis on biochemical and biophysical bases of functions common to all forms of life. Nature of protoplasm, enzymes, respiration, biological oxidations, nutrition, permeability and water balance, irritability, muscle, nervous and humoral mediation. *(Lec. 2, Lab. 3) Prerequisite: BOT 111, ZOO 111, PHY 111, or equivalents.* Hammen

442 Mammalian Physiology *II, 3*
Intensive study of the physiological mechanisms that regulate the animal body and its organ systems. Emphasis on knowledge obtained from experimental mammalian and human physiology. Laboratory experiments on vertebrate animals. *(Lec. 2, Lab. 3) Prerequisite: ZOO 345.* Hill

463 Animal Ecology *II, 3*
Roles of animals in the structure and function of ecosystems. The adaptations of animals to their environments and the effects of limiting factors. Analysis of animal populations and communities. Use of statistical techniques. Readings in primary source materials, laboratory and field studies. *(Lec. 2, Lab. 3) Prerequisite: BOT 262 or ZOO 262 or permission of instructor.* Shoop

465 Limnology *I, 3*
Physical and chemical properties of natural waters, such as thermal stratification and dissolved gases, in relation to biotic communities in the aquatic environment. Survey of fauna and flora of standing and running water. Introduction to concept of productivity. *(Lec. 3) Prerequisite: ZOO 111.* Cobb

466 Vertebrate Biology *II, 3*
Life histories, adaptations, ecology, classification, and distribution of vertebrate animals. Laboratory and extensive field work on local vertebrates. *(Lec. 2, Lab. 3) Prerequisite: ZOO 216 or equivalent.* Heppner

467 Animal Behavior *II, 3*
The ethology and comparative psychology of both invertebrate and vertebrate animals as individuals and groups. The integration, causation, development, evolution, and adaptive values of behavior patterns. Social behavior. *(Lec. 2, Lab. 3) Prerequisite: ZOO 111 and junior standing.* Cobb

468 Mammalogy *II, 3*
Characteristics and adaptive significance of mammals encompassing their evolution, classification, distribution, life-histories, population dynamics and behavior. Methods and techniques of the identification, collection and preparation of local mammals for study. Field work will be emphasized. *(Lec. 2, Lab. 3) Prerequisite: ZOO 216 and 466 or equivalent. In alternate years, next offered 1972-73.* Staff

471 Evolution *I, 3*
Consideration of the process of organic evolution, the genetic mechanisms, including the interaction of genotype and environment, the history of evolutionary thought, the paleontological record and the biochemical origin of life. *(Lec. 3) Prerequisite: GEN 352 or permission of instructor.* Crenshaw

473 History of Biology *I, 3*
Historical development and interdependence of basic concepts of biology on allied fields in the natural sciences from pre-biblical times to the present. *(Lec. 3) Prerequisite: junior standing or permission of instructor. In alternate years, next offered 1971-72.* Zinn

477 Human Genetics *I, 3*
Degree and mode of inheritance of physical and mental variations of man which have shown to have at least some genetic basis. A term paper is required. *(Lec. 3) Prerequisite: BOT 352, or ZOO 472, or equivalent.* Bischoff

482 Systematic Entomology *I, 3*
Detailed study of insect classification with emphasis on identification of various groups and subgroups. Collecting techniques, curatorial processes and problems of an entomological collection. *(Lec. 1, Lab. 4) Prerequisite: ZOO 354 or 381 or graduate standing. In alternate years, next offered 1972-73.* Hyland

484 (or ELE 484) Modeling of Physiological Systems *II, 3*
Physiological study of selected systems and the development of dynamic models to describe their behavior. Lectures and laboratory projects are concerned primarily with the nervous system. Data collected from initial laboratory experiments with animals are used for later experiments with analog computer modeling. *(Lec. 2, Lab. 3) Prerequisite: MTH 141, ZOO 345. In alternate years, next offered 1971-72.* Hubbel

512 Fine Structure of the Animal Cell *II, 4*
Experimental evidence correlating the fine structure and function of cell organelles, including especially the plasma membrane, endoplasmic reticulum, mitochondria, ribosomes, centrioles, lysosomes and cilia. Introduction to instrumental and to cytochemical methods for study of each cell. Emphasis on the examination of electron micrographs. *(Lec. 3, Lab. 3) Prerequisite: ZOO 210 or permission of department. In alternate years, next offered 1972-73.* Goertemiller

531 Advanced Parasitology Seminar *I, 2*
Advanced topics in the host-parasite relationships of protozoan and metazoan parasites. Reading knowledge of one foreign language assumed. Topics vary from year to year. Ecology of the Helminth Fauna of Fishes Inhabiting New England Coastal Waters in 1971-72. *(Lec. 2) Prerequisite: ZOO 331 or equivalent. In alternate years, next offered 1971-72.* Hyland and Zinn

543 Biology of Reproduction in Animals *I, 3*
Aspects of reproduction in animals of different phyla. Hormonal interrelationships, environmental control and adaptive mechanisms. *(Lec. 2, Lab. 3) Prerequisite: ZOO 345 and 545. In alternate years, next offered 1972-73.* Chipman

544 Invertebrate Physiology *II, 3*
Life processes of invertebrate animals, including nutrition, metabolism, nitrogen excretion, respiratory pigments, mechanisms of locomotion, hormonal effects. *(Lec. 2, Lab. 2) Prerequisite: ZOO 354 and 441 or their equivalents.* Hammen

545 Endocrinology *I, 3*
Comparative anatomy, histology, embryology, physiology of the endocrine glands of vertebrates. Lectures, demonstrations, student reports. *(Lec. 3) Prerequisite: ZOO 216 and 313 or equivalent.* LaRoche

547 Comparative Physiology *I, 3*
Diverse adaptations by which animals of the different phyla meet the common problems of life processes. Emphasis on an evolutionary consideration of receptors, nervous systems, and effectors. Laboratory experiments on favorable invertebrate and lower vertebrate preparations. *(Lec. 2, Lab. 3) Prerequisite: ZOO 345.* Hill

548 Neurophysiology *II, 4*
Fundamental processes occurring in the nervous systems of invertebrates and vertebrates. Structure and functions of nervous elements with emphasis on integration and coordination of motor mechanisms. *(Lec. 3, Lab. 3) Prerequisite: ZOO 345, MTH 141 or equivalent, and permission of instructor. In alternate years, next offered 1972-73.* Staff

552 Pathology of Endocrine Functions *II, 3*
The anatomical, physiological, developmental and behavioral changes associated with disorders of hormone production in vertebrates, primarily in mammals. *(Lec. 3) Prerequisite: ZOO 545 or permission of instructor.* LaRoche

554 Seminar in Morphogenetic Theory *II, 2*
Recent investigations in developmental physiology, and the control of differentiation and development. Reference to original papers. *(Lec. 2) Prerequisite: ZOO 313 or equivalent, and permission of instructor. In alternate years with ZOO 418, next offered 1971-72.* Goertemiller

555 Seminar in Physiological Genetics *I, 3*
Consideration of the nature of the gene and its action in the development and physiological processes of the organism. *(Lec. 3) Prerequisite: BOT 352 or equivalent, basic knowledge of chemistry and biology, and permission of instructor. In alternate years, next offered 1971-72.* Crenshaw

562 Seminar in Behavioral Ecology *I, 1*
Special topics in the relationships between animal behavior and ecology, such as social organization of animals, evolution of behavior, competition and habitat selection. Discussion and presentation of individual reports. *(Lec. 1)* Staff

563 Ichthyology *I, 3*
Fishes of the world. Their structure, evolution, classification, ecology and physiology. Emphasis on local marine and freshwater fauna. Several field trips. *(Lec. 2, Lab. 3) Prerequisite: ZOO 216 and 466.* Krueger

576 Ecological Genetics *II, 4*
Analysis of the interactions between genotype and environment in natural and laboratory populations of animals, including selection and other mechanisms responsible for gene frequency change, the evolution of dominance, heterosis and speciation. *(Lec. 3, Lab. 3) Prerequisite: BOT 352 or permission of department.* Crenshaw

579 (or BOT 579 or GEN 579) Advanced Genetics Seminar *I and II, 1*
Current topics in genetics, including cytological, ecological, molecular, physiological, population, quantitative and radiation genetics. *(Lec. 1) Prerequisite: GEN 352 and permission of instructor.* Crenshaw and Mottinger

581 General Acarology *I, 3*
Detailed study of mites and ticks, their structure, life histories, and classification. Free-living forms as well as plant and animal feeders. *(Lab. 6) Prerequisite: ZOO 331 or 481 or 586, and permission of instructor. In alternate years, next offered 1971-72.* Hyland

586 Medical and Veterinary Entomology *II, 3*
Life histories, classifications, habits and control of insects and other arthropods which affect the health of man and animals. Duties of the entomologist on public health team, including field practice in methods of insect surveys, control measures and subsequent surveys to determine success of control measures. *(Lec. 1, Lab. 4) Prerequisite: ZOO 331 or 481 or equivalent. In alternate years, next offered 1971-72.* Hyland

595, 596 Graduate Seminar in Zoology *I and II, 1 each*
Consideration of philosophy and techniques of research and information presentation at the graduate level consisting of reports by students, critique and discussion by the class. *Required of entering graduate students in zoology. Prerequisite: graduate standing. S/U credit.* Chipman

599 Masters Thesis Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

640 to 645 Seminar in Physiology *I and II, 1-3 each*
Reports and discussions on topics of current research in physiology. Subject matter adapted to meet interests of staff and students. *(Lec. 1-3) Prerequisite: ZOO 345.* Hill and Staff

648, 649 Seminar in Environmental Physiology *I and II, 2 each*
Reading, library research, special lectures on topics of current research interest in environmental physiology. *(Lec. 2) Prerequisite: one year of physiology, and at least one course in ecology or permission of department.* Staff

664 Seminar in Ichthyology *II, 2*
Reading, library research, reports and class discussion on problems of current research interest in the biology of fishes. *(Lec. 2) Prerequisite: ZOO 563 or permission of department.* Krueger

666 Physiological Ecology *II, 3*
Comparative study of physiological adjustments which animals make in response to environmental factors, with emphasis on the physiological basis of animal distribution and evolution. *(Lec. 3) Prerequisite: one year of physiology and a course in ecology.* Staff

668 Laboratory in Physiological Ecology *II, 3*
Application of laboratory techniques to research problems in physiological ecology, such as energetics, gas exchange, thermoregulation and temperature tolerance, salt and water balance, and acclimatization to various environmental factors. Assigned research project on advanced level. *(Lab. 9) Prerequisite: ZOO 666 (may be taken concurrently with ZOO 666), and permission of department.* Staff

670 to 675 Advanced Ecology Seminars *I and II, 2 each*
Specialized and advanced areas of ecological research and theory, including zoogeography, pleistocene ecology, population dynamics, energy flow in ecosystems and radiation ecology. *Prerequisite: ZOO 463 and permission of department.* Shoop and Staff

691, 692 Assigned Work *I and II, 1-3 each*
Subject matter adapted to meet needs of student. May be arranged with any member of the staff, with the permission of the head of the department. *(Lec. 3 or Lab. 6)* Staff

693, 694 Zoological Problems *I and II, 1-3 each*
Special work to meet needs of individual students who are prepared to undertake special problems. *(Lec. 3 or Lab. 6)* Staff

699 Doctoral Dissertation Research *I and II*
Number of credits is determined each semester in consultation with the major professor or program committee.

Directories

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FRANK HOWARD, Ph.D., *Professor of Plant Pathology-Entomology, Emeritus*

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FRANK M. PELTON, Ph.D., *Professor of Education, Emeritus*

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EDSON SCHOCK, B.S., *Associate Professor of Mechanical Engineering, Emeritus*

GRACE BUSSING SHERRER, Ph.D., *Professor of English, Emerita*

WALTER LEE SIMMONS, Ph.D., *Professor of English, Emeritus*

JOHN B. SMITH, M.S., *Professor of Agricultural Chemistry, Emeritus*

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MARY CECILIA WHITLOCK, M.A., *Professor of Textiles and Clothing, Emerita*

CARL R. WOODWARD, Ph.D., Litt.D., D.Sc., LL.D., Ed.D., *President, Emeritus*

FACULTY

First date after title indicates appointment to present position; the second date, when the first fails to do so, indicates first appointment in the University.

WERNER A. BAUM, *President and Professor of Physics and Geography, 1971, 1968*
B.S., 1943; M.S., 1944; Ph.D., 1948, University of Chicago; Sc.D., 1971, Mount St. Joseph College.

PAUL IRVING ABELL, *Professor of Chemistry, 1964, 1951*
B.S., 1948, University of New Hampshire; Ph.D., 1951, University of Wisconsin.

WARD ABUSAMRA, *Associate Professor of Music, 1965, 1952*
B.S., 1950; M.A., 1951, Columbia University.

ELIE ABUSHANAB, *Assistant Professor of Medicinal Chemistry, 1970*
B.S., 1960, American University of Beirut; M.S., 1962; Ph.D., 1965, University of Wisconsin.

SARA P. ADAMS, *Instructor in English, 1969*
B.A., 1966; M.A., 1968, University of Rhode Island.

LUKE S. ALBERT, *Professor of Botany, 1970, 1960*
B.S., 1950, Lebanon Valley College; M.S., 1952; Ph.D., 1958, Rutgers—The State University.

LEWIS M. ALEXANDER, *Professor of Geography and Director, Law of the Sea Institute, 1960*
A.B., 1942, Middlebury College; M.A., 1948; Ph.D., 1949, Clark University.

ANTHONY J. ALLEN, *Assistant Professor of Education, 1969*
B.S., 1960, Loyola University; M.Ed., 1967; Ph.D., 1970, Boston College.

AARON JOHN ALTON, *Professor of Marketing Management, 1961*
A.B., 1942, Miami University (Ohio); M.B.A., 1947, Harvard Business School; Ph.D., 1956, Ohio State University.

WINSLOW AMES, *Associate Professor of Art, 1970, 1966*
B.A., 1929, Columbia University; M.A., 1930, Harvard University.

DAVID L. ANDERSON, *Assistant Professor of Journalism, 1969*
B.J., 1961, University of Missouri; M.A., 1969, University of Massachusetts.

JUDITH L. ANDERSON, *Assistant Professor of Speech, 1970*
B.A., 1962; M.A., 1963, University of Kansas; Ph.D., 1970, Indiana University.

M. VICTORIA ANSBACHER, *Instructor, Community Health Nursing, 1970*
B.S., 1967, Skidmore College.

BARBARA UEHLING ARCHER, *Adjunct Professor of Psychology, 1969*
B.A., 1954, University of Wichita; M.A., 1956; Ph.D., 1958, Northwestern University.

E. JAMES ARCHER, *Vice President for Academic Affairs and Professor of Psychology, 1969*
B.S., 1949; M.S., 1950; Ph.D., 1952, Northwestern University.

CHARLES P. ARMSTRONG, *Assistant Professor of Management Science, 1971*
B.S., 1961; M.B.A., 1965, University of Illinois.

CHARLES G. ARNOLD, *Assistant Professor of Physical Education for Men, Aquatics Director and Coach of Swimming, 1970*
B.S., 1951; M.S., 1955, Springfield College.

SONA ARONIAN, *Assistant Professor of Russian, 1970*
A.B., 1960, Boston University; Ph.D., 1970, Yale University.

JOHN WRIGHT ATWOOD, *Associate Extension Professor of Animal Science, 1960*
B.S., 1941, University of Connecticut; M.S., 1953, University of Rhode Island.

VICTOR ATYAS, *Clinical Psychologist in Counseling Center and Clinical Assistant Professor of Psychology, 1970*
B.S., 1955, Memphis State University; Ph.D., 1970, University of Tennessee.

ROBERT C. AUKERMAN, *Professor of Education, 1954*
A.B., 1934; A.M., 1935, Wayne State University; Ph.D., 1945, University of Michigan.

CAROL E. AVERY, *Instructor in Textiles and Clothing, 1970*
B.S., 1951; M.S., 1967, University of Rhode Island.

ALFRED CLARENCE BACHELDER, *Associate Professor of Mechanical Drawing and Shopwork and Director of Engineering Instrument Shop, 1962, 1947*
B.S., 1943, Rhode Island School of Design; M.S., 1955, University of Rhode Island.

MARY-JANE BACON, *Associate Professor of Food and Nutritional Science, 1955, 1947*
B.S., 1943, University of New Hampshire; M.S., 1947, Teachers College, Columbia University.

NADINE BAER, *Head, Serials Department, Library, 1947*
B.S., 1947, Simmons College.

RICHARD E. BAILEY, *Assistant Professor of Speech, 1968, 1967*
B.A., 1951, Otterbein College; B.D., 1954, United Theological Seminary; M.A., 1964; Ph.D., 1968, Ohio State University.

MARTHA EMILY BARDEN, R.N., *Assistant Professor of Public Health Nursing, 1963, 1961*
Diploma, 1944, Rhode Island Hospital School of Nursing; B.S., 1956, Boston University; M.S., 1961, Yale University.

WALTER L. BARKER, *Assistant Professor of English, 1966*
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HAROLD BARNETT, *Instructor in Economics, 1970*
B.A., 1965, Miami University (Ohio).

STANLEY M. BARNETT, *Assistant Professor of Chemical Engineering, 1969*
B.A., 1957, Columbia College; B.S., 1958, Columbia University; M.S., 1959, Lehigh University; Ph.D., 1963, University of Pennsylvania.

ROBERT ALFRED BARRON, *Assistant Professor of Mathematics, 1956* (Leave Sem. I, II)
A.B., 1951, Princeton University; M.A., 1955, Fordham University.

DAVID E. BASS, *Adjunct Professor of Zoology, 1965*
A.B., 1932, Brown University; M.A., 1951; Ph.D., 1953, Boston University.

LEONARD J. BASS, *Assistant Professor of Computer Science, 1970*
B.A., 1964; M.A., 1966, University of California, Riverside; Ph.D., 1970, Purdue University.

MICHAEL S. BASSIS, *Instructor in Sociology, 1971*
A.B., 1967, Brown University; M.A., 1968, University of Chicago.

FRANK A. BATES, JR., Colonel, U.S. Army, *Professor of Military Science, 1968*
B.S., 1947; M.S., 1948, University of Michigan.

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B.A., 1950; M.A., 1954, Cairo University; Ph.D., 1961, Syracuse University.

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B.A., 1951, University of Connecticut.

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LOIS M. BOWERS, *Assistant Reference Librarian, 1968*
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B.S., 1939, Tufts College; M.S., 1940; S.D., 1950, Harvard University.

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A.B., 1935, Columbia University; M.B.A., 1948; Ph.D., 1951, New York University.

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B.S., 1952, University of Maine; M.S., 1954, Purdue University.

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B.A., 1956, Northeastern University; M.A., 1961, University of Rhode Island.

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B.A., 1956; M.A., 1958, University of Chicago; LL.B., 1962, Yale Law School.

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B.S., 1960; M.S., 1962, Xavier University; Ph.D., 1967, University of Minnesota.

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S.B., S.M., 1952; Sc.D., 1960, Massachusetts Institute of Technology.

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B.S., 1956, University of Connecticut; M.S., 1958, University of Rhode Island; D.F., 1965, Duke University.

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B.A., 1945, Wheaton College; M.S., 1955, University of Rhode Island.

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B.A., 1959, Yale University; M.A., 1963; Ph.D., 1967, University of Michigan.

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B.A., 1962, University of Sheffield (England); M.A., 1964, University of Nebraska.

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Appendix

LOAN FUNDS AND SCHOLARSHIPS

These are privately contributed loan and scholarship funds. For federal programs and general student aid information see page 19.

LOAN FUNDS

Norman M. Fain Fund, Providence Wholesale Drug Company Fund, The Rhode Island Foundation Fund, The University of Rhode Island Foundation Fund and the URI Alumni Association Fund are privately contributed loan funds of $5,000 or over, used as "matching funds" for federal loan programs.

Alumni Association Fund, Leroy F. Burroughs Fund, Providence Engineering Society Fund, and the John H. Washburn Memorial Fund are privately contributed loan funds of $5,000 or more administered by the Student Aid Office.

Metropolitan Providence Cooperative Extension Loan Fund (honoring retired agent Ella Simas): $200 available annually to sophomore, junior, or senior who is a metropolitan homemaker or member of a metropolitan homemaker's family.

Patrons Association Loan Fund: Short-term loans for emergency reasons, administered by Dean of Students.

Dean Mason Campbell Memorial Loan Fund: Short-term loans for emergency reasons, administered by Dean, College of Agriculture.

SCHOLARSHIPS

Scholarships preceded by an asterisk(*) are awarded directly by the college concerned and/or the organization providing the funds.

ANY COLLEGE OF THE UNIVERSITY

ALUMNI ASSOCIATION: Income from endowment. (See also Francis H. Horn and Carl R. Woodward Scholarships.)

ALUMNI CENTURY CLUB MEMORIAL: Offered in honor of R.I. alumni who sacrificed their lives in two world wars. Recipients selected on the basis of financial need, campus citizenship, scholastic ability and leadership as evidenced by participation in sports and other extracurricular activities.

AMERICAN SCREW COMPANY FOUNDATION: Income from $10,000 endowment awarded to worthy students, with preference to children of former employees of American Screw Company.

ANN & HOPE: $1,000 awarded annually, with prefence to students with financial need, children of Ann & Hope employees, and student summertime employees.

B. A. BALLOU AND COMPANY, INC.: $200 awarded annually to a deserving student.

ARTACKY AND ELESE BERBERIAN: $200 awarded annually to a deserving student.

CASTELLUCCI AND GALLI, INC.: Income from $5,000 endowment.

COTTRELL COMPANY, DIVISION OF HARRIS-INTERTYPE CORPORATION: $1,000 available annually, with preference first to children of Cottrell employees, second to residents of Westerly-Pawcatuck area, third to students in College of Engineering.

A. T. CROSS COMPANY: Income from $7,500 endowment awarded to a deserving student.

SENATOR WILLIAM M. DAVIES, JR., MEMORIAL: Offered to residents of R.I. in honor of an outstanding and respected member of the General Assembly, who

was leader of the state senate when he died on January 1, 1963. $500 available annually for two $250 awards to be made for the freshman and sophomore years.

FRANCES B. DEFRANCE MEMORIAL: For woman student with financial need. Contributed by Chapter B, P.E.O., Kingston, R.I. in memory of its beloved member and one of its founders, Frances B. DeFrance (Mrs. Jesse A.).

DANIEL R. DYE MEMORIAL: $200 annually to a graduate of East Providence, R.I. High School who has financial need, selected by the URI Student Aid Office and Awards Committee.

FEDERAL PRODUCTS FOUNDATION: $3,000 available annually, with preference given to sons and daughters of Federal Products Corporation employees.

GROSSMAN FOUNDATION: $200 awarded annually to a deserving student.

HEDISON CORPORATION: $200 awarded annually to a deserving student.

JAMES H. HIGGINS MEMORIAL: Income from $10,000 endowment, awarded to men or women students. Gift is from the estate of Mrs. James H. (Ellen F.) Higgins.

JAMES H. HIGGINS, JR.: Income from $11,000 endowment, awarded to deserving students.

HIGH SCHOOL MODEL CONGRESS: $325 awarded to an incoming freshman who has given outstanding performance in the High School Model Congress. Application must be made for this award.

HIGH SCHOOL MODEL LEGISLATURE: $325 awarded to an incoming freshman who has given outstanding performance in the Model Legislature. Application must be made for this award.

PERCY HODGSON: Income from $9,300 endowment awarded annually to worthy students, with preference to students from foreign countries.

FRANCIS H. HORN: Income from $10,000 gift of URI Alumni Association and $17,345 in gifts from Friends of Francis H. Horn, with special consideration to applicants from foreign countries who can qualify with respect to academic standing and financial need.

INDUSTRIAL NATIONAL BANK OF RHODE ISLAND: $1,000 available annually.

INTERNATIONAL STUDENT: A limited number of partial or full out-of-state tuition awards based on financial need.

A. LIVINGSTON KELLEY MEMORIAL: Income from $5,000 endowment, established by the will of A. Livingston Kelley, awarded to a worthy student who is a resident of R.I.

KENYON PIECE DYEWORKS, INC.: Income from $8,500 endowment.

HARRY KNOWLES MEMORIAL: Income from $8,000 endowment established by the will of Harry Knowles.

AUSTIN T. LEVY MEMORIAL: Income from $5,000 endowment awarded annually, with preference to needy and deserving graduates of Burrillville High School.

GEORGE C. MOORE COMPANY/FULFLEX, INC.: $1,500 awarded annually to deserving students, with preference to children of George C. Moore Company employees in Westerly and of Carr-Fulflex, Inc. in Bristol.

* NATIONAL MERIT SCHOLARSHIP: Sponsored by the University of Rhode Island Foundation, a four-year scholarship with annual awards of at least one-half of the student's financial need, but not more than $1,500 per year.

RAU FASTENER COMPANY: $200 awarded annually to a student who meets normal requirements of scholarship and need, with preference to children of Rau Fastener employees.

RAYTHEON COMPANY: $500 awarded annually to deserving students.

RESERVE OFFICERS TRAINING CORPS (ROTC): One, two and three year scholarships are awarded annually by the Department of the Army to qualified students enrolled in the ROTC program. Includes tuition, fees, textbooks, incidentals and $50 per month. Applications may be made at the Department of Military Science.

RESERVE OFFICERS TRAINING CORPS (ROTC four-year scholarships): Available to selected young men motivated toward a career in the Army. Includes tuition, books, laboratory fees, and $50 per month (tax free). Forward applications to Headquarters, First U.S. Army, Attn. AHAAG-CA, Fort Meade, Md. 20755 by early December of applicant's senior year in high school.

RHODE ISLAND HOSPITAL TRUST COMPANY: $500 available annually to R.I. residents, with preference given to sons and daughters of Rhode Island Hospital Trust Company employees.

RHODE ISLAND JUNIOR COLLEGE TRANSFER STUDENTS: Two awards up to $600 each, based on need, to graduating students of Rhode Island Junior College who have demonstrated high scholastic achievement.

PASQUALE AND ROSARIA RIZZI: Income from $17,750 endowment awarded annually to two or more junior and/or senior members of Beta Psi Alpha chapter of Theta Delta Chi fraternity on basis of scholarship, achievement and financial need.

MARY L. ROBINSON MEMORIAL: Income from fund established by the will of Anna D. Robinson in memory of her mother, awarded to women students.

SAMUEL AND GERTRUDE J. ROSEN: Income from endowment fund, awarded to deserving men or women students.

N. EDWARD ROSENHIRSCH MEMORIAL: Income from $13,500 endowment, awarded to deserving students.

SCIENCE FAIR: $325 each to two incoming freshmen in recognition of outstanding exhibits in the annual R.I. Science Fair for high school students. Application must be made for this award.

EDWIN S. SOFORENKO FOUNDATION SCHOLARSHIP: Income from $6,000 endowment to be awarded annually to deserving students on the basis of need with first preference to employees of Insurance Underwriters, Inc. and their families.

STUDENT-TO-STUDENT: Income from $6,000 endowment fund awarded annually.

UNCAS MANUFACTURING COMPANY: $500 awarded annually to deserving students.

UNITED STEELWORKERS OF AMERICA: $4,000 available annually for awards to deserving URI students who are sons or daughters of members of Providence Subdistrict #1 of United Steelworkers of America.

UNIVERSITY: The Board of Regents has made available a sum of money to be used for scholarships. While it is expected that in any year the great majority of these scholarships will be awarded to residents of R.I., in certain exceptional cases out-of-state students may qualify.

UNIVERSITY OF RHODE ISLAND FOUNDATION: Endowment funds administered for the benefit of the University. Income is appropriated annually for scholarships to be awarded by the University Committee on Financial Aid to Students.

URI PARENTS FUND: Income from $17,500 endowment.

URI PATRONS ASSOCIATION: Income from $14,700 endowment.

USS THRESHER: Tuition scholarships available to sons and daughters of the men lost aboard the submarine USS *Thresher*.

VETERANS' ADMINISTRATION (Junior G.I. Bill): Provides monthly payments while attending college to students whose parents have died or are permanently and totally disabled from disease or injury incurred in armed forces during Spanish-American War, World War I, World War II; or Korean conflict. Contact regional Veterans' Administration Office for details.

WASHINGTON TRUST COMPANY: $250 awarded annually to a deserving undergraduate student from Rhode Island.

WESTERLY LIONS CLUB: $500 awarded annually to needy graduates of Westerly High School with preference to upperclassmen.

GEORGE F. WESTON: Income from fund established by Alumni Association of the Technical High School of Providence.

KEVIN J. WOLL MEMORIAL: Awarded to an incoming freshman from a Rhode Island high school.

CARL R. WOODWARD: Income from $10,000 Alumni Association gift.

*WORLD WAR ORPHANS' EDUCATION FUND: Provided by the State of R.I. to help defray costs of education for children of veterans of either World War who died or were more than 50% disabled because of service. Fund is administered by the State Department of Education, to which inquiries for details should be directed.

ARTS AND SCIENCES

BESSIE D. BELMONT MEMORIAL: Gift of $5,000 by Dr. and Mrs. Ralph S. Belmont in memory of his mother. Income awarded annually to an undergraduate majoring in natural sciences on basis of scholarship and/or diligent application and financial need.

THE CHEMICAL CLUB OF NEW ENGLAND: $500 annual award to a deserving junior or senior student from New England majoring in chemistry or chemical engineering.

CHEMISTRY CONTEST: Winner of annual Chemistry Competitive Examination awarded $325 for the freshman year.

JOHN CLARKE TRUST: $1,500 available annually to worthy students preparing for careers in teaching or nursing with preference given to residents of Aquidneck Island.

*FINE ARTS: Awards to students talented in the fields of art, music, and theatre. Major donor to this scholarship fund is the Jane Rockwell Levy Foundation.

*KENT COUNTY DENTAL AUXILIARY: $200 awarded annually to sophomore resident of Kent County. Based on scholarship, clinical ability, and need.

HENRY H. MACKAL: Income from $20,000 endowment awarded to deserving students majoring in engineering mathematics, or the natural sciences.

*MAX ROSEN MEMORIAL: Income from $5,000 endowment awarded annually to a deserving student, preferably a junior, majoring in history with emphasis in American history.

LEONARD ECKERMAN SMITH MEMORIAL: Income from $5,000 endowment awarded to students at the University of Rhode Island having a major interest in public speaking.

BUSINESS ADMINISTRATION

DR. WINFIELD S. BRIGGS MEMORIAL: To students of accounting. Income from $19,000 endowment, $300 each award.

SAUL AND ALFRED GOLDSTEIN FUND: Income from $5,000 endowment available to a deserving student.

RHODE ISLAND ASSOCIATION OF INSURANCE AGENTS: Two $375 annual awards: one on the basis of financial need and one for scholastic ability, to R.I. residents in the College of Business Administration interested in insurance.

RHODE ISLAND CONSUMER FINANCE ASSOCIATION: Two $400 annual awards to the first semester juniors of high scholastic achievement who are most deserving. Students must have entered college as freshmen and completed two years.

*RHODE ISLAND SOCIETY OF CERTIFIED PUBLIC ACCOUNTANTS: An annual scholarship award of $200 to the sophomore or junior majoring in accounting who plans to enter the field of public accounting and who has a good scholastic record.

*SOCIETY FOR ADVANCEMENT OF MANAGEMENT, R.I. CHAPTER: $200 annual award to a sophomore or junior student who is interested in management. Recipient chosen by Chapter on recommendation of a faculty committee.

*THE ARTHUR YOUNG FOUNDATION: $1,000 annual award to be distributed to not less than two, nor more than three, senior students with demonstrated need and scholastic excellence.

ENGINEERING

THE CHEMICAL CLUB OF NEW ENGLAND: $500 annual award to a deserving junior or senior student from New England majoring in chemistry or chemical engineering.

COTTRELL COMPANY: see under "Any College."

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PROVIDENCE SECTION: $300 annual award to a deserving undergraduate majoring in electrical engineering and in need of financial aid.

KAISER ALUMINUM AND CHEMICAL COMPANY: $1,500 available annually for three students in electrical, industrial, and mechanical engineering, with preferences to "disadvantaged" students.

HENRY H. MACKAL: Income from $20,000 endowment awarded to deserving students majoring in engineering, mathematics, or the natural sciences.

CHARLES A. MAGUIRE ASSOCIATES: Income from $5,000 endowment awarded to students in the field of engineering.

ARTHUR J. MINOR MEMORIAL: Income from $5,000 endowment available annually to deserving students.

GRANT H. POTTER MEMORIAL: Income from $50,000 endowment, a bequest of Warren L. Offer, for scholarships to deserving students, with preference to R.I. engineering students specializing in the fields of electronics or aeronautics.

RHODE ISLAND ROAD BUILDERS ASSOCIATION: $500 annual award to a student in civil engineering, who has financial need.

NELSON C. WHITE: $500 awarded annually to students exhibiting most creative thinking in engineering.

HOME ECONOMICS

*BORDEN COMPANY HOME ECONOMICS: $300 awarded annually to a senior who has completed two or more courses in foods and nutrition and has achieved the highest grade average of all eligible students in all college work preceding the senior year.

*ELIZABETH W. CHRISTOPHER MEMORIAL: $200 annual award to a young woman in home economics who has completed her fourth semester at the University. Selection will be made on the basis of scholarship and evidence of potential for service and concern for the welfare of others.

*RHODE ISLAND STATE GRANGE: Three annual awards of $200 each to students who have completed their sophomore year leading to a degree in any accredited college in R.I. Student must be a member of a R.I. Subordinate Grange in good standing and have shown an active interest in Grange work for at least two years. Preference given students in home economics and agriculture. Applications should be made to the Secretary of the R.I. State Grange on or before July 1 preceding junior year.

*SEARS-ROEBUCK FOUNDATION: Two $300 annual awards to incoming freshmen in home economics based on scholastic ability and financial need.

WOMAN'S NATIONAL FARM AND GARDEN ASSOCIATION (following three awards):

FORT BRANCH: $100 awarded annually to a woman in home economics from Cranston, R.I.

MABEL PERRIN: $200 awarded annually to a woman in home economics on the basis of scholastic ability and financial need. Restricted to Rhode Island residents.

RHODE ISLAND DIVISION: $100 awarded annually to a deserving student in home economics or horticulture. Restricted to Rhode Island residents.

NURSING

See also page 20.

M. ADELAIDE BRIGGS MEMORIAL: Income from $19,000 endowment, $300 each award.

JOHN CLARKE TRUST: $1,500 available to worthy students preparing for careers in teaching or nursing with preference given to residents of Aquidneck Island.

ESTHER A. WATSON: $200 awarded annually to a deserving student with preference to graduates of The Pawtucket Memorial Hospital School of Nursing and then relatives of such graduates.

PHARMACY

See also page 20.

*AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION: Five $100 annual awards based upon scho-

lastic achievement and need. Given by the AFPE with the understanding that the University will match the awards to the students selected.

*JOHN W. DARGAVEL FOUNDATION: $200 awarded annually to student in either his third, fourth or fifth year of pharmaceutical education and in good scholastic standing.

*BARNEY M. GOLDBERG FUND: Available to students in third, fourth or fifth year who have financial need.

*FLORENCE CHAMPLIN HAMILTON MEMORIAL: Income from $6,000 endowment awarded annually to a student in the College of Pharmacy on the basis of scholastic ability and financial need.

*MRS. C. GORDON MACLEOD: $250 awarded annually to student(s) in the College of Pharmacy on the basis of scholastic ability and financial need.

*WILLIAM G. PECKHAM MEMORIAL: Established by the will of Mary M. Peckham (Mrs. William G.), the scholarship provides $200 to a first-year student registered in pharmacy and continues until graduation if merited by scholastic performance.

*PROVIDENCE WHOLESALE DRUG COMPANY: $450 awarded annually to student in third, fourth or fifth year who has satisfactory academic standing and financial need.

RHODE ISLAND COLLEGE OF PHARMACY: Income from $139,000 endowment, for scholarships in the field of pharmacy and allied sciences.

*R.I. TRAVELING MEN'S AUXILIARY: $300 awarded annually to an upperclass student of the College of Pharmacy on the basis of scholastic ability and financial need.

*WATERBURY DRUGGISTS' AUXILIARY: $200 available annually to a worthy third-, fourth-, or fifth-year student from the area of Waterbury, Conn.

RESOURCE DEVELOPMENT

*ASHAWAY LINE AND TWINE MANUFACTURING CO.: Income from $5,000 endowment awarded annually to a deserving student in Fisheries and Marine Technology.

*JOHN SAMUEL CLAPPER MEMORIAL: $250 annual grant established by Orville O. Clapper in honor of his father who pioneered the development of modern turf. Two awards of $100 and $150 to outstanding juniors or seniors showing marked and abiding interest in turf culture.

*CHARLES M. COX: $300 awarded annually to a student or students on basis of need, character and scholarship, with preference to undergraduates in dairy science or poultry science.

*EPPLEY FOUNDATION FOR RESEARCH, INC.: $500 awarded annually to deserving students in Fisheries and Marine Technology.

*KELVIN HUGHES DIVISION, SMITHS INDUSTRIES, INC.: $500 annual award to a student in Commercial Fisheries program.

*ALICE P. MAYER: Five annual awards of $300 each for agricultural students who reside in Newport County. Preference to first- and second-year students.

*NORTHEAST INSTITUTE OF FOOD TECHNOLOGISTS UNDERGRADUATE: $300 annual award established by the Northeast section of the Institute of Food Technologists for undergraduate students in the New England area who have a significant interest in furthering the development of food science. Selection based on interest in food science, academic excellence, personal character and extracurricular activities.

*JOHN E. POWELL MEMORIAL: Income from $5,000 endowment available annually to students on basis of worth and need.

*RALSTON PURINA: $500 awarded annually to a student with interest related to animal agriculture. Selection on basis of scholarship, leadership, character, citizenship potential, and need.

*RHODE ISLAND STATE GRANGE: Three annual awards of $200 each to students who have completed the sophomore year leading to a degree in any accredited college in R.I. Student must be a member of a R.I. Subordinate Grange in good standing and have shown an active interest in Grange work for at least two years. Preference to students in home economics and agriculture. Applications should be made to the Secretary of the R.I. State Grange on or before July 1 preceding junior year.

*CHARLES (SCOTTY) ROSS MEMORIAL: $200 awarded annually on the basis of need, character and scholarship to an upperclassman interested in the processing and production of quality milk and milk products.

*JEAN LOUISE PIMENTAL ('70) MEMORIAL: $200 annual award to a student in Animal Science, with preference to a woman from Rhode Island.

WOMAN'S NATIONAL FARM AND GARDEN ASSOCIATION (RHODE ISLAND DIVISION): $100 awarded annually to a deserving student in horticulture or home economics. Restricted to Rhode Island residents.

*WOMAN'S SEAMEN'S FRIEND SOCIETY OF CONNECTICUT: $2,000 awarded annually to students from Connecticut in marine-oriented programs, who have financial need.

SPECIAL AWARDS

DANFORTH LEADERSHIP TRAINING SCHOLARSHIP: All expenses for two weeks of leadership training at the American Youth Foundation Camp at Shelby, Michigan, awarded to an outstanding freshman with preference given to students having special interest in dairy, poultry or agricultural education. Same to a freshman in home economics.

DANFORTH SUMMER FELLOWSHIP: Awarded jointly by Danforth Foundation and Ralston Purina Co. to a junior. Preference to students with special interest in dairy, poultry, or agricultural education. Covers expenses during two weeks in St. Louis and vicinity and two weeks of leadership training at the American Youth Foundation Camp, Shelby, Mich. Basis is attainment in mental, physical, social, and religious development. Same fellowship awarded by Danforth Foundation to a junior in home economics.

RHODE ISLAND TUBERCULOSIS AND RESPIRATORY DISEASE ASSOCIATION AWARD: $500 awarded annually in honor of its former president, Harry L. Gardner, to a senior accepted by accredited medical school. Based on need.

HISTORICAL OUTLINE

1888 State Agricultural School established.
Agricultural Experiment Station established.
Watson farm purchased as site.
1889 Taft Laboratory.
John H. Washburn appointed principal.
1890 South Hall.
1891 Davis Hall.
Ladd Laboratory.
1892 Rhode Island College of Agriculture and Mechanic Arts founded May 19.
John H. Washburn, President.
1894 First class graduated.
Alumni Association formed.
1895 Davis Hall burned and rebuilt.
1897 Lippitt Hall.
First *Grist* published.
1898 Preparatory school established.
1902 Homer J. Wheeler, Acting President.
1903 Kenyon L. Butterfield, President.
1904 Extension Department organized.
1906 Howard Edwards, President.
Greenhouse and Horticultural Building.
1907 Master's degree awarded for the first time.
1908 Preparatory school discontinued.
The *Beacon* established as a monthly.
Rho Iota Kappa (first fraternity).
1909 East Hall.
By charter amendment, name changed to Rhode Island State College.
1910 Theta Chi (first national fraternity).
1912 First fraternity house (Beta Phi, now Phi Gamma Delta).
1913 Ranger Hall.
Chapter of Phi Kappa Phi, national honor society.
1918 Academic work suspended April 28.
Student Army Training Corps.
1919 Academic work resumed January 2.
1921 Washburn Hall.
1924 Home Management House.
1928 Memorial Gateway.
Bliss Hall.
Edwards Hall.
Rodman Hall.
East Farm acquired.
1930 John Barlow, Acting President.
1931 Raymond G. Bressler, President.
President's House.
1932 Reorganization of college: Schools of Engineering, of Science and Business, and of Agriculture and Home Economics.
1934 Asa Sweet and Edward Sweet lands purchased.
1935 Chapter of Phi Sigma Society, national biological honor society.
1936 Chapter of Alpha Zeta, national agricultural society.
Narragansett Marine Laboratory.
Animal Husbandry Building.
Eleanor Roosevelt Hall.
Quinn Hall.
Central Heating Plant.
Peckham farm purchased.
1937 Green Hall.
1938 Meade Field.
1939 Board of Trustees of State Colleges created.
1940 John Barlow, Acting President.
East Farm addition, 45 acres.
1941 Carl R. Woodward, President.
1942 Accelerated war program, with summer term, initiated.
Reorganization of School of Science and Business into separate schools of Science and of Business Administration.
Engineering Experiment Station.
Industrial Extension Division.
1943 Army Specialized Training Unit assigned to college.
1944 Second Peckham farm purchased.
Industrial Extension Division replaced by Division of General College Extension.
War-accelerated program ended in September.
1945 Degree program in nursing.
Sherman farm acquired.
1946 Quonset hut colony erected as emergency housing project.
School of Home Economics.
1947 Chapter of Phi Alpha Theta, national history honorary society.
1948 School of Arts and Sciences.
Bachelor of Arts degree authorized by Board of Trustees.
1949 A.B. degree awarded for first time at June Commencement.
1950 Butterfield and Bressler Halls.
1951 Name changed to University of Rhode Island by act of General Assembly.
Chapter of Omicron Nu, national home economics honor society.
1952 Pastore Chemical Laboratory.
1953 Chapter of Sigma Xi, national scientific society.
Frank W. Keaney Gymnasium.
Laboratories for Scientific Criminal Investigation.
1954 Chapter of Tau Beta Pi, national engineering honor society.
Rhode Island Memorial Union.
1955 Chapter of Pi Sigma Alpha, national political science honor society.

1956 Ranger Hall remodeled and rededicated.
1957 College of Pharmacy.
1958 URI Foundation.
Francis H. Horn, President.
Degree of Doctor of Philosophy authorized by Board of Trustees.
Child Development Center.
Hutchinson, Peck and Adams Residence Halls.
Hope Dining Hall.
1959 Woodward Agricultural Science Laboratory.
Administration Building.
Computer Laboratory.
Chapter of Rho Chi, national pharmaceutical honor society.
Potter Infirmary.
Wales and Kelley Halls.
1960 Fish Oceanographic Laboratory.
Independence Hall.
Davis Hall and East Hall remodeled.
Two-year program in dental hygiene.
Bureau of Government Research.
Faculty Senate established.
1961 Graduate School of Oceanography.
Quinn Hall and Washburn Hall remodeled.
Tucker, Merrow and Browning Halls.
Gilbreth Hall.
1962 Crawford Hall.
W. Alton Jones Campus.
Trident commissioned.
Chapter of Kappa Delta Pi, national education honor society.
1963 Bliss Hall remodeled.
Tyler Hall.
Graduate Library School.
Weldin and Barlow Halls.
1964 Chapter of Omicron Delta Epsilon, national economics honor society.
Fogarty Health Science Building.
Watson House restored.
1965 Addition to the Memorial Union.
University Library.
Law of the Sea Institute.
Sherman Maintenance Building.
Bachelor of Fine Arts and Bachelor of Music degrees authorized.
Research Center in Business and Economics.
Water Resources Research Center.
1966 Aldrich, Burnside, Coddington, Dorr, Ellery, and Hopkins Halls, and Roger Williams Center.
Justin S. Morrill Science Building.
Fine Arts Center (phase I).
Institute of Environmental Biology.
1967 Two-year program in commercial fisheries.
Ballentine Hall.
Thirty-eight acres west of campus acquired.
F. Don James, Acting President.
1968 Kelley Hall Research Annex.
Pell Marine Science Library.
Horn Laboratory.
First Sea Grant.
Werner A. Baum, President.
New England Marine Resources Information Program.
1969 Home Management Center.
Chapter of Sigma Pi Sigma, national physics honorary society.
Chapter of Sigma Delta Pi, national Spanish honorary society.
Heathman Hall.
Forty additional acres acquired at Narragansett Bay Campus.
Faculty Center.
Dental hygiene bachelor's program.
International Center for Marine Resource Development.
1970 Fayerweather Hall.
Gorham Hall.
Marine Advisory Service.
Chapter of Beta Gamma Sigma, national business administration honorary society.
1971 Tootell Physical Education Center.
Fine Arts Center (phase II).
Conference Center, Jones Campus.
Campus post office.

SUMMARY OF ENROLLMENT

without duplicates
September 1969 to June 1970

COLLEGE OF ARTS AND SCIENCES	*Women*	*Men*	*Total*
Bachelor of Arts	1464	1122	2586
Bachelor of Science			
Biology	120	258	378
Chemistry	11	41	52
Dental Hygiene	3		3
Geology	5	33	38
Mathematics	34	57	91
Medical Technology	49	7	56
Physical Education *Men*		141	141
Physical Education *Women*	99		99
Physical Therapy	1		1
Physics	9	28	37
Bachelor of Fine Arts	85	34	119
Bachelor of Music	42	28	70
Associate in Science			
Dental Hygiene	48		48
	1970	1749	3719

COLLEGE OF BUSINESS ADMINISTRATION			
Accounting	13	198	211
Business Education	39	33	72
Finance	3	69	72
General Administration	15	166	181
Insurance		37	37
Management	5	219	224
Marketing Management	18	85	103
Office Management	17	2	19
Unclassified	16	166	182
	126	975	1101

COLLEGE OF ENGINEERING			
Chemical Engineering	2	83	85
Civil Engineering	1	145	146
Electrical Engineering	2	235	237
Industrial Engineering	2	95	97
Mechanical Engineering	2	148	150
Engineering Science	1	35	36
Unclassified	2	92	94
	12	833	845

COLLEGE OF HOME ECONOMICS	*Women*	*Men*	*Total*
Child Development and Family Relations	195	2	197
Food, Nutrition and Institution Management	50		50
General Home Economics	32		32
Home Economics Education	99		99
Textiles, Clothing and Related Arts	128		128
Unclassified	115		115
	619	2	621
COLLEGE OF NURSING	259	8	267
COLLEGE OF PHARMACY	53	197	250
COLLEGE OF RESOURCE DEVELOPMENT			
Agricultural Business	1	46	47
Agricultural Science	20	106	126
Agricultural Technology	25	143	168
Commercial Fisheries	1	48	49
	47	343	390
UNASSIGNED	4	5	9
TOTAL UNDERGRADUATES	3090	4112	7202
GRADUATE STUDENTS	889	1415	2304
SPECIAL STUDENTS	244	157	401
SUMMER SESSION 1969			
Term I			2592
Term II			2325
DIVISION OF UNIVERSITY EXTENSION			7384
Degree credit students only			
TOTAL ENROLLMENT			22208

Calendar

1971-1972

FIRST SEMESTER

Sept. 12, Sunday	Residence halls open, 10:00 a.m.
Sept. 13, Monday	Meeting of the University Faculty, 3:30 p.m.
Sept. 13, 14	University registration
Sept. 15, Wednesday	Classes begin, 8:00 a.m.
Oct. 11, Monday	Holiday, Columbus Day
Oct. 12, Tuesday	Monday classes meet
Oct. 19, Tuesday	Meeting of the University Faculty, 3:30 p.m.
Oct. 25, Monday	Holiday, Veterans Day
Oct. 27, Wednesday	Honors Day
Nov. 6, Saturday	Mid-semester, 12:50 p.m.
Nov. 15-19	Registration
Nov. 24, Wednesday	Thanksgiving recess begins, 12:50 p.m.
Nov. 29, Monday	Thanksgiving recess ends, 8:00 a.m.
Dec. 18, Saturday	Christmas recess begins, 12:50 p.m.
Jan. 3, Monday	Christmas recess ends, 8:00 a.m.
Jan. 7, Friday	Last day of classes
Jan. 8-10	Reading days
Jan. 11-19	Final examinations
Jan. 21, Friday	Last day for grades, 9:00 a.m.

SECOND SEMESTER

Jan. 31, Feb. 1	Registration
Feb. 2, Wednesday	Classes begin, 8:00 a.m.
Feb. 15, Tuesday	Meeting of the University Faculty, 3:30 p.m.
Mar. 24, Friday	Mid-semester Spring recess begins, 5:00 p.m.
Apr. 3, Monday	Spring recess ends, 8:00 a.m.
Apr. 24-28	Registration
May 16, Tuesday	Meeting of the University Faculty, 3:30 p.m.
May 18, Thursday	Last day of classes
May 19-21	Reading days
May 22-31	Final examinations
May 29, Monday	Holiday, Memorial Day
June 2, Friday	Last day for grades, 9:00 a.m.
June 11, Sunday	Commencement

SUMMER SESSION

June 19, Monday	First five-week term begins
June 26, Monday	Six-week term begins
July 4, Tuesday	Holiday, Independence Day
July 22, Saturday	First five-week term ends
July 24, Monday	Second five-week term begins
Aug. 5, Saturday	Six-week term ends
Aug. 14, Monday	Holiday, Victory Day
Aug. 26, Saturday	Second five-week term ends

1972-1973

FIRST SEMESTER

Sept. 10, Sunday	Residence halls open, 10:00 a.m.
Sept. 11, 12	University registration
Sept. 13, Wednesday	Classes begin
Sept. 14, Thursday	Meeting of the University Faculty, 3:30 p.m.
Oct. 9, Monday	Holiday, Columbus Day
Oct. 10, Tuesday	Meeting of the University Faculty, 3:30 p.m.
Oct. 23, Monday	Holiday, Veterans Day
Oct. 25, Wednesday	Monday classes meet Honors Day
Nov. 3, Friday	Mid-semester, 4:50 p.m.
Nov. 7, Tuesday	Holiday, Election Day
Nov. 13-17	Registration
Nov. 22, Wednesday	Thanksgiving recess begins, 12:50 p.m.
Nov. 27, Monday	Thanksgiving recess ends, 8:00 a.m.
Dec. 22, Friday	Christmas recess begins, 4:50 p.m.
Jan. 2, Tuesday	Christmas recess ends, 8:00 a.m.
Jan. 5, Friday	Last day of classes
Jan. 6-8	Reading days
Jan. 9-17	Final examinations
Jan. 22, Monday	Last day for grades, 9:00 a.m.

SECOND SEMESTER

Feb. 5, 6	University registration
Feb. 7, Wednesday	Classes begin
Feb. 20, Tuesday	Meeting of the University Faculty, 3:30 p.m.
Mar. 30, Friday	Mid-semester, 4:50 p.m.
Apr. 13, Friday	Spring recess begins, 4:50 p.m.
Apr. 23, Monday	Spring recess ends, 8:00 a.m.
Apr. 23-27	Registration
May 15, Tuesday	Meeting of the University Faculty, 3:30 p.m.
May 18, Friday	Last day of classes
May 19-21	Reading days
May 22-31	Final examinations
May 28, Monday	Holiday, Memorial Day
June 4, Monday	Last day for grades, 9:00 a.m.
June 10, Sunday	Commencement

SUMMER SESSION

June 18, Monday	First five-week term begins
June 25, Monday	Six-week term begins
July 4, Wednesday	Holiday, Independence Day
July 21, Saturday	First five-week term ends
July 23, Monday	Second five-week term begins
Aug. 4, Saturday	Six-week term ends
Aug. 13, Monday	Holiday, Victory Day
Aug. 25, Saturday	Second five-week term ends

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4 Biological Science Building A3
5 Bliss Hall *engineering* B4
6 Canterbury House *Episcopalian center* E3
7 Catholic Center B4
8 Chafee Social Science Center A3
9 Child Development Center E3
10 Crawford Hall *chemical engineering* B4
11 Dairy Barn B2
12 Davis Hall C3
13 East Hall *physics* B4
14 Edwards Hall C4
15 Faculty Center B4
16 Fine Arts Center A4
17 Fire Station B5
18 Fogarty Health Science Building *nursing and pharmacy* D3
19 Gilbreth Hall *industrial engineering* B4
20 Green Hall D4
21 Greenhouses A4
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23 Independence Hall *arts and sciences* D4
24 Information D3
25 Keaney Gymnasium D1
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30 No. 37 Graduate Reading Center D3
24 No. 44 Police Department, Psychology D3
31 No. 70 Career Planning and Placement, Economics C3
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33 No. 80 Personnel, Purchasing C3
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64 Barlow Hall D2
65 Bressler Hall D3
66 Browning Hall D2
67 Burnside Hall B2
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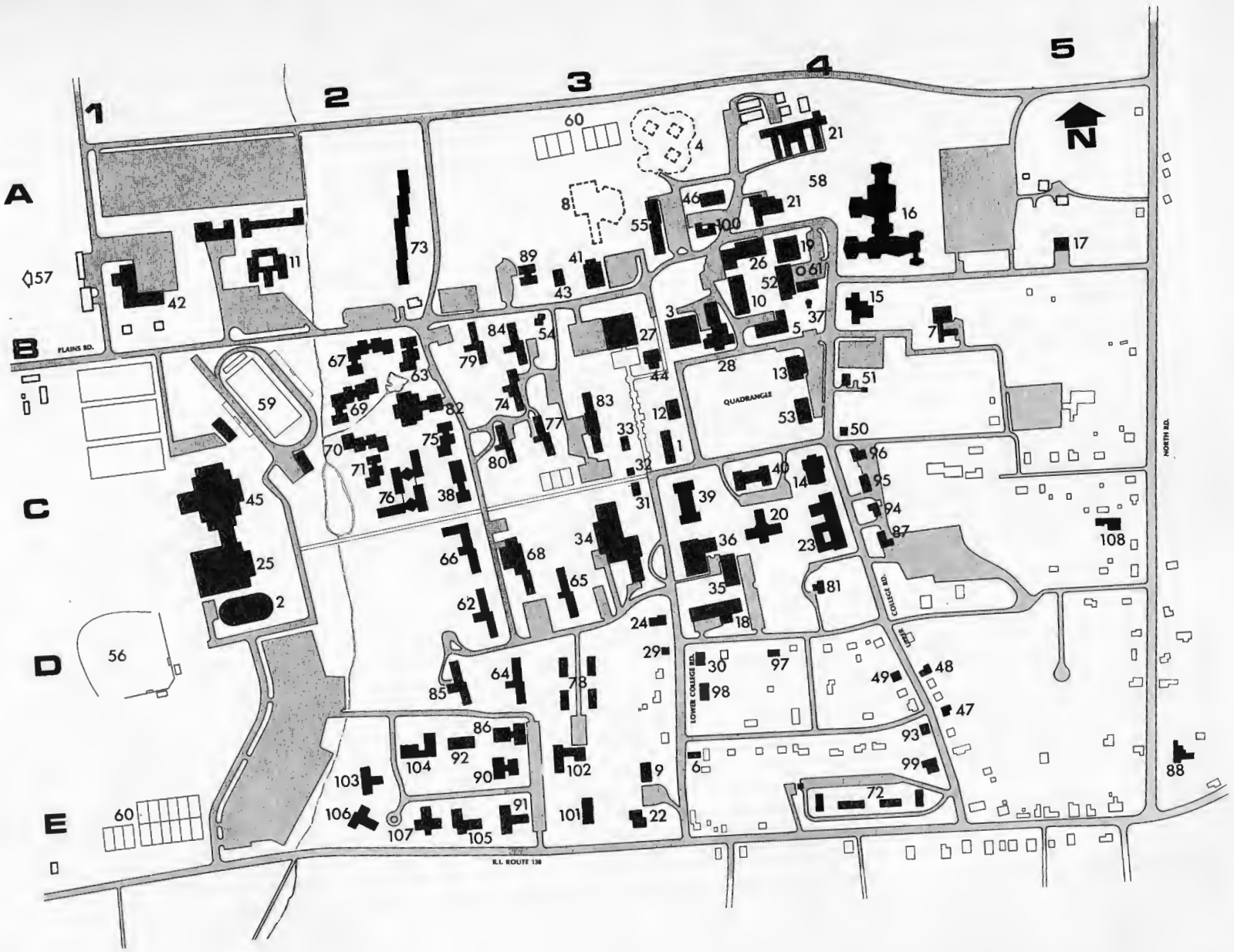
106 Sigma Delta Tau E2
107 Sigma Kappa E2


1
2
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5
A
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C
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E
N
PLAINS RD.
QUADRANGLE
LOWER COLLEGE RD.
COLLEGE RD.
NORTH RD.
R.I. ROUTE 138