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1965 SUMMER SESSION

University of Massachusetts Bulletin

EARLY REGISTRATION

Applications and Registration Forms received prior to May 28 for the first six-week session and prior to July 9 for the second six-week session will allow a student to proceed through registration in the minimum time.

Volume LVII FEBRUARY, 1965 Number 1

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UNIVERSITY OF MASSACHUSETTS

SUMMER SESSION

1965

TWO SIX-WEEK SESSIONS

June 14–July 23

July 26–September 3

SPECIAL SESSIONS IN

Engineering – Forestry – Home Economics – Nursing

ADMINISTRATIVE OFFICERS

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Helen Curtis, A.B., A.M. — *Dean of Women*

Hugh Montgomery, B.S., B.S. in L.S. — *Librarian*

CALENDAR FOR THE SUMMER SESSION

First Six-Week Session

Registration	June 14, Monday
Classes Begin	June 15, Tuesday

(All courses in the School of Education will meet during the late afternoon or evening during the week of June 15 to accommodate teachers who are still in service. A schedule will be available at registration).

Classes End	July 23, Friday

Second Six-Week Session

Registration	July 26, Monday
Classes Begin	July 27, Tuesday
Classes End	September 3, Friday

Final Examinations will be given during regular class time. They may take two class periods at the option of the instructor.

Registration for both main sessions and special sessions starting on either June 14 or July 26 will be held in the Student Union Ballroom. Registration for other summer courses will be at the Registrar's Office, South College, on the first day of the session. On June 14 and July 26 the following schedule will be followed (students may register *after* their assigned time, but not before)

Last name beginning with

A—Ax	Dr—Ez	La—Le	Ro—Rz	1:00 p.m.
B—Bj	F—Fz	Li—Mak	S—Sh	1:30 p.m.
Bl—Br	G—Go	Mal—Mc	Si—So	2:00 p.m.
Bu—Cap	Gr—Hal	Me—Mo	Sp—Sz	2:30 p.m.
Car—Cok	Ham—Hi	Mu—Oz	T—Tz	3:00 p.m.
Col—Cz	Hl—Jo	P—Pi	V—Wh	3:30 p.m.
D—Do	Ju—Kz	Pl—Ri	Wi—Z	4:00 p.m.
			(CLOSED)	5:30 p.m.

TO AVOID DELAYS ON REGISTRATION DAY, ALL STUDENTS SHOULD SEND IN THEIR APPLICATIONS, RESIDENCE FORMS, AND CERTIFICATES OF RESIDENCE (IF APPLICABLE) AT THE EARLIEST POSSIBLE DATE.

APPLICATION FORMS MAY BE OBTAINED FROM THE REGISTRAR'S OFFICE SOUTH COLLEGE, UNIVERSITY OF MASSACHUSETTS, AMHERST, MASSACHUSETTS.

THE UNIVERSITY RESERVES, FOR ITSELF AND ITS DEPARTMENTS, THE RIGHT TO WITHDRAW OR CHANGE THE ANNOUNCEMENTS IN THIS CATALOG.

General Information

The University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier. Now in its second century, the University is a member of the great community of Land Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry.

Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Masachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges—in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus consists of approximately 950 acres of land and 90 buildings. These structures—including classroom and laboratory facilities as well as dormitories and other units—extend in a great circle around the Campus Pond. This arrangement helps in maintaining the University as a community in which the individual holds central importance.

The community itself is located in a region that offers outstanding opportunities for a student's cultural development. Art exhibits, dramatic productions, concerts, and other activities in the Four College area are fully available to all students. In addition, the University maintains excellent recreational facilities as well as intercollegiate and intramural sports activities. The total program is dedicated to giving every student a chance to develop all of his capabilities under the best possible conditions. As the University moves into its second century, this will continue to be its prime objective.

Programs Offered

The Summer Session for 1965 at the University of Massachusetts will consist of two six-week terms. Registration day for the first six-week term will be June 14, with classes beginning on June 15 and ending on July 23. Registration day for the second six-week term will be on July 26 with classes beginning on July 27 and ending on September 3. Special courses run throughout the summer beginning on June 1. These are described in the Directory of Courses section of this bulletin. Students who are enrolled in one of the special courses which meet for one, two or three weeks normally will enroll for that course only. Most of these courses run for eight hours a day, so that dual registration is not possible. During the Summer Session most of the basic courses will be offered, enabling the student to make substantial progress toward his degree. With careful planning and regular attendance it is possible, through judicious use of Summer Session attendance, to obtain a bachelor's degree in three calendar years. The full facilities of the University—its professional teaching staff, classrooms, libraries, laboratories, dining rooms and dormitories—will be available this summer.

Entering Freshmen

The University of Massachusetts invites well-qualified high school graduates to begin their college education immediately after June, 1965, graduation. Because of the rising enrollment pressures on University facilities, the University believes that for certain students a summer program of studies might be helpful. For the good student who, perhaps, is already convinced his formal education will require graduate or professional studies after his undergraduate work, an early start may save him valuable time. Similarly, students in financial need may find it less expensive overall to complete their undergraduate work in as short a time as possible. Summer Session attendance can substantially reduce the time necessary to get a bachelor's degree. Students who wish to start their undergraduate work in the summer of 1965 *must apply for regular admission* in the spring. Further information will be sent to each applicant by the Registrar with the application form. June graduates of high schools, certified for college work, may begin required freshman courses including those in English, languages, natural and social sciences and physical education. (All entering freshmen will be required to take physical education in the summer for nonacademic credit.

This course is timed so that it will not conflict with a regular program of study and this credit may be taken in addition to the normal study load.) In addition, a limited number of June, 1965, high school graduates will be admitted to the University on the condition that they begin their college career in the Summer Session, take their vacation period during the fall semester, and return in the spring semester. Whereas the information in the preceding paragraphs refers to students regularly admitted for the fall, 1965, semester, this special program is intended for students who because of late application or for other reasons might not be admissible except on the summer-spring sequence. Following successful completion of the first year on this program, students may return to a fall-spring sequence. Further information on this program may be obtained from the Admissions Office, South College.

Programs in Education

Program for Teacher Certification. The School of Education is continuing its program of preparation toward teacher certification for undergraduates and graduates of colleges of liberal arts and science who wish to teach in either elementary or secondary schools and who find it difficult to take courses during the regular university year. University of Massachusetts undergraduates must obtain special prior permission to enroll in this program. The progam includes four professional courses in the summer followed by student teaching in public schools during the fall. In certain cases in emergency fields such as elementary education, foreign languages, mathematics and sciences it may be possible to arrange a year's internship with full pay in a public school in place of student teaching.

Study-Experience Program. Certain courses in the Gifted Child and Remedial Reading offer excellent opportunities to learn course content and then to apply it by direct contact with children in a workshop. These workshops involve working with individual or small groups of children in the facilities of the Mark's Meadow Laboratory School.

Special attention is drawn to the fact that in the Study-Experience Program a student must not take a workshop course unless he takes simultaneously or has taken the accompanying content course.

Specialization. Attention is also drawn to the areas of concentration in these particular fields (1) Audio Visual–420 (120), 421 (121), 422 (122), 366 (66), 666 (166), 850 (267) (2) Reading–261 (61), 561 (161), 785 (265), 782 (257), 783 (263), 784 (264), (3) Vocational Agiculture–372 (72), 672 (172), 375 (75), 675 (175), and the two areas under the new doctorate program (4) Guidance–705 (216), 917 (242), 277 (77), 577 (177), 912 (240), and (5) Administration–952 (213), 953 (209), 814 (283), 705 (216).

For a more detailed description of the various programs and for application materials the candidate should write to the Dean, School of Education, University of Massachusetts, Amherst, Massachusetts.

Special Program in Speech Therapy

The Department of Speech offers a special program in speech therapy of particular interest to present and prospective personnel in the areas of speech therapy, classroom teaching, medicine, nursing, guidance, and social service. Speech 282 (85), 582 (185) Introduction to Speech Pathology will be of special interest to fields allied to Speech in presenting needs of children and adults with significant speech handicaps. Students may enroll for Clinical Practicum which will present an unusual opportunity for speech and hearing therapists and advanced students in intensive supervised clinical practice.

High School Juniors

The University of Massachusetts annually invites high school students who have completed their junior year of high school with outstanding records and who are nominated by their high school principals to attend the Summer Session. In this way students may take work on the college level to enrich their high school education or to do work in a field they might not otherwise be able to cover. It is hoped that this program will help students enter any college with advanced standing.

While students in this category will ordinarily return to their own high schools to complete their senior year, some may wish to apply for admission as full-time students at the University in September, 1965 after successful completion of the summer program. The University does not guarantee admission at that time, but each case will be treated individually.

Students who are nominated by their high school principals are required to take the Scholastic Aptitude Test of the College Entrance Examination Board no later than May of their junior year.

Inquiries about and recommendations for this special program should be addressed to the Office of Admissions, South College, University of Massachusetts, Amherst, Massachusetts.

Credit for Summer Work

All courses carry degree credit and are equivalent in method, content, and credit to courses offered in the University during the regular academic year. Credits obtained in these courses are ordinarily accepted as transfer credits by other colleges and universities. Students desiring to pursue courses for the advanced degrees must seek the approval of the Dean of the Graduate School.

Thesis and Special Problems Credit

Graduate students contemplating special problems course work and thesis work during the Summer Session should seek the permission of their Department Heads and/or advisers and get approval from the Dean of the Graduate School. Such programs, although not listed by title and number in the Summer Session bulletin, are available by many departments on campus during the Summer Session.

Advance Enrollment
(Undergraduate and Graduate Students)

To expedite advance enrollment, or to obtain approval of admission, undergraduate students contemplating attendance should notify the Registrar as soon as possible. Graduate students must receive approval for admission from the Dean of the Graduate School. *Payment of fees and other costs prior to the registration date is strongly advised to insure enrollment in certain courses offered.*

Expenses

In order to avoid delays at registration, students are encouraged to register before May 28th by mail. This will allow the Treasurer's Office to prepare a fee statement for each student and will enable the student to pay his bill in advance. Students who do not preregister by May 28, should be prepared to pay their term bill *by personal check* at the time of registration. Students who do not register on or before the respective registration dates will be liable to payment of the regular late registration of $5.00. Students whose bills are not paid on the same dates for the same terms will be similarly liable for payment of the late payment fee of $5.00.

Tuition for residents of Massachusetts	$10.00 per credit
Tuition for non-residents of Massachusetts	15.00 per credit
(Physical Education will be billed = 1 credit)	
Health Fee*	
Special Sessions	1.50 per week
Main Sessions (6 weeks)	8.00 per session
Student Union Fee*	1.00 per week
Student Recreation Fee*	1.00 per ~~session~~

*These fees must be paid by all students, including commuters.

Board

Per week	$11.00

Monday through Friday ticket rate. Meals are also available on weekends at the Dining Commons or Student Union on a cash basis.

Rent

One week	$9.00
Two weeks	19.00
Three weeks	28.00
Six weeks	56.00

Books, Stationery and Supply Expenses

Students should be financially prepared to pay for necessary books and incidental supplies. Certain departments also make special charges for necessary laboratory supplies.

Special Examinations

Students receiving credit by special examination must pay $5.00 per credit before the examination may be taken.

Tuition and Fee Refunds

A student who leaves the University for any reason except as specified below before a term is completed will be granted a refund of tuition and fees in accordance with the following schedule:

a. During the first week—60%
b. During the second week—20%
c. After the second week—no refund

A student who makes an advance payment and then for any reason does not attend any part of the term at the University will be given a full refund of tuition and fees.

A student who is involuntarily called into military service before the completion of a term will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that term. If academic credit is given, there will be no refund.

A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Residence

New students who are residents of Massachusetts must file a certificate of residence with the Treasurer's Office in order to obtain the residential tuition rate. See the application form for the appropriate form.

Housing and Board

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus residence halls and be required to eat at University dining halls unless given permission to commute from their parents' homes. University board is optional for seniors and those over 21 and is available on a cash basis.

Residence halls will be open for occupancy at 2:00 p.m. on the day immediately preceding registration day and will close on the day following the final day of classes. Resident students will be housed in the new Orchard Hill residences—Dickinson House for women, Webster House for men. Room assignments will be available to pre-registered students prior to arrival. All students wishing room assignments must register 10 days prior to the first day of classes.

Student rooms are doubles and are provided with basic furniture, including spring bed and mattress, desk, chair, lounge chair, wastebasket, window drapes, and study lamp. Each student is responsible for providing an ash tray, if desired, and a pillow, bed linen, blankets and towels (linen may be contracted for through a private linen service).

Married students may write to the University Housing Office regarding accommodations.

Meal tickets for resident students provide board at the University's new South Dining Commons on a five day basis. Weekend board is available at the Dining Commons on a cash basis and cafeteria service is available in the Student Union coffee shop during the summer for other students desiring food service.

War Orphans

Students already enrolled under P. L. 634 should re-enroll for Summer Session. New enrollees should present certificate of eligibility. Students should see Mr. George Emery, Machmer Hall, for further information on this program.

University Health Service

Medical consultation and treatment are available to students at the University Infirmary, which is located east of French Hall and north of Brooks Dormitory. Nearly complete medical care is available on the campus, and all services furnished at the Infirmary are provided without additional cost to those who have paid the Student Health Fee.

Recreation and Entertainment

As the center of student activity and social life, the Student Union Building serves as a recreational center and common meeting place for the University Community. Recently refurbished, the Union provides well-lit, spacious lounges, a music room with listening booths, a piano practice room, a reading lounge with current magazines, meeting rooms (large and small), an information counter that doubles as a lost and found department, and a games area consisting of billiards, bowling alleys, table tennis, television, and card table games.

During the summer school sessions the Student Activities Office is fully staffed and located on the second floor of the Student Union. Indoor and outdoor extracurricular activities are designed to meet varying interests of individuals. Such features as band concerts, movies, dances and professional entertainment are scheduled during the summer. There is a fully developed Fine Arts series including a Summer Theater, Art Exhibits, a lecture series, and a concert series.

In addition, programs for recreation offering informal participation in sports such as swimming (outdoor and indoor), softball, tennis, and hiking are available. The natural environment in which the University is located affords almost unlimited facilities for combining recreational activities with academic and professional achievement.

Placement and Financial Aid Services

Scholarships: A limited number of scholarships are available to full-time students pursuing a degree at the University of Massachusetts. Applications may be obtained from Placement and Financial Aid Services, Machmer Hall, University of Massachusetts, Amherst, Mass. Completed forms should be returned for consideration no later than June 1, 1965.

Loans: Three types of loans are available to full-time students pursuing a degree at the University of Massachusetts—University Short-Term loans, Massachusetts Higher Education loans and National Defense Education Act loans. Students should see Mr. Robert J. Morrissey, Director, Placement & Financial Aid Services, Machmer Hall, for information on these programs.

Part-Time Student Employment: Campus part-time jobs are available for a limited number of students. Students seeking employment should see Mr. George E. Emery, Placement Officer for Men, and Miss Edith V. Antunes, Placement Officer for Women. Their offices are located in Placement and Financial Aid Services, Machmer Hall.

Regulations

Normal University regulations will apply during the Summer Session. The regulation concerned with adding and dropping courses will be as follows for the shorter Summer Session: Students may add or drop any course within four class days without penalty. Students may drop any course between the fourth day but before the eleventh day with a mark of W (Withdrawn) being recorded. After the tenth day any course dropped is recorded WF (Withdrew Failing). This grade is computed in the quality point average. An exception may be made to this rule in certain cases of protracted illness or serious personal or social problems. In such exceptions, a WP (Withdrew Passing) may be recorded if the student obtains (1) the favorable recommendation of the appropriate University Health or Student Personnel officer, (2) the approval of his advisor and the Provost, and (3) a certificate from his instructor that the student was passing the course at the time that he first contacted the University Health or Student Personnel officer with regard to his problem. An overload of courses is not considered sufficient grounds for dropping courses under this arrangement.

Motor Vehicle Regulations

Driving to and from classes is not permitted, and only students in the following categories will normally be authorized to possess and operate a motor vehicle in the Amherst area:

a. Commuting students who live over one mile from the center of campus during the academic year.

b. Students whose locomotive capability is so seriously impaired that they would be prevented from meeting regular class appointments without motor vehicle assistance.

c. Married students residing with spouse.

d. Students over 25 years of age.

e. Members of the senior class.

f. At the discretion of the Dean of Men or Dean of Women, students presenting extenuating circumstances in writing may be authorized to possess motor vehicles.

All motor vehicles must be registered with the University Police. In advance of arrival on campus, eligible students should obtain from the University Police Department a copy of the University regulations pertaining to possession, registration and operation of motor vehicles.

Directory of Courses

The information provided in this section will enable prospective students to choose a schedule of courses without reference to other material. *Building and room assignments will be available at registration.* Preceding the course title is the course number, which follows a definite pattern. This catalog represents the first use of the revised course numbering system approved by the Faculty Senate of the University. Both the old and the new numbers appear in this catalog, the new number first, followed by the old number in parentheses. The following information refers to the *new* numbers. Courses having numbers starting with 0 do not carry graduation credit (for instance Men's Physical Education 001). Courses numbered from 100 to 199 are freshman and sophomore courses. Courses numbered from 200 to 399 are junior and senior courses and may be followed by a second number, such as 252, 552 or 331, 631, indicating that these courses may also be taken for graduate credit with the completion of additional requirements as determined by the instructor. Courses numbered from 400 to 499 include professional courses which presume a bachelor's degree. Courses numbered from 700 to 999 are graduate level courses. In summary,

001–099 Non-credit courses, non-quality point courses, entrance deficiencies
100–199 Undergraduate credit only—Lower division
200–399 Undergraduate credit only—Upper division
400–499 Professional courses which presume a bachelor's degree
500–699 Graduate credit only, courses corresponding to 200–399 series
700–999 Graduate level courses

Following the course title is a code which indicates the credit for the course, the term in which it is taught and the letter indicating the hour of the day during which the course will be taught. A course listed as I, II will be offered during both terms. A course listed as I–II indicates a single course of twelve weeks duration. Note: Some courses meet for more than one period each day. Separate sections are listed on separate lines. A course listed as I A 3 cr will be offered during the first main session for three credits during the 7:45 a.m. to 9:05 a.m. block.

Courses meeting during terms other than the first and second main terms have the dates indicated in the description. They do not include an indication for hour meeting, since most meet eight hours a day.
The letter code for time periods is as follows:

A	7:45 a.m.– 9:05 a.m.
B	9:15 a.m.–10:35 a.m.
C	10:45 a.m.–12:05 p.m.
D	1:00 p.m.– 2:20 p.m.
E	2:30 p.m.– 3:50 p.m.
F	4:00 p.m.– 5:20 p.m.

College of Agriculture

Arless A. Spielman, *Dean*

DEPARTMENT OF AGRICULTURAL ENGINEERING

Agricultural Engineering 690 (190) Instrumentation I–II A 3 cr

The study of instruments as applied to research. Recorders, indicators, controllers, and transducers in general. Transducers will be covered in detail for ten or more variables including temperature and humidity. Special emphasis on applications and limitations. Twelve weeks.

Agricultural Engineering 761 (241) Control of Heat and Vapor Flow in Agricultural Buildings and Processes I–II B 3 cr

Application of mass flow theory to heat and vapor transfer. Thermal and vapor interchange between environment and livestock; design of control system. Twelve weeks.

DEPARTMENT OF ENTOMOLOGY

Entomology 126 (26) General Entomology I A, D 3 cr

A brief survey of the entire field of entomology: structure, development, classification, biology, and control of insects. Formation of an insect collection.

Entomology 279, 579 (79, 179) Animal Ecology II C, D 3 cr

Relations of animals to their physical and biotic environment, with observations and quantitative measurements of these factors and responses in the field and laboratory.

DEPARTMENT OF FORESTRY AND WILDLIFE MANAGEMENT

Forestry 221, 521 (51, 151) Timber Harvest and Conversion 4 cr

Timber harvesting, milling techniques, and markets; field trip of one week duration to observe processes in major wood industries. 4 40-hour weeks, June 28–July 23.

Forestry 225, 525 (55, 155) The Elements of Forest Mensuration 3 cr

The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data. 3 40-hour weeks. June 7–June 25.

College of Arts and Sciences

I. Moyer Hunsberger, *Dean*

DEPARTMENT OF ART

Art 100 (33) Basic Drawing I, II E&F 3 cr

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation.

Art 115 (14)—1 Introduction to Art I D 3 cr
2 Introduction to Art II C 3 cr

An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles.

Art 120 (31) Basic Design I, II A&B 3 cr

Two-dimensional design concepts arising out of work with specific problems in a variety of media.

Art 200, 500 (51, 151) Water Color I E&F 3 cr

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisite Art 100, 120 (33, 31).

Art 202, 502 (52, 152) Water Color I E&F 3 cr

Continuation of Art 200, 500 (51, 151). Prerequisite, Art 200, 500 (51, 151).

Art 220, 520 (53, 153) Oil Painting II E&F 3 cr

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 100, 120 (33, 31).

Art 222, 522 (54, 154) Oil Painting II E&F 3 cr

Continuation of Art 220, 520 (53, 153). Prerequisite, Art 220, 520 (53, 153).

Art 285, 585 (79, 179) Modern Painting and Sculpture I C 3 cr

Origin of modern movements in art, and an analysis of contemporary techniques and styles as they relate to society.

DEPARTMENT OF BOTANY

Botany 101 (1) Introductory Botany II B, D, E 3 cr

Structure, function and reproduction of plants, dealing primarily with the flowering plants. Basic biological principles are emphasized.

DEPARTMENT OF CHEMISTRY

Chemistry 111 (1) General Chemistry I Section 1 A, DE 3 cr
Section 2 B, DE

A study of fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry.

Chemistry 112 (2) General Chemistry II Section 1 A, DE 3 cr
Section 2 B, DE

A study of fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry.

Chemistry 127 (27) Analytic Chemistry II D, EF 4 cr

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Not acceptable for major credits except by special arrangement. Prerequisite, Chemistry 112 (2) or 114 (4).

Chemistry 160 (33) Organic Chemistry II B, DEF 4 cr

A short course intended to satisfy the requirements in this field for all students who do not specialize in chemistry. Prerequisite, Chemistry 112 (2).

Chemistry 213, 513 (83, 183) Instrumental Analysis II D, EF 3 cr

The theory and technique of colorimetry, spectrography, potentiometry, microscopy, polarography, chromatography and other special analytical methods. Prerequisites, Chemistry 210 (32), 286 (66).

Chemistry 261 (51) Organic Chemistry I B 3 cr

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 112 (2) or 114 (4). Concurrent enrollment in Chemistry 263, 264 (53, 54) is required.

Chemistry 262 (52) Organic Chemistry II B 3 cr

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 112 (2) or 114 (4). Concurrent enrollment in Chemistry 263, 264 (53, 54) is required.

Chemistry 112 (2) or 114 (4). Concurrent enrollment in Chemistry 263, 264 (53, 54) is required.

Chemistry 263 (53) Organic Laboratory I DEF 1 cr

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 261, 262 (51, 52).

Chemistry 264 (54) Organic Laboratory II DEF 1 cr

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 261, 262 (51, 52). A continuation of Chemistry 263.

Chemistry 290, 590 (76, 176) Advanced Physical Chemistry I A 3 cr

A survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas. Prerequisite, Chemistry 286 (66).

DEPARTMENT OF ECONOMICS

Economics 125 (25)—1 Elements of Economics I B 3 cr
—2 Elements of Economics II A 3 cr

A study of basic principles which govern the allocation of resources and behavior of the markets in the American economy.

Economics 126 (26) Problems of the National Economy II A 3 cr

The determinants of stability and growth of the national economy and of the world economy.

Economics 201, 401 (73, 173) Modern Economic Theory and Analysis II B 3 cr

Micro-economic analysis; type of markets; theory of the firm and the industry under a variety of market conditions; theory of business decisions under conditions of certainty.

Economics 214, 414 (56, 156) Business Fluctuations and Forecasting I A 3 cr

Nature and causes of business fluctuations; methods of forecasting; government policy for stability; utility of available statistical data as guides to private and public policy. Prerequisites, Economics 211 (53) or Finance 210 (55).

Economics 231, 531 (83, 183) Social Control of Business II D 3 cr

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation of public enterprises for competition.

Economics 266, 566 (82, 182) Economic Development I B 3 cr

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required.

Economics 771 (281) Economic Planning I C 3 cr

Various kinds of economic plans in effect or proposed. Appraisal of the techniques of economic planning.

Economics 892 (292) Seminar on Economic Policies II C 1–3 Cr

Selection and application of the tools of economic analysis to major problems of public policy.

DEPARTMENT OF ENGLISH

English 111 (1) English Composition I A 3 cr
English Composition I B 3 cr
English Composition I C 3 cr

Practice in exposition for college and professional use reinforced by adult readings and an introduction to literary criticism.

English 112 (2) English Composition II A 3 cr
English Composition II B 3 cr
English Composition II C 3 cr

Continuation of English III (1).

English 125 (25) Masterpieces of Western Literature I A 3 cr
Masterpieces of Western Literature I B 3 cr
Masterpieces of Western Literature I C 3 cr

An analysis of selected masterpieces designed to enrich the student's appreciation of literary values and to sharpen his understanding of abiding human issues.

English 126 (26) Masterpieces of Western Literature II A 3 cr
Masterpieces of Western Literature II B 3 cr
Masterpieces of Western Literature II C 3 cr

Continuaiton of English 125 (25).

English 201 (61) History of English Literature I C 3 cr

A study of the major phases of English literary history. Representative writers from Chaucer to Dryden will be examined.

English 202 (62) History of English Literature II B 3 cr

A study of representative English writers from the eighteenth century to the present. A continuation of English 201 (61) but may be elected independently.

English 221, 521 (67, 167) Shakespeare II B 3 cr

The dramatic art of Shakespeare as revealed in a study of approximately twenty plays.

English 225 (69) The Renaissance in England I D 3 cr

The non-dramatic literature of Tudor and Jacobean England in terms of emergent forms and literary ideas. Special attention to More, Spenser, Bacon and Thomas Browne.

English 255 (81) English Prose of the Romantic Period I C 3 cr

A study of the techniques and ideas of the chief prose writers (from 1798 to 1837) including Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincy and Carlyle.

English 256 (82) English Prose of the Victorian Period II C 3 cr

The chief Victorian prose writers (from 1837 to 1900), including Macaulay, Newman, Arnold, Mill, Ruskin, Huxley, and Pater.

English 264, 564 (85, 185) Modern European Drama (in Translation) II B 3 cr

Major modern dramatists beginnnig with Ibsen and including Chekhov, Pirandello, Strindberg, Giraudoux and others. Emphasis on comparative currents in various European nations.

English 266, 566 (89, 189) Modern Poetry II B 3 cr

An analysis of twentieth-century poetry developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson to those of the present.

English 275, 575 (57, 157) Major American Writers II B 3 cr

Selected major American writers of the 19th and 20th centuries, including Emerson, Hawthorne, Longfellow, Lowell, Henry James, Henry Adams, Fitzgerald, and Hemingway.

English 276, 576 (58, 158) Major American Writers I B 3 cr

Selected major American writers of the 19th and 20th centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Stephen Crane, Dreiser, Wolfe, and Faulkner.

English 337 (51) Advanced Expository Writing I C 3 cr

Practice in writing information and persuasive prose in the form of essays, reports, and news and feature articles. Primary emphasis on clarity and development of style.

English 341 (53) Creative Writing I C 3 cr

Intensive practice in writing prose fiction, with some attention to other forms, supplemented by discussion of ideas and techniques in contemporary literature. Prerequisite, a grade of A or B in English 111 (1) or 112 (2), or permission of the instructor.

English 345 (54) Creative Writing II B 3 cr

A continuation of English 341 (53), with emphasis upon fiction. Prerequisite, permission of the instructor.

English 525 (175) English Literature of the Restoration I C 3 cr

A study of approximately twenty works illustrating themes and techniques of Restoration Comedy, sentimental drama, and the Heroic play, with emphasis on Dryden, Wycherley, Congreve and Sheridan.

English 703 (202) Middle English I B 3 cr

A study of the language and of documents representing the chief dialects.

English 737 (204) Literature of the 17th Century II D 3 cr

Readings in 17th century prose from Hobbes to Bunyan, and in poetry from Donne to Milton; analysis of the more significant areas of thought and style.

English 740 (205) Literature of the Restoration and 18th Century I D 3 cr

Readings in English poetry and prose from Dryden to Burns, emphasizing the major writers and including representative plays.

English 746 (207) Literature of the Victorian Age I C 3 cr

Readings in the chief poets and prophets of the Victorian Age, with emphasis on Browning, Tennyson, Carlyle, Newman, Mill, Ruskin, Arnold and Pater.

English 755 American Realism II B 3 cr

The development of American Realism from 1865 to 1914, stressing Mark Twain, Henry James, Howells, and Henry Adams.

English 870 (232) Seminar: English Literature (to be announced) II B 3 cr

English 870a (232a) Seminar: English Literature (Scottish) I B 3 cr

English 870b (232b) Seminar: English Literature (Ben Jonson) I B 3 cr

English 871 (233) Seminar in the English Language (American Dialect) I 3 cr

English 872 (231) Seminar: American Literature (Robert Frost) II C 3 cr

Note: All seminars are by permission of the instructor.

DEPARTMENT OF GEOLOGY

Geology 101 (1) Physical Geology I B, DE 3 cr

The nature and origin of the landscape features of the earth and their underlying rocks and structures, including the work of rivers, waves and currents, wind, and glaciers, and the role of earthquakes, volcanoes, and the processes of mountain building.

Geography 135 (35) Fundamentals of Geography I B, EF 3 cr

A systematic introduction to the study of physiography, climate, mineral resources, and a man's use of his physical environment.

Geography 181 (81) World Political Geography I C 3 cr

The human and physical environments in which states exist and the problems which these environments pose in current and likely future behavior.

Geology 389 Field Problems I–II 2–6 cr

Directed field study and/or research. Prerequisites, Geology 130 (33), 220 (56), and approval of faculty advisor and department head. Class hour by arrangement.

DEPARTMENT OF GERMAN-RUSSIAN

German 009 German Graduate Reading Course I B 0 cr

Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of German required.

German 101 (1) Elementary German I A, D 3 cr

Conversation, reading, grammar, and composition.

German 102 (2) Elementary German II A, D 3 cr

Conversation, reading, grammar, and composition.

German 107 (7) Intermediate German I C 3 cr

Reading, conversation, composition. Grammar review. Prerequisites, German 101 (1), and 202 (2).

German 108 (8) Intermediate German II B 3 cr

Reading, conversation, composition. Grammar review. Prerequisites, German 101 (1) and 102 (2).

German 254 (67) Twentieth Century Prose I C 3 cr

Main literary currents from Nietzsche to Hesse. Particular attention to the works of Thomas Mann, Kafka and Werfel. Prerequisites, German 107 (7) and 108 (8).

German 267 (67) German Masterpieces in Translation I B 3 cr

Literary works ranging from the Middle Ages to the present. Admission by permission of department.

Russian 101 (1) Elementary Russian I B, C 3 cr

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training.

Russian 102 (2) Elementary Russian II B, C 3 cr

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training.

Russian 107 (7) Intermediate Russian I C 3 cr

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites, Russian 101 (1) and 102 (2).

Russsian 108 (8) Intermediate Russian II C 3 cr

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites, Russian 101 (1) and 102 (2).

DEPARTMENT OF GOVERNMENT

Government 100 (25) American Government I, II C 3 cr

Political institutions and processes, as illustrated by the American government system.

Government 150 (26) European Governments I, II B 3 cr

A survey of the politics and governmental institutions of Great Britain, France, Germany and Soviet Russia.

Government 202, 502 (72, 172) I A 3 cr

A study of the development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present.

Government 236, 536 (57, 157) The Government and Politics of Russia II B 3 cr

Organization and functioning of the Communist party; the administrative process; terror as a system of power; Soviet foreign policy, its formation and execution.

Government 254, 554 (53, 153) International Relations II C 3 cr

The nation-state system and conceptions of national interest in modern world politics. Forms and distribution of power, making of foreign policy and adjusting international conflict.

Government 290, 590 (65, 165) Constitutional Law I C 3 cr

An historical study of the United States Constitution as interpreted by decisions of the Supreme Court.

Government 321, 621 (55, 155) The Presidency in American Government II C 3 cr

Constitutional and political aspects of the presidency in legislation, administration and the conduct of foreign and military affairs. The President as party leader.

Government 391, 691 (95, 195) Seminar II C

A study of special problems in the field of government.

Government 700 (200) Special Problems I 1–6 cr

Class hour by arrangement.

DEPARTMENT OF HISTORY

History 100 (5)—Modern European Civilization to 1715 I A 3 cr
Modern European Civilization to 1715 I B 3 cr
Modern European Civilization to 1715 I C 3 cr

The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently.

History 101 (6)—Modern European Civilization Since 1715 II A 3 cr
Modern European Civilization Since 1715 II B 3 cr
Modern European Civilization Since 1715 II C 3 cr

History 150 (25) The Development of American Civilization to 1877 I B 3 cr

A survey of the American national growth. Either semester may be elected independently.

History 150 (25) The Development of American Civilization to 1877 II C 3 cr

A survey of the American national growth. Either semester may be elected independently.

History 151 (26) The Development of American Civilization Since 1877 I C 3 cr

The Development of American Civilization Since 1877 II B 3 cr

A survey of the American national growth. Either semester may be elected independently.

History 219 (66, 166) The History of Modern Germany I C 3 cr

The evolution and development of Germany since the accession of Frederick the Great with emphasis upon diplomatic, political, military and social-economic trends and problems.

History 320 (87, 187) American Colonial History to 1863 I A 3 cr

Discovery and exploration; early European settlements; systems of political and economic control; religious and intellectual development; and Anglo-French rivalry.

History 321 (88, 188) The American Revolutionary Era II B 3 cr

Coming of the Revolution; War for Independence: Evolution of American Federalism.

History 332 (71, 171) The South in American History II C 3 cr

From early settlement to contemporary regional problems.

History 703 (201) Literature of American History II B 3 cr

Interpretations of major themes as developed in the works of leading historians. This course will treat the period through the Civil War.

History 704 (202) Literature of American History I B 3 cr

Interpretations of major themes as developed in the works of leading historians. This course will treat the period from 1865 to the present.

History 723 (223) European Historiography I A 3 cr

European historians and schools of historical interpretation from the Greeks to the Enlightenment.

History 759 (259) European Diplomacy Between the Wars I C 3 cr

Training in historical research and an introduction into the relationships among European nations in a critical period.

DEPARTMENT OF MATHEMATICS

Mathematics 111 (1) Introductory Mathematics I A 3 cr

Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions, by the methods of algebra and analytic geometry.

Mathematics 112 (Part 2 and 22) Finite Mathematics I B 3 cr
Finite Mathematics II C 3 cr

Probability, vectors, and matrices, and an introduction to linear programming. Prerequisite, Mathematics 111 (1).

Mathematics 121 (7) Algebra and Trigonometry II B 3 cr

Functions, quadratic equations, logarithms, variation, determinants of the second and third orders, and plane trigonometry. Students who have entrance credit in trigonometry cannot take Mathematics 121 for University credit.

Mathematics 123 (9) Analytic Geometry and Calculus I. I A 3 cr

Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivatives, differentiation of algebraic functions, tangent and normal lines.

Mathematics 124 (10) Analytic Geometry and Calculus II. I A 3 cr
Analytic Geometry and Calculus II. II D 3 cr

Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Mathematics 123 and Trigonometry.

Mathematics 135 (5) Introductory Engineering Mathematics I A 3 cr

Introduction to analytic geometry and calculus.

Mathematics 136 (6) Introductory Calculus for Engineering II B 3 cr

Continuation of Mathematics 135 (5). Prerequisite, Mathematics 135 (5).

Mathematics 185 (31) Applied Calculus for Engineers I B 3 cr

Parametric equations, vectors, determinates partial differentiation, multiple integrals. Prerequisite, Mathematics 136 (6).

Mathematics 186 (32) Applied Calculus for Engineers II A 3 cr

Infinite series, expansion of functions, hyperbolic functions, differential equations. Prerequisite, Mathematics 185 (31).

Mathematics 221 (71) Vector Analysis I C 3 cr

The algebra and calculus of vectors. Application to physics and to other fields will be considered. Prerequisite, Physics 104 or 106; corequisites, Mathematics 174 or 185.

Mathematics 325 (85) Introductory Modern Analysis I. II E 3 cr

Real and complex numbers. Basic topography of the real number system. Limit concept and continuity. Differentiation. Partial differentiation. Prerequisite, Mathematics 174.

Mathematics 371 (88) Sets and Ordered Structures II C 3 cr

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal, ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic. Prerequisite, Mathematics 325 or permission of the instructor.

DEPARTMENT OF MUSIC

Music 101 (1) Music Appreciation—Introduction to Music I, II B 3 cr

Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and the cultural significance of representative works from the ninth century to the present are studied and discussed.

Music 113 (5) Intermediate Music Theory I B 3 cr

Music 114 (6) Intermediate Music Theory II B 3 cr

Studies in harmony and modulation including sight singing and ear training. Analysis of musical form and practice in writing original compositions. Prerequisite, Music 112 or its equivalent.

Music 121 (13) Applied Music—Individual Instruction I 1 cr

Class hour by arrangement.

Music 122 (14) Applied Music—Individual Instruction II 1 cr

A study of literature and in instrumental technique or voice production. Prerequisite, intermediate level of proficiency as determined by examination, 7½ hours or its equivalent. By arrangement.

DEPARTMENT OF PHILOSOPHY

Philosophy 105 (25) Introduction to Philosophy I, II B 3 cr

An introduction to some of the most important of the general questions, ideas, theories and methods of inquiry which have given direction to Western thought.

Philosophy 110 (42) Ethics II C 3 cr

An examination of classical and contemporary theories concerning policy formation and the justification of personal decision and the ways of life.

Philosophy 125 (31) Introduction to Logic I A 3 cr

An inquiry into the nature of critical thinking, including (1) the functions of language, (2) the structure of deductive arguments, (3) a glimpse at inductive methods.

Philosophy 750 (266) Philosophy of Education I B 3 cr

An evaluation of various educational theories and practices on the different levels viewed in the light of its historical perspective and contemporary thought. Prerequisite, permission of the instructor.

DEPARTMENT OF PHYSICS

Physics 103 (3) Introductory Physics I A&B 4 cr

Mechanics, Sound, Heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for premedical, predental, preveterinary, and some science major students. Prerequisites, Mathematics 123 (9) previously or concurrently for Physics 103 (3).

Physics 104 (4) Introductory Physics II A&B 4 cr

A continuation of Physics 103 (3). Prerequisite, Physics 103 (3).

Physics 105 (5) General Physics II A&DE 3 cr

Mechanics. For students primarily interested in physics, engineering, chemistry or mathematics who, in general, have had high school physics. Prerequisite, Mathematics 135 (5) previously or concurrently.

Physics 106 (6) General Physics I A&DE 3 cr

Heat, electricity, and magnetism. Prerequisites, Mathematics 135 (5); Physics 105 (5); Mathematics 136 (6) concurrently.

Physics 519 (180) Electronics Instrumentation for Scientists I DEF 3 cr

A laboratory oriented course designed for physicists and chemists. The course begins with basic electronic principles and leads systematically through servo systems, operational amplifiers for measurement and control digital circuits and other devices used in laboratory practice. Prerequisite, permission of the instructor.

Physics 719 (219) Nuclear Physics I–II B 3 cr

Course devoted to basic concepts of nuclear physics, instruments and methods. Topics to be covered include natural radioactivity, nuclear radiations—their properties and interaction with matter, nuclear radiation detectors, electrostatic magnetic analyzers, mass spectrometry, charged particle accelerator, elementary discussion of L and B decay, nuclear isomerism, internal conversion, nuclear reaction, neutron physics, fission, nuclear spin and magnetic movements, cosmic rays and elementary particles. Prerequisite, Physics 585, 586 (285, 286).

DEPARTMENT OF PSYCHOLOGY

Psychology 101 (1) General Psychology I B 3 cr

An introduction to the principles and study of behavior. Topics considered include development of behavior, sensation, learning, thinking, motivation, intelligence, attitudes, and personality.

Psychology 261 (65) Child Psychology I B 3 cr

The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 281 (61) Social Psychology I D 3 cr

Development, interrelationships, and functions of attitudes. Emphasis upon religions and political behavior, psychoanalytic and behavioristic theories of prejudice, attitude measurement, propaganda, group persuasion. Survey project. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 301 (56) Educational Psychology I A 3 cr

Psychological facts and principles of development, learning, and measurement as applied to educational situations. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 311 (81) Psychological Tests II C 3 cr

Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationals, construction, characteristics, uses and evaluation are emphasized. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 321 (79) Personality II B 3 cr

An introduction to the scientific study of personality. Topics include psychoanalytic and cognitive approaches, the influence of social-cultural conditions, personality types and learning. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 325 (83) Abnormal Psychology I C 3 cr

The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics. Prerequisite, Psychology 101 (1) or 105 (5).

Psychology 871 (283) Practicum I A 3–12 cr

Practice in the application of psychological techniques to the following areas of psychology: child, clinical, counseling, industrial, and social.

Psychology 891 (257) Seminar I 2 cr

Selected topics of current significance in psychology. Research studies will be analyzed and theoretical advances explored. Prerequisite, permission of the instructor. Class hour by arrangement.

DEPARTMENT OF ROMANCE LANGUAGES

French 009 French Reading for Graduate Students I A 0 cr

French 101 (1)—Elementary French I A 3 cr
Elementary French I C 3 cr

For those who have had no previous creditable training in French. Intensive practice in the four language skills.

French 102 (2)—Elementary French II A 3 cr
Elementary French II C 3 cr

A continuation of French 101 (1).

French 107 (7)—Intermediate French I A 3 cr
Intermediate French I C 3 cr

An intensive review and study of the language. Readings in modern French literature. Prerequisite, French 102 (2) or equivalent.

French 108 (8)—Intermediate French II B 3 cr
Intermediate French II C 3 cr

A continuation of French 107 (7).

French 220, 520 (77, 177) The French Renaissance II C 3 cr

A study of the major writers of the 16th Century with appropriate attention to important humanistic and artistic developments.

French 265, 565 (59, 159) Major Figures of the Contemporary French Novel I C 3 cr

A study of the novel of social concern, the novel of personal and aesthetic concern, and the novel concerned with the human condition.

Spanish 101 (1)—Elementary Spanish I A 3 cr
Elementary Spanish I B 3 cr

For students with no previous creditable training in Spanish. Intensive practice in the language skills. To fulfill the language requirement, upon completion of this course most students are required to continue by taking Spanish 107 (7) and 108 (8).

Spanish 102 (2)—Elementary Spanish II A 3 cr
Elementary Spanish II B 3 cr

A continuation of Spanish 101 (1).

Spanish 107 (7)—Intermediate Spanish I A 3 cr
Intermediate Spanish I C 3 cr

For upperclassmen who have completed Spanish 101 (1), 102 (2) and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 108 (8) fulfill the language requirement.

Spanish 108 (8)—Intermediate Spanish II A 3 cr
Intermediate Spanish II C 3 cr

A continuation of Spanish 107 (7).

Spanish 126 (26) Introduction to Spanish Literature II B 3 cr

Selected great works of Spanish literature studied in complete text in literary-historical perspective. Conducted in Spanish. Prerequisites, Spanish 108 (8) or permission of the department.

Spanish 745 (272) Lope and Calderon II C 3 cr

The apogee of the Golden age.

Spanish 785 (290) Dario and the Modernists I B 3 cr

The Modernist movement in Spanish-America with intensive study of the poetry of Rubin Dario.

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

Sociology 101 (1) Introduction to Sociology I, II A 3 cr

A study of the social order, and of the individual considered as a member of his various groups.

Sociology 251, 551 (51, 151) Urban Sociology II A 3 cr

A study of urban American social conditions with reference to population, ecology, health, and the classically defined institutional complexes and their problems of adjustment.

Sociology 256, 556 (56, 156) Race Relations I C 3 cr

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration of similar problems in Africa and Asia. Prerequisite, Sociology 101 (1).

Sociology 257, 557 (57, 157) The Family II C 3 cr

The development of the customs of courtship and marriage of the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 101 (1).

Sociology 275, 575 (75, 175) Social Problems I D 3 cr

The incidence, distribution, and interrelations among the major types of social tensions in human societies. Various theories of causation. Research projects and field trips. Prerequisite, Sociology 101 (1)

Sociology 278 (78) Criminology I A 3 cr

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite, Sociology 101 (1).

Sociology 282 (82) Sociological Theory I C 3 cr

An examination of contributions of European and American writers who have concerned themselves with theories of the origin, growth, and development of human social organization. Prerequisite, Sociology 101 (1).

Anthropology 104 (4) Cultural Anthropology II C 3 cr

An introduction to social and cultural anthropology dealing with variations among societies in technology and economics, social and political organization, art, religion and ideology.

Anthropology 364, 664 (64, 164) Problems in Anthropology II D 3 cr

Examination of selected problems in physical anthropology, archaeology, social and cultural anthropology. Illustrative material will be drawn from both non-literate and peasant societies. Prerequisite, Anthropology 104 (4).

DEPARTMENT OF SPEECH

Speech 101 (3) Oral Communication I–II A 2 cr
Oral Communication I–II B 2 cr
Oral Communication I–II C 2 cr

Introductory instruction and practice in oral self-expression; literary interpretation and public speaking. Twelve weeks.

Speech 282, 582 (85, 185) Introduction to Speech Pathology I B 3 cr

A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy. Observation; field trips. Prerequisite, Psychology 101 (1).

Speech 285, 585 (84, 184) Audiology II B 3 cr

A study of the symptoms and causes of hearing loss; special attention to diagnostic test procedures. Supervised practice in audiometric testing. Observation; field trips. Prerequisite, Psychology 101 (1).

DEPARTMENT OF STATISTICS

Statistics 121 (21) Elementary Statistics I A 3 cr

The nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation time series.

Statistics 251 (51) Elementary Statistics II B 3 cr

The analysis of variance; the design of experiments; sample surveys, multiple regression, non-parametric tests.

Statistics 255 (55) Introductory Statistics I. I B 3 cr

Descriptive statistics, mathematical properties of distribution functions, statistical inference, relationships between variables.

Statistics 261 (61) Design of Experiments (methodology) II A 3 cr

Purpose of experimental designs and their basic assumptions; individual comparisons components of error, confounding; applications from various fields. Prerequisite, Statistics 121 (21) or 255 (55).

DEPARTMENT OF ZOOLOGY

Zoology 101 (1) Introductory Zoology I C, D, E 3 cr

Principles of biology with special reference to the cell and its metabolism and to the anatomy, physiology and evolution of the major groups of the animal kingdom.

School of Business Administration

H. B. Kirshen, *Dean*

DEPARTMENT OF ACCOUNTING

Accounting 125 (25) Introduction to Accounting I. I A 3 cr

An introduction to the principles underlying the collection, recording, and interpretation of accounting data.

Accounting 126 (26) Introduction to Accounting II. II A 3 cr

A continuation of Accounting 125 (25) with major emphasis on accounting for corporations, partnerships and manufacturers. Prerequisite, Accounting 125 (25).

Accounting 261 (61) Intermediate I. I B 3 cr

A two semester course developed to meet the needs of two groups of students: (1) the general business student for whom the intermediate course may be the final course in accounting, and (2) the accounting major as a basis for further specialized courses.

Accounting 262 (62) Intermediate II. II B 3 cr

A continuation of Accounting 261.

Accounting 263 (63) Cost Accounting I C 3 cr

Methods of cost determination for job order, process, and standard cost systems, with emphasis on cost control and interpretation. Prerequisite, Accounting 126 (26).

Accounting 273 (73) Federal Taxes II C 3 cr

A study of federal income tax laws and regulations as they affect individuals; the preparation of tax returns. Prerequisite, Accounting 125 (25) or 27.

DEPARTMENT OF GENERAL BUSINESS AND FINANCE

Finance 201 (65) Corporation Finance I D 3 cr

Corporate financial behavior: Appraisal of factors affecting decision-making regarding the sources and application of funds. Introduction to the capital budgeting and cost of capital problem. Prerequisite, Accounting 125 (25) or consent of instructor.

Finance 210 (55) Financial Institutions II A 3 cr

The American financial system and the functional relationships between financial institutions and the economic activities of the households, business firms

The development of a general theory of investment management and its application to individual and institutional investors including Computer Portfolio Management. Prerequisites, Finance 210 (55), and Finance 201 (65) or consent of the instructor.

General Business 230 (76) Life Insurance I C 3 cr

The application of life insurance to the problems of family security, business security, investments, and estate protection.

General Business 240 (65) Principles of Transportation II B 3 cr

The development and growth of transportation as a function of production of goods; rate structures and transportation laws as they affect the relationships between carriers and shippers.

General Business 260 (71) Business Law I. I B 3 cr

The law of contract and sales.

General Business 261 (72) Business Law II. II D 3 cr

Th law of agency and negotiable instrument and time permitting, bankruptcy and wills. Prerequisite, General Business 260 (71).

General Business 270 (68) Real Estate II C 3 cr

A comprehensive survey of real estate principles and practices; the mechanics of the real estate market and the economic and legal factors that influence it.

DEPARTMENT OF MANAGEMENT

Management 201 (61) Principles of Management I C 3 cr

The basic course dealing with the fundamental principles and practices of the managerial process in the business enterprise.

Management 214 (64) Personnel Management II D 3 cr

The principles and policies followed by management in the procurement, development, direction and control of personnel.

Management 371 (92) Problems of Management II B 3 cr

An integrating course dealing with the problems of management embracing the organic management functions, using cases for analysis and systematic decision-making practice. Prerequisite, Management 201 (61) and senior class standing.

Management 565 (67, 167) Management—Union Relations I B 3 cr

A comparison of union-management objectives, functions and structure, including the scope and impact of union penetration into areas of managerial authority. Prerequisites, Management 201 (61) or 214 (64).

DEPARTMENT OF MARKETING

Marketing 254 (54) Sales and Sales Management I A 3 cr

The principles and practices of selling; the management of sales personnel and the control of sales operations.

Marketing 262 (62) Marketing Research I C 3 cr

The aims, sources and fact-gathering methods of marketing research activities. Individual case study and research projects.

Marketing 271 (71) Retailing II C 3 cr

Basic concepts of retailing with case studies of retail management problems.

Marketing 273 (73) Advertising II A 3 cr

The techniques and media of advertising, its services to business and the organization and economic functions of the advertising industry.

Marketing 276 (76) Wholesaling I B 3 cr

A study of wholesale marketing with emphasis on the marketing activities of manufacturers and wholesale middlemen in the industrial goods area. Prerequisite, Marketing 253 (53) or the equivalent.

School of Education

A. W. Purvis, *Dean*

Education 251, 551 (51, 151)—251 History of Education I II B 3 cr
551 History of Education I C 3 cr
551 History of Education II B 3 cr

Educational movements are traced from early Greece to the present with the aim of better understanding of modern problems.

Education 260, 560 (60, 160) Elementary School Curriculum II B 3 cr

The elementary school curriculum from the standpoint of content and methodology. Emphasis placed on the unit method and the activity programs. Prerequisite, Education 251 (51) and 264 (64).

Education 261, 561 (61, 161) Teaching of Elementary Reading and Language Arts I A 3 cr

Discussions and demonstrations of principles and effective practices in the teaching of all phases of the language arts. Prerequsite, Education 251 (51) and 264 (64).

Education 262, 562 (62, 162) Teaching of Elementary Arithmetic and Science II A 3 cr

Accepted methods and materials in the teaching of arithmetic and science in the elementary grades will be studied and demonstrated. Prerequisite, Education 251 (51) and 264 (64).

Education 264, 564 (64, 164) Principles of Elementary Education I B 3 cr

The aim, organization, program, pupil population, of the elementary school and the relationship between elementary and secondary school are the areas of concentration.

Education 277, 577 (77, 177) Principles of School Guidance II C 3 cr

The need for guidance in the schools, the nature of guidance, and an overview of an adequate guidance service for a school system.

Education 310, 610 (52, 152) Principles and Methods of Teaching II A 3 cr

By means of discussion, case studies, and current educational literature, teaching ideals and procedures are set up and applied to the major teaching fields. Prerequisite, Education 251 (51) and Psychology 301 (56).

Education 311, 611 (88, 188) Secondary School Curriculum II C 3 cr

Learning materials and activities and their organization in various teaching fields. Prerequisite, Education 251 (51) and Psychology 301 (56).

Education 353, 653 (53, 153) Educational Tests and Measurements II A 3 cr

The most serviceable tests for measuring achievement are considered; test construction, administration, scoring, and interpretation of results are studied and applied to the classroom.

Education 366, 666 (66, 166) Preparation and Use of Audio-Visual Materials I A 3 cr

Study is made of available machines, materials and techniques for teaching groups of students.

Education 372, 672 (72, 172) Vocational Education in Agriculture I A 3 cr

A survey of vocational agricultural education and an introduction to teaching of vocational agriculture at the secondary level.

Education 375, 675 (75, 175) Technique of Teaching Vocational Agriculture I C 3 cr

The materials, methods, policies, and special requirements of Massachusetts for teaching vocational agriculture and related subjects in high schools and in special county agricultural schools. Prerequisite, Education 372 (72), or permission of the instructor.

Education 420 (120) Construction of Audio-Visual Aids II C 3 cr

Designed to help teachers and audio-visual specialists to prepare audio-visual materials for use in an educational program. Students will prepare slides, graphics, recordings, still pictures, motion pictures. Prerequisite, Education 666 (166).

Education 421 (121) Teaching With Television and Radio II B 3 cr

Provides the classroom teacher with an understanding of television and radio so that he can participate in the preparation, utilization, and evaluation of educational programs using these media. Prerequisite, Education 666 (166).

Education 430 (130) Elementary School Science I A 3 cr

Methods and materials of instruction.

Education 431 (131) Elementary School Social Studies I A 3 cr

Recent findings in research in terms of their implications for the elementary school social studies program.

Education 445 (145) The School Adjustment Counselor I C 3 cr

Principles and practices of school adjustment counseling.

Education 705 (216–2) Seminar: Gifted I B 3 cr

An exploration of various methods of giving enriched academic experiences to the gifted in public schools. Prerequisite, teaching experience.

Education 715 (215–1) Modern Math Workshop II B 3 cr

Practical experiences with small groups of elementary children in the application and adaptation of modern math concepts to classroom instruction.

Education 716 (215–2) Workshop: Gifted I C 3 cr

Designed to include opportunity for work with selected children of upper elementary levels. Discussion sessions will relate practical experience to theory and to research studies.

Education 717 (215–3) Workshop: Educational Administration 3 cr

Primarily for principals and personnel supervisors using simulated materials for decision experiences. June 21–June 26.

Education 718 (215–4) Workshop: Educational Administration 3 cr

Oriented to chief administrative problems using simulated materials and decision making techniques. July 19–July 24.

Education 719 (215–5) Workshop: Remedial Reading I C 3 cr

This may be taken in conjunction with Techniques in Remedial Reading Education 785 (265) by a selected group of experienced teachers. It involves working with individual elementary school pupils in the Remedial Reading Clinic. Prerequisite, Education 560 (160).

Education 766 (289) Curriculum Development: Theory and Research I C 3 cr

Curriculum design and theory, the dynamics of change, current research studies and experimental programs, and theories of teaching and learning as they affect curriculum design. Prerequisites, Education 511 (188) or 560 (160).

Education 767 (285) Developments in Elementary School Mathematics I B 3 cr

A critical evaluation of the current literature, research and studies in the curriculum and teaching of elementary school mathematics. Prerequisite, Education 562 (162).

Education 768 (258) Implementing the Elementary School Program II A 3 cr

Curriculum design and classroom organization, including practices in planning, presenting, and evaluating programs involving integration of skills and activities for the various grade levels. Prerequisite, Education 677 (177), Psychology 665, and background in Psychology.

Education 783 (263) Diagnosis of Reading Difficulties II A 3 cr

Theory and interpretation of diagnostic procedures to develop a background of information in the diagnosis and treatment of reading difficulties. Prerequisite, Education 561 (161).

Education 785 (265) Techniques in Remedial Reading I B 3 cr

Methods and materials in diagnosis and remedial instruction. Prerquisite, Education 561 (161).

Education 812 (280) Developments in Secondary School English II C 3 cr

A critical evaluation of the current literature, yearbooks, research, and experiments in the curriculum and teaching of English. Prerequisite, Education 510 (152).

Education 813 (281) Developments in Secondary School Social Studies I B 3 cr

A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school social studies. Prerequisite, Education 510 (152).

Education 850 (267) Auto-Instructional Devices and Programmed Learning I C 3 cr

Theory and practice of programmed learning for typical school subjects. Each student will set up objectives and construct a program for a unit of work. Implications for future use in education will be considered. Prerequisite, Education 666 (166).

Education 880 (231) Contemporary Problems in Education I A 3 cr

An intensive examination of several major issues confronting American education. Evaluation, and criticism of proposals being offered for their solution.

Education 884 (235) Educational Sociology I A 3 cr

Consideration of sociological and anthropological concepts and current studies in terms of their application to the American school system and its problems. Prerequisite, Sociology 101 or consent of the instructor.

Education 887 (232) History of American Education II C 3 cr

The development of American education in the context of American intellectual thought.

Education 913 (241) Administration of School Guidance Services II B 3 cr

Operative framework of guidance programs in terms of personnel, functions, physical facilities, institutional integration, finance and laws. Prerequisites, Education 677 (177), teaching experience and permission of the instructor.

Education 917 (242) Elementary School Guidance I A 3 cr

A study of skills, techniques, and objectives of guidance in the elementary school, emphasizing those aspects of guidance of particular interest to the elementary school teacher or guidance person. Prerequisites, Education 677 (177), Psychology 665, and background in Psychology.

Education 950 (205) Fundamentals of Educational Administration I B 3 cr

Introductory course in general school administration, the relation of public education to the cultural pattern, organization, and practices in school administration.

Education 955 (214) Community Relations for School Personnel II A 3 cr

The development of good public relations policies and the techniques of assisting lay people in interpreting school activities, policies, and objectives.

Education 957 (219) Principles of School Law I C 3 cr

The legal basis of school operation, cases in school law, the role of the attorney general and school solicitor in school law interpretation, and school operation in relation to federal, state, and local environment. Prerequisite, Education 950 (205).

Education 958 (226) School Personnel Administration II C 3 cr

The leadership role in staff performance and duties, planning and promotion of continuous programs of inservice training, recruitment and development of personnel, internal organization and administration. Prerequisite, Education 950 (205).

Education 991 (291) Educational Research II C 3 cr

The principles and methods of research with special emphasis upon the technique used in Education. Statistics are studied chiefly from the standpoint of reporting and understanding the results of research.

School of Engineering

E. E. Lindsey, *Acting Dean*

Engineering 103 (3) Engineering Graphics I D & E 3 cr

Problems involving points, lines, planes and solids in space. Development of orthographic and pictorial theory. Course objectives are met by the solution of assigned problems and original student designs in both freehand and instrumental forms.

Engineering 104 (4) Engineering Problems II D & E 2 cr

A study of computation techniques, utilizing both the slide rule and the computer, focusing on problem solutions and equation analysis. Course also includes orientation to the professional nature of engineering and the roles of various branches of engineering.

DEPARTMENT OF CHEMICAL ENGINEERING

Chemical Engineering 288 (88) Chemical Engineering Laboratory 3 cr

Study of plant size equipment illustrating some unit operations. Emphasis on the securing of accurate data, correct operating techniques, and on report writing. Prerequisite, Chemical Engineering 246 (56). 4 40-hour weeks, June 7–July 2.

DEPARTMENT OF CIVIL ENGINEERING

Civil Engineering 140 (35) Mechanics I. I C 3 cr

Elements of static and strength of materials. Prerequisite, Integral Calculus concurrently.

Civil Engineering 141 (36) Mechanics II. II C 3 cr

A continuation of strength of materials; elementary kinematics of mechanisms and dynamics of particles and rigid bodies. Prerequisite, Civil Engineering 140 (35).

Civil Engineering 242 (37) Mechanics III. II B 3 cr

Advanced topics in dynamics and strength of materials. Prerequisite, Civil Engineering 141 (36).

DEPARTMENT OF ELECTRICAL ENGINEERING

Electrical Engineering 141 (41) Linear Circuit Analysis I A, D & E 4 cr

Analysis using differential relationships, free and forced responses, complex frequency, steps and network theorems. Prerequisites, Mathematics 185 (31), Physics 106 (6), and Engineering 104 (4).

Electrical Engineering 142 (42) Linear Circuits Analysis II. II A, D & E 4 cr

Analysis using differential relationships, free and forced responses, complex frequency, steps and impulses, poles and seros and network theorems. Prerequisites, Mathematics 136 (6) and Physics 106 (6).

Electrical Engineering 285 (85) Electrical Measurements, 3 cr

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices. Prerequisite, Electrical Engineering 142 (42). 3 40-hour weeks, Section 1—July 26–August 13. Section 2—August 16–September 3.

DEPARTMENT OF MECHANICAL ENGINEERING

Mechanical Engineering 123 (23) Materials Processing Laboratory I 3 cr

A lecture and laboratory course to develop a basic understanding of metal working using cutting and joining processes. Not for Industrial or Mechanical engineers. Offered immediately previous to the fall semester. Prerequisite, Mechanical Engineering 103 (3). 3 40-hour weeks; July 26–August 12 and August 16–September 3.

Mechanical Engineering 125 (25) Materials Processing Laboratory II 2 cr

An understanding of the weldability of metals using manual and automatic process applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering 103 (3), June 7–July 9.

Mechanical Engineering 126 (26) Materials Processing Laboratory III 2 cr

An understanding of the machining of metals using standard machine tools applicable to machine design and industrial processes. Prerequisite, Mechanical Engineering 103 (3), June 7–July 9.

Mechanical Engineering 263 (63) Engineering Thermodynamics I. I B 3 cr

An application of the laws of thermodynamics to various energy-transforming devices including ideal and actual cycles of steam, internal combustion engines and air compressors. Prerequisites, Physics 105 (5) and 106 (6), Mathematics 135 (31).

Mechanical Engineering 264 (64) Engineering Thermodynamics II. II B 3 cr

A study of liquids and vapors, thermodynamic cycles, energy transformations, the transfer of heat plus appropriate problems. Prerequisite, Mechanical Engineering 263 (63).

School of Home Economics

Marion A. Niederpruem, *Dean*

Food and Nutrition 551 (191) Institutional Administration 0 or 2 cr

Basic policies and the theory of management, research findings affecting school food service, control technique and planning developments which influence efficiency of management will be stressed. July 12–July 23. 10:00 a.m.–12:00 Noon, 1:00 p.m.–3:00 p.m., Mon.–Fri.

Home Economics Education 710 (210) Seminar—Advanced Curriculum Development for Home Economics in Secondary Schools 0 or 2 cr

Functional curricula for Home Economics in the Secondary School, their design and implementation. Group work in identifying needed areas of concentration, exploration of means to attain depth in learning, development or selection of teaching materials for specific individual or small group projects. Prerequisite, Home Economics Education 582 (182). July 6–July 16. Mon.–Sat. 10:00 a.m.–12:00 Noon, 1:00 p.m–3:00 p.m.

Management and Family Economics 710 (210) Family Management in Low-Income Families 0 or 2 cr

Characteristics of low-income families which influence achievement of family goals with special reference to appropriate educational programs. July 6–July 16. Mon.–Sat. 9:30 a.m.–4:30 p.m.

Textiles, Clothing and Environmental Arts 570 (186) Textiles II (Synthetic Fibers—and the Consumer) 0 or 1 cr

Study of new developments in synthetics; analysis of performance and satisfaction factors of synthetic apparel and household fabrics. June 28–July 2. Mon.–Fri. 9:00 a.m.–12:00 Noon, 1:00 p.m.–3:00 p.m.

Textiles, Clothing and Environmental Arts 710 (210) Socio-Psychological Aspects of Clothing 0 or 3 cr

Explanation of clothing behavior as related to selected theories and methodology derived from the behavioral sciences. July 19–August 6. Mon.–Fri. 10:00 a.m.–12:00 Noon, 1:00 .m.–3:00 p.m.

School of Nursing

Mary A. Maher, *Dean*

Nursing 210 (S) G.N. (53 S G.N.) New Concepts of Nursing the Patient with Tuberculosis and Respiratory Diseases 2 cr

Factors influencing modern medical and nursing care of patients with tuberculosis and respiratory diseases will be considered. Emphasis will be placed on the role of the nurse. June 28–July 10.

Nursing 301 (S) G.N. (57 S G.N.) Principles of Public Health Nursing

Unit 1—An introductory work conference in principles of public health nursing practice designed for nurses practicing in public health nursing agencies and in schools of nursing.

Unit 2—Prinicples and methods of interviewing in nursing practice. June 21–July 10.

School of Physical Education

Warren P. McGuirk, *Dean*

Men's Physical Education 001a, 001b (1a, 1b) General Physical Education I E, F 2 cr

Men's Physical Education 002a, 002b (2a, 2b) General Physical Education II E, F 2 cr

Aim of course is to inculcate in the student an adequate knowledge of, a sufficient technique in, and a wholesome attitude toward physical education activities through the medium of individual, dual, and team sports.

Women's Physical Education 001a, 001b (1a, 1b) General Physical Education I E, F 2 cr

Women's Physical Education 001a, 001b (1a, 1b) General Physical Education II E, F 2 cr

Students are required to pass a safety test in swimming. Except for this requirement all unrestricted students may select any activity which is offered.

Physical Education 727 (227) Comparative Physical Education and Athletics

This course will be offered as a European Tour under the auspices of the NEA. Write directly to Prof. Lynn Vendien, School of Physical Education, University of Massachusetts, for further information.

Physical Education 736 (236) Experimental Physiology of Exercise I B 3 cr

Experimental investigation of the physiological effects of exercise.

Physical Education 738 (238) Kinesthetic Form I C 3 cr

The problem of the definition of form in movement as it relates to learning.

DEPARTMENT OF AIR SCIENCE

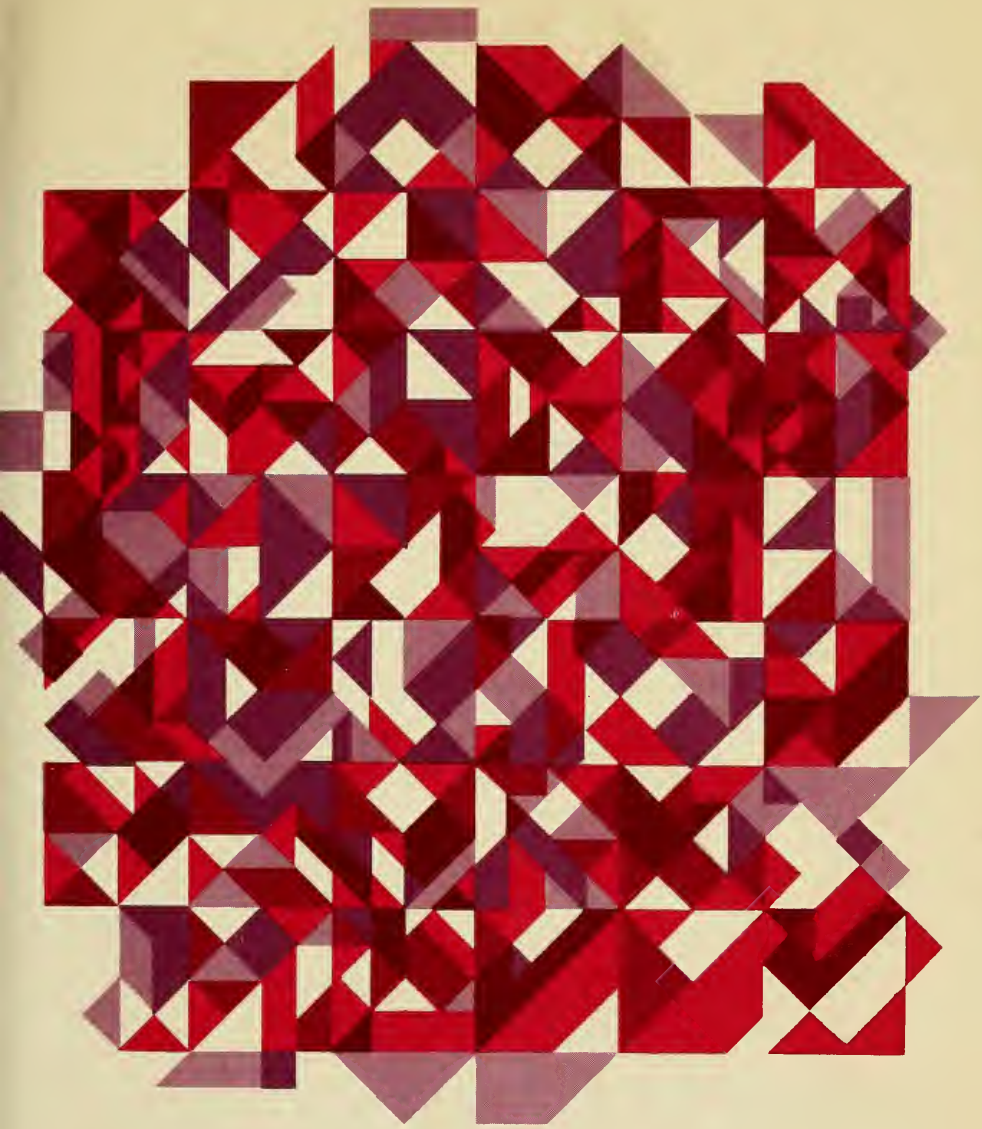
Air Science 111 (11) Foundations of Aerospace Power I. I–II A 1 cr

A survey of the mission and role of the United States Air Force and its component commands, an evaluation of the professional officer in the United States Air Force, and a study of the principles of leadership.

DEPARTMENT OF MILITARY SCIENCE

Military Science 111 (111) Introductory Military Science I–II D 1 cr

An introduction to National Defense, organization and officer procurement; a study of the research and development of military weapons and a familiarization of weapons; fundamentals of leadership.



Undergraduate Schools

University of Massachusetts
Bulletin
1965-1966

UNIVERSITY OF MASSACHUSETTS

Amherst

1965-1966

CATALOG OF THE UNIVERSITY

This Catalog of the University of Massachusetts
presents announcements concerning its colleges, schools and
divisions for the sessions of 1965–1966.
All students are responsible for observing the regulations
in this Catalog. The University reserves,
for itself and its departments, the right to change
its announcements or regulations whenever such
action is deemed appropriate and necessary.

VOLUME LVII MARCH, 1965 NUMBER II

Published seven times a year by the University of Massachusetts in February,
March (2), August, November (2), and December.
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for the sessions 1965–1966 is part of the One Hundred and First Annual Report of
the University of Massachusetts and as such is Part II of Public Document 31,
Section 8, Chapter 75, of the General Laws of Massachusetts.

Contents

Correspondence

Inquiries regarding various phases of the University program should be directed as follows:

Office of the President
JOHN W. LEDERLE

Academic Affairs
OSWALD TIPPO, *Provost*

Administration
LEO F. REDFERN, *Dean*

Admission, Registration and Transcripts
WILLIAM D. TUNIS, *Dean of Admissions and Records*

Expenses, Payments
ROBERT H. BRAND, *Associate Treasurer*

Extra-Curricular Activities
MARK NOFFSINGER, *Coordinator of Student Activities*

Four College Cooperation
Provost's Office

Graduate School
EDWARD C. MOORE, *Dean*

Health Services
ROBERT W. GAGE, M.D.

Housing
JOHN C. WELLES, *Director*

Office of Institutional Studies
RAYMOND CASTELPOGGI, *Associate Director*

Loans, Scholarships, Student Employment
ROBERT J. MORRISSEY, *Director, Placement and Financial Aid Services*

Men's Affairs
ROBERT S. HOPKINS, *Dean of Men*

News
DANIEL M. MELLEY, *News Editor*

Publications
WILLIAM DEMINOFF, *Director*

Stockbridge School of Agriculture
FRED P. JEFFREY, *Director*

Student Affairs
WILLIAM F. FIELD, *Dean of Students*

Summer Session
WILLIAM C. VENMAN, *Director*

University Relations

ROBERT J. MCCARTNEY, *Secretary of the University and Director of University Relations*

Veterans' Affairs

GEORGE E. EMERY, *Veterans' Coordinator*

Women's Affairs

HELEN CURTIS, *Dean of Women*

Academic Calendar for 1965–1966

1965	
Monday, January 4	Classes resume: 8 a.m.
Wednesday, January 13	Classes end
Friday, January 15	Final examinations begin
Saturday, January 23	Final examinations end
Tuesday, February 2	Registration
Wednesday, February 3	Classes begin: 8 a.m.
Friday, February 19	Washington's Weekend begins after last class
Tuesday, February 23	Classes resume: 8 a.m.
Saturday, March 20	Mid-term marks close
Saturday, April 10	Spring recess begins after last class
Tuesday, April 20	Classes resume: 8 a.m.
Friday, April 23	Monday class schedule will be followed
Tuesday, May 11	Counseling Day: no four-year classes
Tuesday, May 25	Classes end
Thursday, May 27	Final examinations begin
Monday, May 31	Memorial Day: no classes
Saturday, June 5	Final examinations end
Friday, June 11	Commencement Weekend begins
Saturday, June 12	Alumni Day
Sunday, June 13	95th Commencement
Monday, June 14	Summer School begins for first five-week session
Friday, July 23	First five-week session of Summer School ends
Monday, July 26	Second five-week session begins
Friday, September 3	Summer School ends
Thursday, September 9	Registration
Friday, September 10	Classes begin: 8 a.m.
Tuesday, October 12	Columbus Day: no classes
Saturday, October 30	Mid-term marks close
Thursday, November 11	Veterans' Day: no classes
Friday, November 12	Thursday class schedule will be followed
Wednesday, November 24	Thanksgiving recess begins after last class
Monday, November 29	Classes resume
Wednesday, December 1	Counseling Day: no four-year classes
Saturday, December 18	Christmas recess begins after last class

1966

Monday, January 3	Classes resume
Saturday, January 8	Last day of classes
Wednesday, January 12	Final examinations begin
Thursday, January 20	Last day of final examinations
Monday, January 31	Registration
Tuesday, February 1	Classes begin: 8 a.m.
Tuesday, February 22	Washington's Birthday: no classes
Saturday, March 19	Mid-term marks close
	Spring Recess begins after last class
Monday, March 28	Classes resume
Monday, April 11	Classes resume
Tuesday, April 19	Patriots' Day: no classes
Wednesday, May 4	Counseling Day: no four-year classes
Tuesday, May 24	Last day of classes
Thursday, May 26	Final examinations begin
Monday, May 30	Memorial Day: no classes
Saturday, June 4	Last day of final examinations
Friday, June 10	Commencement Weekend begins
Saturday, June 11	Alumni Day
Sunday, June 12	96th Commencement

Trustees of the University

Organization of 1965
Members of the Board — *Term Expires*

Dennis Michael Crowley of Boston 1966
Martin Sweig of Winthrop 1966
Frank Learoyd Boyden of Deerfield 1967
George L. Pumphret of Dorchester 1967
Harry Dunlap Brown of North Chatham 1968
John William Haigis, Jr. of Greenfield 1968
Most Reverend Christopher Joseph Weldon of Springfield . . . 1969
Fred C. Emerson of Agawam 1969
Edmund J. Croce of Worcester 1969
Calvin H. Plimpton of Amherst 1969
Hugh Thompson of Milton 1969
Joseph P. Healey of Arlington 1970
Frederick Sherman Troy of Boston 1970
Robert D. Gordon of Lincoln 1971
Louis Martin Lyons of Cambridge 1971
Mrs. George R. Rowland of Boston 1972
John J. Maginnis of Worcester 1972

Members Ex Officio

His Excellency John A. Volpe, *Governor of the Commonwealth*
John William Lederle, *President of the University*
Alfred L. Frechette, *Commissioner of Public Health*
Owen B. Kiernan, *Commissioner of Education*
Charles Henry McNamara, *Commissioner of Agriculture*
Harry C. Solomon, *Commissioner, Department of Mental Health*

Officers of the Board

His Excellency John A. Volpe, *Governor of the Commonwealth, President*
Frank Learoyd Boyden of Deerfield, *Chairman*
Robert Joseph McCartney, *Secretary*
Kenneth William Johnson of Amherst, *Treasurer*

General Information

The University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier. The University is a member of the great community of Land Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry. Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University on its Amherst campus joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges—in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus in Amherst consists of approximately 950 acres of land and 110 buildings. These structures include classroom and laboratory facilities as well as dormitories and other units.

To augment the Commonwealth's facilities at the university level, the University of Massachusetts in Boston will be opened in September, 1965. The new University will offer educational programs comparable in quality to those available on the campus in Amherst. Day sessions, late-afternoon classes, evening school as well as full summer sessions will be offered in the new program. The total resources of the University of Massachusetts are dedicated to giving all qualified students full opportunities to develop their capabilities for service in a growing society.

Branches of Instruction

THE UNDERGRADUATE COLLEGE

The University offers four-year undergraduate instruction leading to the following degrees: Bachelor of Science, Bachelor of Arts, Bachelor of Science in Chemical, Civil, Electrical, Industrial and Mechanical Engineering, Bachelor of Business Administration, and Bachelor of Landscape Architecture (five-year course).

This instruction is carried out in the College of Agriculture, College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, Physical Education, and the Department of Public Health. The aim of the undergraduate course is to give as high a degree of proficiency in some particular branch of learning as is possible without sacrificing the breadth and depth which should characterize a well-rounded college education.

The Bachelor of Arts degree is conferred upon those candidates who fulfill the requirements for this degree specified by the College of Arts and Sciences and the School of Education. The Bachelor of Science degree is conferred upon those candidates who fulfill the requirements for this degree in the College of Arts and Sciences, the College of Agriculture, the Schools of Home Economics, Nursing, Physical Education, and the Department of Public Health. All graduates from the School of Engineering receive the appropriate degrees of Bachelor of Science in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, or Mechanical Engineering. All graduates from the School of Business Administration receive the degree of Bachelor of Business Administration.

Special arrangements are made for some graduates of county agricultural schools and of agricultural departments of certain high schools to complete the college course with majors in agriculture or horticulture. Upon the completion of their course they are granted a Bachelor of Vocational Agriculture degree.

UNDERGRADUATE MAJOR PROGRAMS

Undergraduate major programs are available in the following areas:

College of Agriculture

- Agricultural and Food Economics
- Agricultural Engineering
- Animal Sciences
- Entomology
- Food Science and Technology
- Forestry
- Landscape Architecture
- Plant and Soil Sciences
- Restaurant and Hotel Management
- Wildlife and Fisheries Biology

College of Arts and Sciences
- Art
- Astronomy (Four College Cooperation Program)
- Botany
- Chemistry
- Economics
- English
- French
- Geology
- German
- Government
- History
- Journalism
- Mathematics
- Microbiology
- Music
- Philosophy
- Physics
- Pre-Dental
- Pre-Medical
- Pre-Veterinary
- Psychology
- Russian
- Sociology and Anthropology
- Spanish
- Speech
- Zoology

School of Business Administration
- Accounting
- General Business
- Business Administration and Economics
- Finance
- General Management
- Marketing
- Personnel Management and Industrial Relations
- Production Management
- Retailing

School of Education
- Education
- Elementary Education

School of Engineering
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering

School of Home Economics
- Dietetic and Institutional Administration
- Food and Nutrition in Business
- Fashion in Retailing and Business
- Nursery School Education
- Secondary Education and Extension

School of Nursing
- Basic Nursing

School of Physical Education
- Physical Education for Men
- Physical Education for Women
- Recreation Leadership

Department of Public Health
- Medical Technology
- Public Health

THE GRADUATE SCHOOL

Graduate work leading to the Doctor of Philosophy degree may be taken in the following fields: Agronomy, Animal Science, Botany, Chemistry, Chemical Engineering, Civil Engineering, Economics, English, Entomology, Food Science and Technology, French, Geology, German, Government, History, Microbiology, Philosophy, Physics, Plant Pathology, Psychology, Sociology, Spanish, and Zoology.

A cooperative Ph.D. program involving Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts is also available in the biological sciences, Chemistry, French, Geology, German, Philosophy, Physics, and Spanish.

The School of Education offers several specialized programs leading to the Doctor of Education degree for those employed in the educational field. The requirements for this degree follow closely those outlined for the Doctor of Philosophy degree except that in place of the foreign language requirement the candidate may demonstrate a mastery of fundamental statistics and computer language and operation. Residency must be met by two consecutive semesters on campus. Prospective candidates should contact the Admissions Committee of the School of Education before starting formal application for admission.

The following departments offer major work leading to a Master's degree: Accounting, Agricultural and Food Economics, Agricultural Engineering, Agronomy, Animal Science, Botany, Business Administration, Chemical Engineering, Chemistry, Civil Engineering, Dramatic Arts, Economics, Education, Electrical Engineering, English, Entomology, Finance, Fine Arts, Food Science and Technology, Forestry and Wood Technology, Geology, German-Russian, Government, History, Home Economics, Industrial Engineering, Landscape Architecture, Mathematics, Mechanical Engineering, Microbiology, Philosophy, Physical Education, Physics, Plant and Soil Sciences, Psychology, Public Health, Romance Languages (French and Spanish), Sociology and Anthropology, Speech, Statistics, Wildlife and Fisheries Biology, Zoology.

The general requirements of the Graduate School regarding admission, residence, credits, tuition, etc., together with specific information concerning details of interest to prospective students, are outlined in a separate bulletin, which may be obtained upon request from the Dean of the Graduate School.

SUMMER SESSION

The Summer Session at the University enables a student to earn almost the equivalent of a full semester's work in twelve weeks. The Summer Session is open to freshmen who wish to begin their college education immediately upon graduation from high school, thus making it possible to obtain a degree in three calendar years instead of the usual four. For students whose career goals include provision for further education, such as graduate school or professional school, the Summer Session offers an opportunity to reach these goals earlier. Students who are in financial need are encouraged to make use of low cost loans to complete their education. Attendance at the Summer Session offers an opportunity to finish degree work a year earlier at a total cost which is somewhat lower than that incurred in the regular four-year program.

Students who begin their college careers in the summer are advised to plan their programs carefully with the aid of their advisers. Normally, it is wise to plan to take the required courses during the summer, and to take electives and major courses during the fall and spring semesters. Sequential required courses are generally offered during both of the main semesters, so that work begun in the summer can be completed during the fall semester. Similarly, work begun in the spring semester can in most cases be completed in the summer following.

The Summer Session also serves the needs of other groups. Students who are currently enrolled in other colleges can come to the University of Massachusetts to do college work in the summer. Graduate students are offered courses which enable them to continue their education around the calendar. Professional workers are offered courses in their specialized fields. A bulletin describing the entire summer program is available from the Registrar's Office early in March of each year.

THE STOCKBRIDGE SCHOOL OF AGRICULTURE

The Stockbridge School of Agriculture, founded in 1918, is part of the College of Agriculture. It is a two-year technical school and offers the associate degree in the following eleven areas: Animal Science, Arboriculture and Park Management, Dairy Technology, Floriculture, Food Distribution, Horticulture, Landscape Operations, Poultry Science, Restaurant and Hotel Management, Turf Management, Vegetable Crops, and Wood Utilization. High school graduates are eligible to apply, and there are no formal entrance tests. Preference is given to students with a good preparation in English, mathematics, and science. A particular effort is made to select applicants who have demonstrated a strong motivation in their major field of interest. On-the-job placement training is required of all students during the summer period between the first and second year. The Stockbridge School issues its own catalogue and a copy may be obtained by writing to the Director of the Stockbridge School of Agriculture, University of Massachusetts, Amherst, Massachusetts.

NEW ENGLAND REGIONAL PROGRAM

The University participates in a cooperative program conducted by the six New England state universities under auspices of the New England Board of Higher Education. Under this program, a student wishing to pursue studies in a major field not offered at his own state university may attend another New England state university at the in-state tuition rate. Information about the program is available in the Office of the Provost.

Admission

WHERE TO FILE

Applications to the University of Massachusetts for either the Amherst campus or the Boston campus are to be sent to the Admissions Office in Amherst.

WHEN TO FILE

High school seniors are advised to file their applications early in the senior year. Out-of-state and foreign applications must be received prior to *February 1st* for fall admission. College Board tests should be taken no later than the January testing date. If they are to be considered during the normal processing, in-state applications should be received by *March 1st.* Thereafter, they may be considered only as vacancies occur.

NO APPLICATION FEE

There is no application fee required at the University of Massachusetts.

TESTS REQUIRED

All applicants for admission, except veterans, must take the Senior Scholastic Aptitude Test given by the College Entrance Examination Board. In addition, the University requires three College Board Achievement tests, including English Composition, of every applicant whose scholastic record in grades 9 through 11 contains four or more grades below the college recommending mark of his high school. All *post-graduate* students and *out-of-state* students are also required to submit these three Achievement tests. All College Board test reports *must* be sent *directly* to the University from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University.

CAMPUS VISITATION

The University recognizes the importance of a first-hand acquaintance with the colleges an applicant may be considering and hopes each will find it possible to visit this campus for the applicant's interest and satisfaction. An applicant should be assured, however, that it will in no way disadvantage his application if he is unable to do so. The University holds several Guest Days for high school seniors in the fall. These are particularly appropriate times to visit the campus and high schools are notified concerning them.

An interview is, however, not part of the admissions procedure. It is physically impossible for the admissions staff to interview all applicants. Personal conferences will therefore be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence. If it seems necessary to schedule an admissions counseling conference, the candidate should send his application and academic records to the Admissions Office prior to the visit so that the applicant's situation may be discussed intelligently.

ACKNOWLEDGMENT AND NOTIFICATION

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

OUT-OF-STATE STUDENTS

The University admits a limited number of well qualified out-of-state applicants. Such candidates should stand in the top quarter of the high school class and be capable of making above average scores on the College Board Scholastic Aptitude and Achievement Tests, all of which are required of out-of-state students.

FINANCIAL AID

Application Procedure

A. Obtain copy of Parents' Confidential Statement prepared by the College Scholarship Service from the secondary school's guidance office.

B. Complete the form and mail directly to the College Scholarship Service in Princeton, New Jersey. The University of Massachusetts should be listed under Item 13.

C. The form should be filed when the admissions application is sent or no later than March 1 of the admissions year.

Loans

Loans may be used to provide supplementary assistance to students receiving scholarships or to help students with genuine need where scholarship funds are not available.

The major source of loan funds for freshmen is the National Defense Student Loan Fund. Applications for the NDS Loans can be obtained from Placement and Financial Aid Services, Machmer Hall, at the University. On these loans, interest is not charged and repayments are not expected (1) while the recipient is a full-time student in college or graduate school; (2) while he is in the service (for up to three years); and (3) for one additional year. Interest then is at the rate of 3 per cent per year and repayments may be made in ten equal annual installments. Students going into public elementary or secondary school teaching may not have to repay up to half of their National Defense Loan.

ENTRANCE DEFICIENCIES

Candidates who are deficient in one or more subjects required for admission to the University must present records which are otherwise stronger than average. Two years of one foreign language and three years of college preparatory mathematics are required. If accepted, a student deficient in language must take one year of college language for no credit; a student deficient in Algebra II must take a semester of mathematics for no credit. Other mathematics deficiencies must be made up elsewhere prior to admission.

VETERANS

Veterans are expected to take examinations especially suited for veterans. These examinations are administered by the University and are given on campus only. If service duty prohibits attendance on the specified test dates, recent Scholastic Aptitude Test results may be submitted in lieu of the University Veterans' Examination. *Veterans must apply to take these tests*, and may receive an application and listing of test dates by writing to the Admissions Office.

TRANSFERS

A limited number of transfers from approved colleges may be admitted. Since applicants for such transfer exceed the number that can be accepted, they are placed on a competitive basis. Ratings will be based upon high school and college records and on the College Board Scholastic Aptitude test, which is required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. *Applicants for Transfer Should Write the Admissions Office for A Transfer Application.* At least 45 semester credits taken in residence at the University are required of all transfers who are candidates for the Bachelor's Degree.

HIGH RANKING HIGH SCHOOL JUNIORS

Applicants who have completed with very high academic standing work through the junior year may be admitted to the University for the semester following the junior year. Such applicants must take the Scholastic Aptitude and three achievement tests given by the College Board in May of the junior year and make scores satisfactory to the University. They must be highly recommended by their high school principal. The maturity and social adjustment of the applicant will be considered along with his intellectual development. Such applicants should apply before the end of the junior year.

BACHELOR OF VOCATIONAL AGRICULTURE DEGREE

Superior graduates of vocational schools of agriculture in Massachusetts and vocational agricultural departments in Massachusetts high schools may be accepted for the Degree of Bachelor of Vocational Agriculture, provided:

a. They are unqualifiedly recommended by the Vocational Division of the Department of Education as *bona fide* Vocational Graduates with superior ranks; and

b. That they can present at least 16 units of certified entrance credits, approved as to quality and quantity by the State Department of Vocational Education; and

c. That they successfully pass the English and College Qualification Test administered by the University Guidance Office. Those who have had algebra will be required to include the algebra examination.

SUBJECT REQUIREMENTS

The subjects of preparatory study required for admission call for the satisfactory completion of a four-year high school course or its equivalent and are stated in terms of units. A unit is the equivalent of at least four recitations a week for a school year. High school graduation alone is not sufficient. The applicant's record must indicate capacity for handling the quality of scholastic work which the University has established as its standard of achievement. Sixteen units of secondary school work must be offered, selected according to the following requirements:

College Preparatory Mathematics	3*
English	4
Foreign Language (2 years of 1 language)	2
U. S. History	1
Laboratory Science	1

The remaining units are elective and may be selected from the following subject matter:

a. Mathematics
b. Science
c. Foreign Language
d. History and Social Studies
e. Free electives (not more than four units)

Free elective subjects are those not included in groups a-d, as for example: Music, art, drawing, typewriting, aeronautics, agriculture, home economics, etc. Such free electives are allowed in order that the student who wishes may have some opportunity to elect other high school offerings, while at the same time covering the fundamental requirements for college work.

Students planning to major in the physical sciences and mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half year of trigonometry. Analytical or solid geometry, chemistry, and physics, and an introduction to analytical geometry and calculus are also strongly recommended.

Students planning to pursue an engineering curriculum should offer two years of algebra, one of plane geometry, and one-half year each of trigonometry and solid geometry. Chemistry and physics are also advised. Those deficient in the mathematics requirement should plan to cover it during the summer prior to entrance or expect to take five years to complete the college course.

Candidates of exceptional ability and promise may be considered for admission even though some of the prescribed courses were not included in their high school program.

*Preferably two years of Algebra and one of Plane Geometry.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT

Successful completion in secondary school of courses leading to the Advanced Placement Examinations of the College Entrance Examination Board together with an adequate performance on those examinations, or the equivalent as approved by the University, will be regarded as meeting the equivalent requirement and will be accorded credit toward graduation.

PHYSICAL EXAMINATION

All students who are entering the University for the first time, and students who are returning after an absence of one semester or more, are required to present health information. Forms for recording details of medical history and details of a physical examination by the student's personal physician will be forwarded shortly after acceptance. In the case of freshmen these must be returned to the University Health Services at least one week prior to the summer counseling appointments. In the case of other students, they must be returned at least two weeks prior to registration. Smallpox vaccination within three years and active tetanus immunization within one year are required as part of the physical examination record. It is recommended that students also be immunized against poliomyelitis and diphtheria.

Expenses

Expenses vary from approximately $1200 to $1400 per year for the normally economical student. First year costs are usually greater than those of the other three years and there is less opportunity for earnings. Therefore, a student is advised to have a definite plan for meeting the expenses of the first year before entering. The following *estimate* of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly college-related and does not include amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year. Tuition for residents of Massachusetts is $200 per year and for others $600.

	Normal
Tuition (citizens of Massachusetts)	$ 200.00
Room in college Residence Hall or private home (approx.)	300.00
Board at college Dining Halls	448.00*
Athletic Fee	30.00
Student Union Fee	20.00
Student Activity Tax (approx.)	28.00
Student Health Services Fee	40.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	18.00
Books, stationery, laboratory and other supplies (estimate)	150.00
	$1,234.00

*Above plan for 7 days; 5-day plan available for $370.00 per year or $185.00 per semester.

INITIAL PAYMENT FOR FRESHMEN

The initial payment for first semester expenses required of freshmen at the time of fall registration is indicated below and is made up of the following items:

Tuition (citizens of Massachusetts)	$100.00
Room rent in college Residence Halls (approx.)	150.00
Board at college Dining Halls	224.00*
Athletic Fee	15.00
Physical Education Equipment Fee (men only)	10.00
Student Union Fee	10.00
Student Activity Tax (approx.)	14.00
Student Health Services Fee	20.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	18.00
Books, stationery, laboratory and other supplies (estimate)	100.00**
	$661.00

The above are only *approximate* figures. A bill will be rendered to the parent of each student prior to the beginning of the semester.

TUITION

As a state institution the University of Massachusetts offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a "bona fide" residence in the Commonwealth with the intention of continuing to maintain it as such.

The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation the student, in addition to the requirements of these regulations, respecting residence,

*Above plan for 7 days; 5-day plan available for $370.00 per year or $185.00 per semester.

**Students should be prepared to pay cash for books and incidental supplies. Certain departments also make special charges for necessary laboratory supplies. Such charges must be paid prior to registration. Freshmen entering the School of Engineering should be prepared to meet an expense of approximately $45.00 for drawing equipment and slide rule.

shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of the husband. The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

ROOM RENT

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus residence halls. Permission for certain students to commute from their parents' home or to live at sorority or fraternity houses must be obtained from the appropriate student personnel Deans each semester.

BOARD

All freshmen, sophomores, and juniors residing in University residence halls will be required to board at University dining halls. Students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities, upon receiving written permission from their respective student personnel Deans. Those not required to board on campus may eat at the Dining Commons on a cash basis. Weekend board is also available on an optional basis. This plan provides for Saturday breakfast and lunch, and Sunday dinner and supper (holiday weekends excluded).

OTHER FEES AND PAYMENTS

Athletic Fee

Funds received from this charge are used to support comprehensive men's and women's intercollegiate programs as well as fine intramural programs.

Physical Education Equipment Fee

Income from this fee is used for the purchase of all clothing issued to male students for use in the required physical education program, intramural athletics and general recreation.

Student Union Fee

Funds received from this charge are used to support the Student Union and meet the operating costs of its various activities.

Student Activity Tax

This tax, authorized by vote of the undergraduate students with the approval of the Board of Trustees, provides each student with the "Collegian," the student newspaper; "Index," University yearbook; student government, class and other activities.

Health Services Fee

Funds received from this charge are used to support the medical, psychiatric and health services provided by the staff of the Infirmary.

Medical-Surgical Insurance

This is an *optional* plan intended to supplement the care received by students at the Infirmary. It provides hospital, medical and surgical care on a twelve-month basis for injuries or illness during the school year, holidays, summer vacation and other times when the student is away from Amherst. Students who register for the fall semester have only *one opportunity* to enter or reject this program each year, at the time of payment of the fall semester bill. It is also offered on the spring semester bill for new spring registrants only. Married students desiring family coverage under the plan now in existence at the University are advised to contact the Student Health Services. All candidates for and members of intercollegiate athletic teams are required to subscribe to the supplementary insurance plan.

Special Undergraduate Students

The Special Student tuition rate is $10.00 per credit hour for Massachusetts residents, up to a maximum of $100.00, and $30.00 per credit hour for non-residents, up to a maximum of $300.00. All students must pay a $1.00 identification card fee yearly, and students taking three or more *courses* a semester must pay a student union fee of $10.00 and a health fee of $20.00.

Payment Due Dates

In accordance with University policy, all charges for tuition, fees, board and room rent in University Residence Halls are due and payable approximately twenty-one days prior to the date of registration of each semester. Bills will be rendered in advance with due date shown and payment may best be made by mail. Students may not register until all University charges are paid.

Scholarship Payments

It is the responsibility of all scholarship holders to see that the University is adequately notified prior to the time fee bills are prepared. Known scholarships are shown on the fee bills. If such items are not shown, deductions may not be made from the bill until satisfactory evidence has been presented to the Treasurer of the University by the donor.

Late Payment and Registration

Any student who does not make payment of his semester charges by the date specified may be required to pay a late payment fee of $5.00. The process of completing arrangements for housing and board according to schedules set forth by the University is to be considered a part of general registration procedures.

Credit by Special Examination

Students receiving credit by special examination must pay $5.00 per credit before the examination may be taken. This fee is non-refundable.

REFUNDS

Tuition and Fee Refunds

A student who leaves the University for any reason, except as specified below, before a semester is completed will be granted a pro rata refund of tuition and fees. A student who makes an advance payment and then for any reason does not attend any part of the next semester or term at the University will be given a full refund of tuition and fees. The $15.00 admission (matriculation) payment required of new students is not refundable. A student who is involuntarily called into military service before the completion of a semester will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that semester. If academic credit is given, there will be no refund. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Refund Schedule

Regular Term

a. Within the first two weeks from the beginning of semester or term —(Registration Day)— 80%.
b. During the third week—60%.
c. During the fourth week—40%.
d. During the fifth week—20%.
e. After the fifth week—no refund.

Summer Session

a. During the first week—60%.
b. During the second week—20%.
c. After the second week—no refund.

Room Rent Refunds

It is the policy of the University that there will be no refund of prepaid room rent after the semester has begun. A student who has made an advance payment of room rent will be granted a full refund of prepaid room rent if he fails to attend any part of the next semester or term or does not reside in a residence hall or other housing. Students involuntarily called to military service may be granted a refund on a pro rata basis.

Board Refunds

Prepaid board will be refunded on a special pro rata per diem basis. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Financial Aid

LOANS

University Loans

Through the generosity of friends of the University, funds have been donated to provide loans for a limited number of students of the three upper classes to assist in paying tuition or other college expenses. These loans are granted, after proper consideration, to needy students of good scholarship whose habits are economical. All loans are secured by a note endorsed by a responsible party as collateral. In general, if loans are taken out by a senior, they must be paid before graduation; otherwise they are due before the beginning of the next school year. Upon withdrawal from the University, loans automatically become due. On most of the funds, interest is charged at the rate of 3% to maturity and 5% thereafter. Application for loans should be made to the Placement and Financial Aid Services. No loan under this plan will be granted in excess of $200 in any one year. If funds are available at the beginning of the second semester, loans may be made in exceptional cases to members of the freshman class whose scholastic record is satisfactory and whose budget calculations have been upset through circumstances beyond their control.

Higher Education Loan Plan

Loans up to $500 per year may also be obtained by students in the three upper classes from the bank of their choice through the Higher Education Loan Plan. Certification of attendance and other information relative to the student's over-all record will be submitted to the bank prior to receipt of the loan. Further information can be obtained through the Placement and Financial Aid Services.

National Defense Student Loan Program

Students may borrow up to $1000 per year under this program. Interest at 3% starts one year after completion of the program and is repayable within 10 years. Special consideration in the granting of these loans is given to needy students of superior scholarship who are majoring in engineering or a physical science, studying a modern foreign language, or planning to teach. Because of the amount of money available, this is necessarily a limited, selective program. Further information and application forms may be secured from the Placement and Financial Aid Services.

Massachusetts Assembly Long-Term Loans

A limited number of loans for college expenses are available to full-time undergraduates of junior and senior standing. Students receiving these loans are expected to be making satisfactory progress toward a degree and should be able to show evidence of needing financial assistance. Payment of these loans may be deferred until after graduation. Interest at three per cent begins on the effective date of the loan and continues until the loan has been repaid in full. Application forms may be obtained at the Office of Placement and Financial Aid Services located in Machmer Hall.

SCHOLARSHIPS

Scholarships consist of two types of awards. One is a straight monetary award. The other is a work scholarship called an Undergraduate Assistantship wherein the recipient of the award is required to perform work of an academic or educational nature (about 8 hours per week) under faculty or staff supervision. Scholarships are awarded only to needy and deserving students of high character whose habits are economical and whose scholastic records are satisfactory. Scholarships are available to upperclassmen who have attained at least a 2.5 cumulative quality point average or a 2.0 to 2.5 with an average of more than 3.0 in his or her last semester. Scholarships are paid in installments at the beginning of each semester in the form of a credit on the student's bill. A scholarship may be discontinued at the close of any semester. If the scholarship student withdraws from the University, any refund of University fees or charges must first be applied to reimburse the scholarship fund for the full amount of the scholarship received by the student for the semester. Applications for scholarships may be obtained from the Placement and Financial Aid Services and must be completed and returned by March 1 to be considered. For a detailed listing of available Scholarships see Appendix, Page 253.

PART-TIME EMPLOYMENT

Part-time employment on campus is available, except for freshmen who are not granted part-time work the first semester unless extreme need prevails. Jobs in various categories, both on and off campus, are filled each year. All jobs are cleared through the Placement and Financial Aid Services. Wages vary according to the type of job and the student's past experience; however, those allowed to work should plan to spend no more than ten to fifteen hours per week on such work. In order to give assistance to as many needy students as possible, the maximum wages earned are limited to the equivalent of board. The average earnings of students engaged in part-time work are approximately $200 per year.

VETERANS AND VETERANS' DEPENDENTS BENEFITS

Veterans or dependents of veterans eligible for education and training under the Disabled Veterans Bill 894, the Korean Veterans Bill 550, or the War Orphan Bill 634 should present a Certificate of Eligibility at registration. Monthly attendance reports to assure payment of benefits are cleared through the Placement and Financial Aid Services. A staff member of these services coordinates all veteran affairs and stands ready to assist in the appropriate clearance and liaison with the Veterans Administration for receipt of benefits and allowances. Veterans who are transferring to the University of Massachusetts from another institution or who have done summer work at another institution will be required to submit a supplemental Certificate of Eligibility at registration. This may be obtained by applying through the veterans' office at the institution last attended.

SPECIAL FINANCIAL AID FOR GRADUATES INTERESTED IN FARMING

The Lotta M. Crabtree Agricultural Funds make available to graduates of the University of Massachusetts funds to be used for farm financing. The purpose of loans from these funds is to assist meritorious graduates who are without means in establishing themselves in agricultural pursuits. These loans are made without interest or service charges other than the cost of title search and legal papers. They must, however, be paid back in full amount within a reasonable length of time and there are certain restrictions on their use. Applications for the "Lotta Crabtree Agricultural Fund" should be addressed to the Trustees of the Lotta M. Crabtree Estate, 619 Washington Street, Boston, Massachusetts, or may be secured at the Placement and Financial Aid Services Office at the University. Decisions regarding the granting of a loan rest entirely with the Trustees under the terms of Miss Crabtree's will.

General Academic Regulations

ATTENDANCE

The attendance of students at all regularly scheduled classes at the University of Massachusetts is expected. No administrative control of attendance is exercised except as hereinafter provided. In cases of illness, students are to explain their absences directly to their instructors. The grade of the student who has met the requirements of the instructor in making up his work shall not be reduced for absence because of illness.

Because the University believes fully in the educational value of outside-of-class activities, including trips which will take students off campus, students are not to be penalized for official absences incurred as a result of such activities. Any student going on such a trip will be entitled to receive make-up work from the instructor in classes missed. If the instructor finds it inconvenient to give a special examination, he has the alternative of not counting the examination missed by the student in computing the final average.

The University has a responsibility for all groups of students who are to be away from their classes or from the University on trips for authorized activities. The person in charge of any such activity involving authorized absence from class shall place the trip announcement on file in the office of the appropriate Dean or Department Head, with a copy to the Schedule Office. The listing shall show the designation of the group or groups to be making the trip, time of departure, destination, and time of return. This information is to be filed at the beginning of the semester for all activities scheduled at that time, otherwise at as early a time during the semester as the information becomes available. In no event should such announcement be later than ten days prior to the day of departure.

Authorization for trips may be made by the Director of Athletics for regularly scheduled athletic events; by the appropriate Student Personnel Dean for extra-curricular trips; and by the Academic Dean or designated Department Head for class trips. For trips extending beyond the normal business hours of the University, a trip list should be submitted to the Office of the Dean of Men for use in case of possible emergencies. This list should include an alphabetical list of student participants, the place at which the event is to be held, the mode of travel, and the name of the instructor or staff member who is to accompany the group. If overnight absence is involved, the place where students are staying is to be indicated in the statement. Students are expected to inform instructors of their absence on authorized trips as soon as the event is announced. Any instructor desiring additional information should make contact directly with the agency authorizing the trip. (No absence or excuse cards will be issued.)

CONDUCT

The customary high standard of college men and women in honor, self-respect, and consideration for the rights of others constitutes the ideal of student conduct. The privileges of the University may be withdrawn from any student at any time if such action is deemed advisable. It should be understood that the University, acting through its president or any administrative officer designated by him, distinctly reserves the right, not only to suspend or dismiss students, but also to name conditions under which they may remain in the institution. Hazing in the sense of the punishment or humiliation of students is not permitted.

DINING

All freshmen, sophomores and juniors residing in University residence halls will be required to board at University dining halls except that such students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities by permission of the appropriate student personnel dean. University board is optional for seniors and is available on a cash basis.

GRADE REPORTING AND RELATED REGULATIONS

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below.

Grades

Grades shall be reported according to the following letter system. No other interpretation of this letter system shall be authorized.

A — Excellent
B — Good
C — Average
D — Passing (but not satisfactory)
F — Failure
Inc. — Incomplete

The grade of Incomplete shall only be reported:

When a portion of the assigned or required class work or the final examination has not been completed because of necessary absence of the student, serious illness, extreme personal circumstances, or for scholarly reasons at the request of the instructor. If the student's

record is such that he would fail the course regardless of the result of the missing work, he is to be given a failure.
In order to qualify for an incomplete, a validation form is obtained from the instructor. One would not be issued by him if the quality of the work to date did not justify it. This form is countersigned by the Health Services or the appropriate Personnel or Academic Dean with copies returned to the instructor and filed with the Registrar.

A student can obtain credit for an incomplete only by finishing the work of the course within two weeks from the date of the final examination. The grade of incomplete is converted to a failure if the course requirements have not been satisfied by this time. Exceptions to the two week deadline may be requested by the appropriate agency in cases of protracted illness, or critical personal problems, or for scholarly reasons at the request of the instructor. The initiative for removal of the incomplete grade rests with the student, but faculty members giving an incomplete grade must be responsible for making suitable arrangements for its removal.

An incomplete on a final grade report is calculated as an F in arriving at a temporary quality point average. When the incomplete is later converted to a grade, the permanent record is changed and the student is notified.

Quality Points

Quality points per semester hour will be assigned as follows: A, 4; B, 3; C, 2; D, 1; F, 0.

Averages will be computed as follows:

Semester Grade Point Average. To compute the semester grade point average, the total points earned will be divided by the total credits carried, which includes the total credits earned and failed.

Cumulative Average. To compute the cumulative grade point average, the total points earned will be divided by the total credits carried, which is the sum of the total credits earned and failed.

Repeated Courses

A course once passed may not be repeated for a higher grade. A student who has received two or more years of language credit in high school may not take the first year of that language for college credit.

Entrance Deficiencies

A student admitted deficient in mathematics (Algebra II) takes Mathematics 01 for no credit. A student deficient in language takes a year of college language for no credit. Neither of these courses counts in the quality point average.

Semester and cumulative grade point averages will be recorded to one decimal place. At the end of the senior year, the cumulative average for all the student's academic work will be recorded to two decimal places.

In computing grade point averages the following will not be included:

1. Freshmen and sophomore required Physical Education.
2. Courses for which the student does not receive credit toward the degree.
3. Grades not earned at the University.
4. Courses satisfied by advanced placement.

This means that the cumulative credits carried on each semester's grade report do not, necessarily, reflect the credits which have been accrued towards graduation.

Failures

A failed course in a subject required for the degree must be repeated. If the failed course is not required, a substitution may be made upon the approval of the adviser. Although repeated, the original failed course continues a part of the student's quality point and course record.

Scholastic Warning

A student whose semester average is below the cumulative average required for retention of his class is warned by a statement on the bottom of both his copy and his parents' copy of the grade report. This warning is to indicate that continued below-standard performance may result in failure to graduate or academic dismissal.

Dismissal

Dismissal from the University for scholastic reasons shall be based upon regulations to be administered by the Committee on Admissions and Records. Changes in these regulations may be made by the Faculty Senate and the University faculty. By action of the University Senate, the following cutting points and graduation requirements have been set:

1. Graduation Average is 1.80.
2. Second Semester Junior Year, First Semester Senior Year: Cumulative Average must be 1.7 unless the Semester Average is 1.8 or better.
3. Second Semester Sophomore Year, First Semester Junior Year: Cumulative Average must be 1.6 unless the current Semester Average is 1.7 or better.
4. Second Semester Freshman Year, First Semester Sophomore Year: Cumulative Average must be 1.5 unless the current Semester Average is 1.6 or better.
5. First Semester Freshman Year:

   A student will be subject to dismissal if his semester average falls below 1.4, subject to the conditions of scholastic probation (outlined below).
6. Transfers and Returning Students

   A transfer student must satisfy the quality point average requirements of the second semester of the freshman year. Thereafter a transfer student is required to meet the academic standards of the class to which he is assigned.

   A returning student must satisfy the cumulative quality point average of the class to which he is assigned.

No new quality point hurdle is raised against students at the end of the fall semester: the cutting point in effect for the class at the end of the preceding semester remains in effect for the class until the next requirement takes effect at the end of the academic year.

Scholastic Probation

Conditions

A. Upperclass students and second semester freshmen who fail to meet the retention average for their class by not more than one-tenth of a point, and first semester freshmen whose averages are within six-tenths of a point are designated as being on Scholastic Probation. No academic dismissal is charged. A student may be allowed one freshman probation and only one upperclass probation semester during his college career.

B. Any student who fails to meet the retention average for his class by more than one-tenth of a point would be dismissed and charged with an academic dismissal. He would automatically be placed on Scholastic Probation at the time of his readmission.

Eligibility

A. While on Scholastic Probation students shall *not* be eligible to hold office in any recognized student organization, to represent the University in any sense on or off campus, to participate actively in any non-academic extra-curricular activity (including athletic, fraternal, dramatic, musical and publications activities).

B. Scholastic Probation students are not permitted to register a car unless they are commuting from home.

C. The Board of Admissions and Records shall be charged with modifying, extending or limiting the restrictions on a student during his period of Scholastic Probation, and shall report all such modifications to the Faculty Senate periodically.

Termination

A. A full summer session program, normally eleven or twelve semester hours, is considered as one semester's work for purposes of lifting probation.

B. Grades and credits transferred to the University from other institutions shall not normally be considered in reviewing a student's probationary status.

Final Examinations

It is University policy not to require a student to take more than two final examinations in one day. When the examination schedule is published, any student who finds himself scheduled for two examinations at the same time or for three examinations on the same day, is to report this situation directly to the University Schedule Office for adjustment.

GRADUATION REQUIREMENTS

It is the responsibility of the individual student to review his own progress toward graduation and the fulfillment of University and school requirements. Through his own initiative, he should address questions concerning these matters to his adviser, Dean or the Registrar.

All four-year curricula of the University conform to the following basic conditions:

Quality Point Average

Beginning with the class of 1964 the graduation requirement is a cumulative average of 1.80. A transfer or returning student must satisfy the cumulative quality point average of the class to which he is assigned.

Accumulated Credits

A. The successful completion of at least 120 semester hours of academic credit. Individual colleges, schools, divisions and departments may require more than 120 semester hours of academic credit. These are exclusive of required physical education courses.

Subject Requirements

B. An introduction to the basic skills of communication by successful completion of English 111 and 112 and Speech 101.

C. An introduction to the humanities by the successful completion of English 125 and 126 (or 127 and 128) and:
   (1) Class of 1966 and before:
   One other semester-course of three hours of academic credit chosen from art, English (excluding technical writing), foreign-language literature, music and philosophy courses and Speech 201.
   (2) Class of 1967 and thereafter:
   One of the elective courses (of at least 3 credits) identified by the letter "C" in the university catalogue.

D. (1) Class of 1966 and before:
   An introduction to the development of western culture and of the modern social sciences gained through the successful completion of nine semester hours of credit in courses chosen from the offerings of at least two of the following departments: economics, history, government, psychology, and sociology.
   (2) Class of 1967 and thereafter:
   An introduction to the social and behavioral sciences by the successful completion of three courses (of at least 3 credits each) chosen from those identified by the letter "D" in the university catalogue; and from at least two departments.

E. (1) Class of 1966 and before:
   An introduction to mathematics and natural sciences to be achieved by the successful completion of twelve semester hours of credit in courses chosen from the offerings of at least two of the following three broad academic divisions: mathematics, biological sciences, physical sciences and Statistics 121.
   (2) Class of 1967 and thereafter:
   An introduction to mathematics and the natural sciences by the successful completion of at least four courses (each of at least 3 credits) chosen from those identified by the letter "E"

in the university catalogue, and from at least two of these groups: A) logic, mathematics and statistics; B) botany, entomology, microbiology and zoology; and C) astronomy, chemistry, geology and physics.

F. Intensive or specialized work in a particular department, division, school or college constituting a major and consisting of the successful completion of at least fifteen semester hours of credit in junior-senior courses in the area of the major.

A basic physical education course is required of all students. A veteran of two or more years' service is not required to take physical education. "Six Months Active Duty for Training" students are not excused from physical education. A transfer student awarded 15 or more transfer credits must complete the physical education semesters of the class to which he is assigned (i.e. a transfer given 30 transfer credits must complete the sophomore year of physical education).

All male non-veteran members of the graduating class of 1966 must complete one year of required basic military. Students graduating in the class of 1967 and thereafter may elect basic military on a voluntary basis. All military training carries graduation credit.

A transfer student must complete the physical education semesters of the class to which he is assigned (i.e. a transfer given 30 transfer credits must complete the sophomore year of physical education).

Residence Requirements

It is the policy of the University that the final year's scholastic work be accomplished in residence, which is defined for this purpose as continuous enrollment and regular attendance in classes conducted on the campus of the University. This requirement may be waived by the Board of Admissions and Records upon the recommendations of the major department and Dean of the College or School. The Board may also waive the requirement for a student admitted to an appropriate professional school after completion of six or more semesters of work at the University, provided:

1. That the cumulative average at the University has been 2.5 or higher.
2. That satisfactory evidence is presented indicating completion of work comparable to that offered at the University in amount sufficient to satisfy requirements for the appropriate bachelor's degree.
3. That the major department and Dean of the College or School approve.

No student is allowed more than ten semesters, including semesters at other colleges, to attain the required graduation average. Twelve semester credits earned in summer schools at the University or other colleges constitute a semester. A student who has met the required graduation average but is deficient in course requirements may continue for one additional semester (total 11).

A student will be dismissed for academic deficiency at the end of seven, eight, or nine semesters if he has failed to satisfy the cutting point requirements of his class set for the seventh semester. A student so dismissed may apply for readmission in the usual way.

Financial Requirements

Diplomas, transcripts of record, and letters of honorable dismissal will be withheld from all students who have not paid all bills and all loans due the University. All such bills due the University must be paid ten days preceding Commencement. If paid after that date and the student is otherwise eligible, he may graduate the following year.

HONORS

A. *University Honors Groups.* At the beginning of each semester a list is posted of those students who, during the previous semester, made a semester grade point average of 3.0 or higher. Three groups are recognized as follows:

First Honors	3.8 (3.75) or higher
Second Honors	3.4 (3.35) to 3.7 (3.74) inclusive
Third Honors	3.0 (2.95) to 3.3 (3.34) inclusive

B. *Graduation with Distinction.* High ranking students will be graduated as follows:

Summa Cum Laude — Cumulative average 3.80 or higher.
Magna Cum Laude — Cumulative average 3.40 to 3.79 inclusive.
Cum Laude — Cumulative average 3.00 to 3.39 inclusive.

A transfer, to be eligible for consideration for graduation with distinction, must have earned his final 60 semester hours of credit in residence at the University.

REPORTS

A. Mid-Semester Report:

First semester freshman mid-semester reports are given to students by advisers and also sent home each semester. No mid-semester reports are prepared for other classes.

B. Final Grades:

First semester; given to students before being sent home.
Second semester; mailed to homes.

TRANSCRIPTS

Two transcripts of a student's record will be furnished without cost by the Registrar's Office. For each additional copy there will be a charge of $1.

REGISTRATION

Pre-Registration

Every student must report for pre-registration on the appointed day. Late pre-registrations will be charged a fee of $5. A student who does not pre-register is not assured admission into the next semester.

Registration

Each student must report for registration on the appointed day. Late registrants must pay a $5 fine.

Course Registration

No course will be recorded on the permanent records of the University nor will a student receive credit for it unless he has registered for such a course in accordance with established procedure on a regularly scheduled registration day or unless his registration shall have been made official by the signature of the Registrar. In the latter case a Program Change Card must be signed by the student's adviser and the Registrar approving the course, and by the instructors of the courses to be dropped and added. No instructor should allow a student to enter his class unless the student was officially enrolled on a regularly scheduled registration day or submits such a Program Change Card authorizing his admission to the class. A student may not drop a course without the approval of his adviser and the Registrar on a Program Change Card and the release of the instructor. A course dropped without this approval will be recorded as a Failure.

COURSE ENROLLMENT AND WITHDRAWALS

A. *General Regulations*

1. *Course Loads*

The normal credit load is at least 15 credit hours. Regular students will carry a minimum of twelve semester hours of

credit (freshmen, eleven). The maximum semester credit load is established by the appropriate school or college. Only students of high academic standing (cumulative averages of 2.5 and above) will be permitted to take an overload of one course with the approval of the academic dean involved and of two courses with the approval of the Dean and the Provost. Approval forms are available in the Office of the Registrar. Seniors in their final two semesters may carry an overload of one course each semester without special permission if such an overload will enable them to graduate, or an overload of two courses each semester with the approval of the academic dean. Seniors needing six or more courses totaling at least 18 credit hours to graduate may elect to spread their course load over their final two semesters.

2. *Certification of Course Changes*

To add, drop, or change a course, the student must obtain the signature of the instructors concerned, the faculty advisor, and the appropriate officer in the Registrar's Office. Signed cards are to be filed with the Registrar. Instructors and advisors are referred to the Manual for Faculty Advisors for specific information.

3. *Exceptions to the Regulations*

Exceptions to the regulations are made only in cases of protracted illness, critical personal or academic problems, and then only with the approval of the student's Academic Dean based upon recommendation of the appropriate one of the following: Health Service, Deans of Men, Women, or Students, or Counseling and Guidance Office.

B. *Course Registration Changes*

ADD PERIOD Within the period of up to and including ten academic days from the beginning of a semester a student may add, drop, or substitute a course without notation on his record. Monday through Saturday are defined as full academic days. No courses may be added after this period.

W PERIOD Within the period of the 11th academic day and up to and including 28 academic days from the beginning of a semester a student may drop a course subject to the minimum load regulation above; the notation of withdrawal on his record as a W is the only penalty. The W period is extended to six academic days beyond the closing date for mid-semester grades (printed in the University Calendar) for the first semester freshmen and first semester transfers.

WF PERIOD After the 28th academic day and subject to general regulations above, a student may not drop a course without having a WF entered on his record at the time of withdrawal. This grade is figured in the cumulative average.

C. *Withdrawal from the University*

Prior to the closing date for mid-semester grades, when a student withdraws from the University, grades of W will be noted on his record. The portion of the semester will not count as one of the ten semesters permitted toward graduation.

After the closing date for mid-semester grades, grades of WF or WP will be entered, as appropriate, for all courses in which the student is enrolled. The WF's will count in the cumulative average. The semester will count as one of the ten semesters permitted for graduation.

Change of Major

A student wishing to change his major must get a Major Change Card at the Registrar's Office. This change is to be approved by the head of the Department or School in which he is now majoring and also by his new major adviser. This card, properly endorsed, must be returned to the Registrar's Office before the change receives final approval. As part of the major change procedure, the student takes his Academic Records Folder to the new department.

SPECIAL COURSE REGISTRATION

Advanced Placement

If a student is given advanced placement by a placement examination or by some other means, and if he completes the advanced work (the next course when the courses are in sequence) with a grade of C or better, he will be given credit but no grade for the omitted work. If the grade in the advanced work is D, he will be considered to have completed any requirement represented by the omitted work but will not receive credit for the omitted work. Credit with no grade awarded in this manner will be treated as transfer credit in the computation of quality-point averages.

Auditing

A full-time undergraduate student may audit a course by presenting his ID card to the instructor of the course, providing that the instructor can accommodate the auditor in his class, feels that the student has sound academic reasons for the audit and that the student has the proper preparation. The student will be expected to pay laboratory fees, where applicable.

Credit by Special Examination

The requirements of any course approved for credit may be met by examination upon arrangement with the Dean of the School or College and the head of the department offering the course, provided the stuent's quality point average is 2.5 or higher. All such arrangements must be completed prior to the mid-semester. No student may earn more than thirty (30) semester hours of credit in this manner.

Credit for Work Completed at Foreign Institutions or in Military Service

Students seeking credit for work taken at foreign colleges or for service-connected educational experiences must apply in writing to the Dean of the College or School in which they are enrolled. Credit may be granted for such work upon approval of the department concerned in each case. No student will be automatically credited for any specific course. Each case must be decided according to appropriate criteria applied by the department concerned.

Four College Courses

The University shares with nearby Smith, Mount Holyoke, and Amherst Colleges an exchange course program for *advanced and outstanding students.* With the permission of the student's Adviser, Department Head, and the Provost, enrollment may be made in an advanced course in the student's major which is *not available at the University*, which is associated with the student's career goals, and which is vital to the student's education. Mutually acceptable arrangements among the four colleges have been made concerning costs and transportation. Applications are available at the Provost's Office and must be completed at or prior to Counseling Day.

RESIDENCE

Student Housing Policy

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in University residence halls. Permission for certain students to commute from parents' home or to live at sorority or fraternity houses must be obtained from the Housing Office. Students who are assigned to housing operated by the University are expected to remain in occupancy for the academic year and may not be released sooner except as their places are taken by suitable substitutes. The University of Massachusetts reserves the right to change room assignments whenever necessary. Most residence hall rooms are double and are furnished with beds, mattresses, desks, chairs, and a chest of drawers. Students care for their own rooms and are responsible for any damage.

Residence halls will be open for occupancy on the day immediately preceding the opening of the University. All student property must be removed from the rooms and the key turned in immediately after final examinations in June. Such property not removed by the owner will be removed by the University and stored at the owner's expense. Students assigned to residence hall rooms will be responsible for the room rent of the entire semester. Room rent is not refundable. Room rental charges do not include the several regular school vacation periods. The University reserves the right to utilize student rooms during vacations for conferences and other groups which meet occasionally on the campus.

Student Room Assignments

Assignment of rooms in all residence halls is under the supervision of the Housing Office. Requests for permission from male students to live off campus must be made on the proper form from the Housing Office.

Full time Heads of Residence who are members of the professional staff of the Dean of Women's and Dean of Men's Offices are in charge of each residence hall. While these Heads of Residence are responsible for the enforcement of University rules and regulations, their primary concern is to counsel students. In each residence hall they are assisted by Floor Counselors in maintaining good living and study habits. Residence halls are governed by an elected or appointed Student House Council, advised by the Head of Residence, a procedure which gives the students valuable training in dealing with the problems of group living.

Freshmen will be assigned rooms in the residence hall and will be notified of the assignment prior to the beginning of college. In the spring of each year, upperclass students have an opportunity to choose rooms for the coming year.

Only students living in their own homes may commute. Upperclass women may apply to the Dean of Women for permission to earn room and board in a private home. Residence halls are maintained for undergraduates; graduate women from other countries are also accommodated whenever possible. The Housing Office maintains a card file of rooms and apartments in the surrounding area available for graduate students.

Apartments for Married Students

The University owns and operates two groups of apartments: Lincoln Apartments for faculty, graduate, and undergraduate students, and County Circle apartments for graduate and undergraduate students. Apartments are unfurnished with the exception of kitchen units which contain an electric oven and sink. Apartments are assigned as of date of availability. New faculty, married graduate students and married undergraduate students receive consideration in that order.

Every effort is made to assist applicants in obtaining housing either on or off campus. A card file of off-campus housing is maintained at the Housing Office. Due to daily changes in these listings and the fact that all off campus arrangements must be made by the parties involved, these listings cannot be given out except on a personal visit. Further information and applications may be obtained from the University Housing Office, Draper Hall.

Insurance

It is not possible for the University to carry insurance which will compensate students or their families for losses suffered on the campus due to such hazards as fire, theft, water damage, etc. For most families such insurance is highly desirable, either as an extension of your present home insurance or as a special contract.

Motor Vehicle Regulations

Driving to and from classes is not permitted, and only students in the following categories will normally be authorized to possess and operate a motor vehicle in the Amherst area:

a. Commuting students who live over one mile from the center of campus during the academic year.
b. Students whose locomotive capability is so seriously impaired that they would be prevented from meeting regular class appointments without motor vehicle assistance.
c. Married students residing with spouse.
d. Students over 25 years of age.
e. Members of the senior class.
f. At the discretion of the Dean of Men or Dean of Women, students presenting extenuating circumstances in writing may be authorized to possess motor vehicles.

All motor vehicles must be registered with the University Police. In advance of arrival on campus, eligible students should obtain from the University Police Department a copy of the University regulations pertaining to possession, registration and operation of motor vehicles.

General Services

UNIVERSITY LIBRARY

The University Library now consists of the Goodell Library built in 1935 together with a new library addition of seven floors completed in September 1959 which is twice the size of the original library building. The library complex will provide space for the future expansion of the book collection to 460,000 volumes. Seating capacity is provided for 1350 readers and includes special study areas and reading rooms. The present book collection exceeds 300,000 volumes in the University Library and the 19 departmental and laboratory libraries. Facilities in the University Library include rooms for reference materials and current periodicals, a rare book room, an extensive microfilm collection, microfilm reading units, a map room, an exhibition area, and a typing room for researchers. The University Library is also a depository for the publications of the United States Government as well as the State Agricultural Experiment Stations.

HAMPSHIRE INTER-LIBRARY CENTER

The University Library is a participating member of the Hampshire Inter-Library Center, a cooperative facility for the acquisition, storage and servicing of research materials, especially journals, documents and reference sets. Incorporated in 1951 to augment library resources in the area, HILC is jointly operated by the four Connecticut Valley colleges—Amherst, Mount Holyoke, Smith, and the University of Massachusetts — and the Forbes Library of Northampton, Massachusetts. The collection numbers more than 21,000 volumes; some 600 journals are received currently. The Center is located on the second level of the new addition to the University Library.

THE UNIVERSITY OF MASSACHUSETTS PRESS

Established officially in 1964, the University of Massachusetts Press publishes high-quality books in the humanities, the arts, science and other scholarly and creative fields. The Press is dedicated to providing a means by which outstanding manuscripts may be published for a wide national and international audience. All activities of the University Press are guided by a Committee whose membership is drawn from the faculty and administration of the University. The editorial and administrative offices of the Press, including that of the Director, are housed in Munson Hall.

BUREAU OF GOVERNMENT RESEARCH

The Bureau of Government Research was established at the University of Massachusetts in 1955. The Bureau is staffed by professional personnel experienced in local government research. Its work consists of research in governmental problems, publication of studies in public administration, conducting training institutes for public officials, providing consultative services to cities and towns, and the maintenance of a research library.

THE MASSACHUSETTS POPULATION RESEARCH INSTITUTE

The Massachusetts Population Research Institute, established in September, 1961 by the Department of Sociology and Anthropology, has a twofold purpose: (1) to serve as a center for the analysis of the structure of and changes in contemporary Massachusetts population; and (2) to provide training for undergraduate and graduate students in the techniques of demographic analysis. The Institute publishes a series of working papers on the major aspects of Massachusetts demographic structure.

OFFICE OF INSTITUTIONAL STUDIES

The Office of Institutional Studies is established to collate materials and information on the University of Massachusetts and institutions of higher education in general. It provides a library of published information on higher education, including studies done at other institutions. It serves as a clearing house for information on our own institutional growth and development; and it undertakes to assist faculty and administration in the continuing analysis of our institutional practices.

OFFICE OF UNIVERSITY RELATIONS

The Office of University Relations, directed by the Secretary of the University, serves 1) as liaison between the campus community and the general public, and 2) as an internal information center for the benefit of faculty, students, and administration. The primary function of the Office is to provide accurate information about the University's current and projected programs and thus to foster understanding of the institution's mission as a nationally recognized facility of higher education, research, and public service. To fulfill its program, the Office of University Relations assigns specific responsibilities to three departments: *Publications*, *News*, and *Photographic and Broadcasting Services.* Through these departments the Office supplies information to all

communications media as well as to agencies of government, schools and other educational institutions and foundations, professional societies, research organizations, extension agencies, and to individuals who request data of various kinds.

COOPERATIVE EXTENSION SERVICE

The Massachusetts Cooperative Extension Service conducts off-campus educational programs for adults and youth (4-H) in agriculture, home economics, and a wide range of related areas. These programs assist people to apply scientific and research information in solving individual, family, and community problems. Educational programs are conducted in food production, processing and manufacture, distribution, and service. Educational programs are also offered to individuals and groups interested in family living, family management, development of youth, the use of natural and economic resources, and the development of communities. The Cooperative Extension Service encompasses the cooperative educational efforts of the University of Massachusetts, the various counties of the state, and the United States Department of Agriculture. Many members of the University of Massachusetts staff, in a wide range of fields, participate in this Cooperative Extension or off-the-campus teaching program. The extension educational work is done in close cooperation with the staffs of the County Extension services which are located in 12 of the counties of the state.

MASSACHUSETTS EXPERIMENT STATION

Making science useful for the improvement of agricultural industry continues to be the primary responsibility of the Massachusetts Experiment Station established by the state legislature in 1887. Basic scientific investigation is conducted to find satisfactory solutions to the problems involved in the production, processing and marketing of food and other agricultural products. A large part of the work of the staff centers around research in biochemistry, plant pathology, genetics, microbiology, soils, plant physiology, animal physiology and veterinary science, forestry, entomology and food technology. Engineering research to develop new and improved methods and techniques for the processing and marketing of food, flowers and nursery crops is an important part of the Experiment Station program.

Economic research is conducted to provide new knowledge upon which to base management decisions by firms in the agricultural industries and public policy decisions relating to natural resources, agriculture and the food supply. Increasing attention is being given to studies of future needs in land and water resources and to research useful in increasing the efficiency of the region's food marketing system.

The science center (Field Station) at Waltham is a part of the Experiment Station established and maintained by the University to serve the people of the state through scientific investigation in the biological

fields considered as "plant science." Problems involved in the genetics, culture, disease and pest control of flowers, vegetables and ornamental plants receive major emphasis. Similar research, but directed at the specific problems of the cranberry industry, is carried on at the Cranberry Research Station in East Wareham.

PUBLIC SERVICE AND REGULATORY ACTIVITIES

In addition to its research responsibilities the Massachusetts Experiment Station carries on many public service activities and administers statutory regulations pertaining to the sale of feeds, fertilizers, seeds and the use of milk testing glassware. These duties have been assigned by the state legislature to the Experiment Station which is equipped with the necessary laboratories and scientific personnel.

ALUMNI ASSOCIATION

The Associate Alumni is the general alumni organization of the University of Massachusetts. The association maintains headquarters at Memorial Hall, erected by alumni and friends in honor of those men of the University who died in World War I. The association publishes a magazine, *The Massachusetts Alumnus*, as the alumni publication of the University. According to its by-laws, the corporation is constituted for the purpose of promoting the general usefulness of the University of Massachusetts; of cultivating mutual regard among its graduates and former students; and of strengthening their attachment to their Alma Mater. Under sponsorship of the University of Massachusetts Building Association, composed of alumni who volunteered their services, 19 dormitories, two faculty apartment centers, and a Student Union Building have been constructed on the campus. The governing body of the Associate Alumni consists of its officers and a board of directors. Four directors are elected each year and serve a term of four years. All graduating seniors become members of, and contributors to, the association at graduation, according to a tradition set by the Class of 1940.

AUDIOVISUAL CENTER

The Audiovisual Center is organized and equipped to aid the professional staff with audiovisual equipment and materials. The Center is located in the north patio level of the School of Education. Libraries of motion pictures, filmstrips and slides are maintained. Major types of audiovisual machines are available on short-term loan for classroom teaching. Machines permanently located in various buildings are maintained and repaired. Assistance is available in the preparation of charts, graphs, maps, and diagrams. Photographic and diazo reproductions are made on paper or in the form of transparencies. Recordings can be made or reproduced.

SPEECH AND HEARING CENTER

The Center's services are available for rehabilitation of adults with speech and hearing problems which may affect vocational and professional performances and placement. Illustrative clients at present include stutterers, and people with voice problems, hearing loss, and aphasia. These include both men and women from surrounding communities who have been given released time from their workday for receiving speech therapy. No fees are charged. Cooperative planning with the Massachusetts Rehabilitation Commission is also available for vocational placement. Consultation service is also available for public schools conducting speech surveys. No fee is charged. The Center's present activities include institute-workshops for school administrators in speech surveys and organization of public school speech and hearing programs. The workshops are held on campus with demonstrations in Speech and Hearing Center facilities. Similar workshops for industrial management can also be arranged without fee.

The Center's program is also available for children with articulation defects, delayed speech, stuttering, voice problems, cleft palate, cerebral palsy, and hearing loss.

Audiological assessment of both children and adults with impaired hearing, including hearing aid counseling, is available as well as rehabilitation programs in auditory training and speech (lip) reading.

PROGRAM IN URBAN AND REGIONAL PROBLEMS

The problems associated with large numbers of people living together in small geographical areas involve many traditional academic disciplines. The departments listed below have developed cooperatively a curriculum for students who have an interest in applying the knowledge of their major to the problems of cities and their effects on adjacent suburban and rural areas. Interested students can obtain information from the following cooperating departments: Agricultural Economics, Civil Engineering, General Business and Finance, Government, Landscape Architecture, Sociology.

INSTITUTES AND OTHER RESEARCH FACILITIES

The University maintains major scientific institutes and other research facilities for the advancement of knowledge in various fields.

The Polymer Research Institute carries on a program of advanced studies directed toward gaining greater understanding of the chemistry of plastics. Research is conducted to find better methods for studying the properties of plastic films, fibers and rubbers, and for establishing a relationship between the structure and properties of these materials.

The *Institute of Agricultural and Industrial Microbiology* is presently engaged in research regarding the use of microorganisms in the production and processing of agricultural and industrial products such as foods and fibers and the control of microorganisms harmful to man and his environment.

The *Institute of Environmental Psychophysiology* has been established for long-range studies of the effects of technological and natural stress factors on the health, safety and efficiency of persons working in various industrial and other settings.

Important to the many research projects undertaken on a continuing basis at the University is the *Research Computing Center* housing computer apparatus and peripheral equipment needed for rapid solution of mathematical and statistical problems associated with such projects. The University also has a subcritical nuclear reactor, electron microscope and other important scientific equipment for use in modern research.

LABOR RELATIONS AND RESEARCH CENTER

The Labor Relations and Research Center has been established to facilitate instruction and research, and to conduct extension programs in labor education. Assisted by an Advisory Council composed of faculty and labor representatives, the Center seeks to identify major problems affecting labor in Massachusetts and supports research on these problems. The Center's staff also plans and conducts short courses, conferences and seminars on and off campus in order to meet the needs of the labor movement and its membership.

Under an interdisciplinary faculty committee, programs of study are available that allow an undergraduate to concentrate, within his regular major department, in the field of labor relations. In cooperation with the Graduate School Council, the Center is also planning a master's degree program in labor studies and will sponsor graduate assistantships and fellowships for qualified students.

The basic objectives of the Center are to provide undergraduates with greater opportunities to understand the significance of the labor movement, to train graduate students interested in careers with government or trade unions, and to aid in providing educational services to the labor force in the Commonwealth.

Services to Students

ACADEMIC PROGRAMS FOR SUPERIOR STUDENTS

The University provides superior students with challenging educational opportunities beyond those normally encountered in the regular four-year curricula. A flexible program of honors work, intended to develop and expand the potential of academically gifted students, is offered in the following areas.

Freshman, Sophomore, and Junior Honors Colloquia

Honors Colloquia provide students of outstanding talent an opportunity to work in small inter-disciplinary groups of ten students and two professors from all colleges and departments of the University. Reading lists of widely-selected materials and discussion emphasize breadth of learning, the ability to make significant personal investigations, to communicate ideas effectively orally and in writing, and to defend these under critical examination of the group. Each student works under close supervision of the two instructors. To provide an extension of the student's viewpoints in areas other than his own, and to expand the scope of his work rather than emphasize intensive study of one field, as is done in senior honors, assigned readings treat topics of broad, central concern which cut across several disciplines and fields, demonstrate the unity of knowledge, and lend experience in intellectual inquiry, analysis, and synthesis. Several academic privileges are accorded Honors Colloquia members, and one credit per semester is granted.

Senior Departmental Honors

Departmental Honors are designed to recognize merit and give highly qualified students time and opportunity for independent study under closer, more personal direction than is ordinarily provided in the University curriculum. Such study shall be devoted to a careful exploration of some question, problem or theme of significance within the student's major field. The ultimate aim of Departmental Honors is to afford talented students maximum freedom to develop their powers of initiative and resourcefulness and greater freedom to make at least a beginning in original, contributive research. To be eligible for admission to Departmental Honors, a student should have a scholastic record of 3.0 or higher for the first five semesters of college work and demonstrate outstanding promise in his major field. In exceptional cases students

who have averages lower than 3.0 but show unusual aptitude for independent work may be accepted if a written statement establishing this is presented to the Director of Honors. Departmental Honors candidates are assigned an advisor who supervises the preparation of the thesis to be submitted to his department and to the Honors Council. The candidate also presents an oral defense of his thesis. If by the excellence of his work he satisfies all the requirements of his department and the Honors Council, the candidate is awarded honors in the field of his specialization upon graduation. During the senior year, independent study is carried forward each semester as a three-credit course in the department of the major. Senior Honors students have the privilege of enrolling in courses normally limited to graduate students. By permission of the head of the department of their major, Senior Honors students may gain admission to the Graduate School of the University and enroll in courses for graduate credit, provided requirements for the baccalaureate are separately fulfilled.

Opportunities for Independent Study

Students majoring in the College of Arts and Sciences who have a cumulative quality point average of 3.0 or better may, upon the recommendation of their major department, the Honors Council, and the approval of the Dean, pursue special courses of study during the senior year. The program must be the equivalent of thirty semester hours of credit, and students electing such programs will be granted release from other formal requirements of the senior year.

FOUR COLLEGE COOPERATION

Amherst, Mount Holyoke, and Smith Colleges and the University of Massachusetts have for some time combined their academic activities in certain selected areas for purposes of extending and enriching their collective educational resources. Under this cooperative program, a student in any one of the four institutions may enroll in courses given at the other three if he has the necessary qualifications and the approval of the Dean or Provost of his own institution. See "Course Registration," Page 37.

The oldest and perhaps most important of the Four College cooperative ventures is the Hampshire Inter-Library Center, a separate legal entity with a Board of Directors composed of the four Presidents, the four Librarians, and representatives from each of the Faculties. The Forbes (Public) Library of Northampton, Massachusetts, which took membership in the Center in 1962 on behalf of the Western (Massachusetts) Regional Public Library System, is also represented on the Board. HILC is a depository for research materials and learned periodicals of a kind and in a quantity well beyond the reach of any one of the libraries operating independently. The Center is now located on the University campus in the new addition to Goodell Library.

An FM radio station, WFCR (88.5), is similarly a Four College activity, operating as a legal entity under a Board of Directors made up of representatives of the four institutions. Other cooperative activities, all designed to give added strength in one way or another to each institution, include: a joint astronomy department; new courses in the history of science; new courses in non-Western studies, financed for three years by the Ford Foundation; Ph.D. programs; publication of *The Massachusetts Review*, internationally known quarterly of the arts, literature and public affairs; a Film Center; a common calendar of lectures and concerts on all four campuses; and a committee on transportation. Additional cooperative projects are in the planning stage. The entire program is under the supervision of a Coordinator who is a member of the administration of all four institutions.

THE STUDENT UNION

The Student Union is the community center for all members of the University family—students, faculty, administration, alumni, and guests. It is not just a building: it is an organization and a program which together constitute a well-defined plan for a fruitful community life on campus.

Constructed in 1957 by the University of Massachusetts Building Association, the Union is the center not only of major social activities, but also of many other organized endeavors forming an important adjunct program in the general educational process of the University as a whole.

Thus, the Union houses the offices of the Coordinator of Student Activities, R.S.O. Business Manager, University and Student Union Program offices, student publications, the Chaplains, and the Student Senate. Service departments of the Union include: the University Store, carrying a complete stock of books and student supplies; the Union Food Service, providing snacks and lunches or catered meals; the Games Area, with bowling, billiards, table tennis and other table games; the seven-chair Barber Shop; and the Lobby Counter, the Union's general service facility (newspaper stand, box office, night and weekend check-cashing service, coat checking, record lending library, lost and found information desk, and a cashier's office provides check cashing daily).

Three large lounges — the Cape Cod, Colonial, and Governor's — are available for reading and conversation. There is also a Music Room, for listening or piano practice; a Reading Room, containing home-town newspapers and periodicals; and ten Meeting Rooms for use by campus organizations.

Student Union program activities are selected, planned and executed by the Student Union Program committees. These groups are composed of interested volunteer students, and their activities are coordinated by a full-time Program Adviser.

The construction cost of the Student Union is being defrayed by a Student Union Fee of $10 per student per semester. The excess of student fees over the bond schedule, plus revenue earnings, compose the operating fund for the Union building.

DISTINGUISHED LECTURESHIPS, SEMINARS, COLLOQUIA

Each year the University brings distinguished personages to the campus to lecture on topics of major significance in the arts, sciences, public affairs, and other areas of human concern. Each talk is given either as a single public lecture or as part of a program of panel discussions and lectures sponsored by a University group for public presentation. Included in the yearly schedule of such events are the Alumni War Memorial Lectures; Distinguished Visitors' Program; the University of Massachusetts Assembly lectures and seminars; public lectures of the University's Distinguished Professors of Public Affairs; panel discussions and talks delivered during International Weekend; and the Phi Kappa Phi and Sigma Xi lectures. In addition, individual departments sponsor continuing programs of extra-curricular lectures, seminars and colloquia for the benefit of majors in those departments as well as for other interested persons.

Recognizing that a comprehensive education is not sustained through curricular experience alone, the University urges all of its students to attend as many of the extra-curricular lectures as they possibly can. Students undertaking honors work or participating in Honors Colloquia programs are informed of forthcoming lectures through an Honors Council newsletter. The student body at large is kept informed of such events through notices in the college newspaper as well as through posters, class announcements, and other means. The entire program is directed towards giving students fresh perspectives and a broader experience than that afforded by the University curriculum alone.

HEALTH SERVICE

The Health Service is devoted to the promotion of optimum health among members of the University community. Its concern is for the total health of individuals and groups, as reflected in the need for complete physical, mental, and social well-being.

The work of the Health Service is carried on in the Infirmary. The building contains an out-patient department with offices and examining facilities for care of ambulatory patients. In addition, there are 88 beds available for care of students whose needs are best met by hospitalization. X-ray, laboratory, and physiotherapy facilities are available to help in reducing time lost by students for reasons of health.

Recognition of the specific emotional needs of students in an educational environment has led to the provision of an active mental health program including diagnostic and limited treatment services. Orthopedic

and radiological consultants are available regularly; other consultation services can be arranged as the need arises. Hospitalization for conditions requiring more specialized care than is available in the Infirmary can be arranged at the Cooley-Dickinson Hospital in Northampton.

Any care rendered on the campus by members of the staff of the Health Service is provided without additional charge to those who have paid the student health fee. The provision of care off campus can be arranged by the Health Services but the cost of this care is a responsibility of the student. A supplementary insurance program, currently underwritten by Massachusetts Blue Cross — Blue Shield, has been developed to provide for most medical and surgical care not available at the Infirmary. All candidates for and members of intercollegiate athletic teams are required to subscribe to the supplementary insurance plan offered by the University.

The Health Service works closely with the School of Physical Education in adapting the facilities of the School to the individual needs of students for restricted or remedial activity. The health status of participants in the athletic program, both intramural and intercollegiate, is under Health Service supervision; and care is always available for any injuries resulting from these activities.

The Health Service also has an active concern for matters of sanitation and safety which affect the health of students, faculty, employees, and visitors. A physician is always on duty at the Infirmary, or on call, to attend emergency needs among families, visitors, and members of conference groups, as well as regular members of the University community.

Students are urged to consult a member of the Health Service staff as soon as any indication of a physical or emotional disorder is evident. It is much easier for the staff, and less time-consuming for the student, to rectify minor difficulties before they have become sources of disability.

Students who are under medical supervision prior to entrance are urged to have their physicians write the Health Service, giving reports and instructions in appropriate detail. Every effort is made to continue treatment without interruption. In brief, the Health Service attempts to provide all students with a coordinated and comprehensive program of health supervision formerly provided by their family physicians.

STUDENT PERSONNEL SERVICES

Under Dean William F. Field, the Office of the Dean of Students is responsible for supervising and coordinating the wide variety of personnel services designed to meet students' needs. The Dean and his staff provide academic, vocational and personal counseling.

The Office of the Dean of Students, the Deans of Men and Women, Placement and Financial Aid Services, and Counseling and Guidance are located in the east wing of Machmer Hall. The Coordinator of

Student Activities and the Student Activities Office are located in the Student Union. The University Health Service is located in the Infirmary Building. The Housing Office is located in the basement of Draper Hall, and the Admissions and Records Office is located in South College.

Dean of Men — The Dean of Men's Office has primary responsibility for all phases of out-of-class matters with which male students are concerned, including residence halls, fraternities, the Men's Affairs Committee, conduct of male students and a number of other individual and personal matters concerning male students.

Dean of Women — The Dean of Women's Office advises and serves as liaison on administrative matters for the Committee of Women's Affairs, the women students' House Counselors and Interdorm Council, Panhellenic Council, sororities and other activities of particular interest to women students.

COUNSELING AND GUIDANCE SERVICES

The Counseling and Guidance Office assists students with personal, emotional, social and vocational choice problems. Students are sometimes referred to this Office by faculty advisers, Student Personnel staff, or dormitory counselors. Many students make appointments directly. Guidance problems such as those associated with choice of major or change of major are ordinarily discussed with faculty advisers. When additional assistance is required, students are often referred, or come of their own choosing, to the Counseling and Guidance Office. Special courses in *reading and study skills* development are offered in the School of Education each semester. Arrangements to take such a course should be made through the Counseling and Guidance Office.

SPECIAL ADVISING

A staff assistant in the Counseling and Guidance Office serves as coordinator of student advising. The assistant arranges for the advising of freshmen during the summer counseling period, coordinates foreign student advising, and works with individual students on special advisement problems throughout the year.

ADVISORY SYSTEM

Each student is assigned to a faculty adviser in the department or school in which he has chosen to major. A student will ordinarily see his adviser when he has questions about selection of courses, school or departmental requirements, change of major, or other problems that are primarily of an academic nature. He routinely sees his adviser for mid-semester marks and to pre-register for the next semester. A change of major ordinarily entails a change of adviser. The University also forwards reports of academic standing to the parents. Both students and

parents are encouraged to consult with the adviser whenever there are problems regarding studies or personal adjustments to college life. Faculty advisers sometimes refer students to the Deans of their schools or the Counseling and Guidance Office when special problems arise. Students may also make appointments directly.

FRESHMAN COUNSELING PROGRAM

Members of the incoming freshman class are required to attend a summer orientation program of two and a half days. This is a period of testing, counseling and pre-registration. A series of guidance and placement tests will be given and then scored. The student will be assigned to a faculty counselor who will help him select his courses for the fall semester and plan his schedule of hours.

If a student is given advanced placement by a placement examination or by some other means, and if he completes the advanced work (the next course if the courses are in sequence) with a grade of C or better, he will be given credit toward graduation but no grade for the omitted work; if the grade in the advanced work is D, he will be considered to have completed any requirement represented by the omitted work but will not receive credit for the omitted work. Credit with no grade awarded in this manner will be treated as transfer credit in the computation of quality-point averages.

A special program for parents is arranged for the final day of the session at which time they learn about the tests and the results, the student's proposed courses and schedule for fall semester, and the facilities and opportunities at the University.

PLACEMENT AND FINANCIAL AID SERVICES

The primary functions of the Placement and Financial Aid Services lie in vocational and financial counseling and the administration of the techniques involved in aiding students to seek appropriate positions and careers; the granting of loans and scholarships; the assignment of part-time work; the coordination of veterans' affairs; and the dissemination of information relative to military service through the draft or reserves.

Senior Placement

While providing vocational and career counseling for all undergraduates, the office gives special emphasis to seniors who are provided with job-hunting techniques and other media for determining their future plans following graduation. Actual contact with employers is made during the year when employers from business, industry, schools, and other sources visit the campus to interview prospective graduates.

Cumulative student personnel records, occupational information and industrial literature libraries, prepared credentials, including personal

resumes and recommendations, along with counseling and guidance are furnished to enable senior men and women to accomplish their career objectives consistent with their interests, abilities, aptitudes and education.

Financial Aid

See "Financial Information," Page 25.

Military Service Information

The Office of Placement and Financial Aid Services also provides information concerning draft status and military reserve duty. Students who reach draft age (18) may register through this office, which notifies the local draft board. Information is transmitted to local draft boards continuously concerning the status of individual students. Attempt is made also to keep abreast of military reserve affairs to aid students who have questions in this regard.

STUDENT IDENTIFICATION CARD

All undergraduate students at the University of Massachusetts are required to obtain an official University of Massachusetts Identification Card and to carry it on their persons at all times. A fee of one dollar per year, which appears on the fall bill, is charged for the card. I.D. cards are used for the purpose of identification in the Library, for cashing checks, etc. As undergraduate students pay an activities fee for attendance at athletic events, concerts, etc., the I.D. card serves in lieu of a ticket for these functions.

RELIGIOUS ACTIVITIES

The University is concerned in an age of anxiety with the needs for spiritual undergirdings for the educated man. In this day of uncertainty, such concern for the affairs of the spirit has an equal prominence with searching for scientific truths and knowledge in human relations.

The University gives support to the religious life of its students in various ways. It affords the use of University facilities for student groups of all faiths. It cooperates with the official agencies of the three faiths most largely represented at the University by recognizing the contributions of their privately supported chaplains and by giving them facilities and privileges for their work.

On the campus, the religious life of Catholic students is enriched by the program of the Newman Club, of which Rev. David J. Power is chaplain and Rev. J. Joseph Quigley is assistant chaplain. Jewish students participate in services and activities sponsored by the B'nai B'rith Hillel Foundation, of which Rabbi Louis Ruchames is the director.

Protestant students join in worship, study, and service planned by the Protestant Christian Council, with the guidance of the Protestant chaplains and Mr. Thomas Frazier, Resident Theologian.

Other religious groups such as the Inter-Varsity Christian Fellowship, the Orthodox Club, the Christian Science Organization, and the Lutheran Club also meet regularly on campus and students interested in their programs are welcome to attend. The Campus Religious Council provides a cooperative inter-relationship among the campus religious groups and serves the whole University community by sponsoring the Annual Blood Drive, book and clothing drives, and the Religious Handbook for Freshmen.

The local Protestant and Catholic churches of Amherst provide opportunities for Sunday worship, and Sabbath services for Jewish students on Friday evenings are held at the Student Union. Students are encouraged to attend the service of their respective faiths. Several denominations sponsor active student programs centered in the local churches as well, and students are welcome to attend events and join groups sponsored by the denominations.

Student Activities and Organizations

Participation in extra-curricular activities offers opportunities to further the broader objectives of a college experience. The knowledge, skills and judgment developed in the classroom can be tested and refined through use in the organizational setting. Thus, more than fifty professional clubs exist on campus as a means of stimulating vocational interest through close contact with members of the teaching staff and representatives of the professions. Student government offers a forum for debate on matters of importance to the entire University community. For those interested in communications, there are several campus publications as well as an FM radio station. Experience in music and drama is available in a number of forms.

Such activities can be a profitable means of fostering maturity and general enrichment in those students who wish to take optimum advantage of all that the University can offer. In encouraging participation in these activities, the University asks only that students plan their time well, in order that they may profit as much as possible from a total University program devoted, first and foremost, to academic studies.

The Student Activities Office is the headquarters for Recognized Student Organizations (R.S.O.) and the University Program Office. It provides a banking, bookkeeping and auditing service for student organizations, as well as help and counsel on planning, budgeting, purchasing, contracting, and most other aspects of the affairs of student organizations. An adviser is available to work closely with officers and faculty advisers of student organizations to help them attain their goals and best serve the University.

The University Program Office provides a resource office available to any campus individual or organization with problems relating to programming.

All extra-curricular activities are supervised by the Committee on Recognized Student Organizations composed of faculty and students. Recognition for outstanding achievement in this area is given at an annual Student Leaders Night held in the spring. An office devoted to administering and assisting in the conduct of student activities is located in the Student Union. Detailed information about student organizations may be obtained by contacting the Student Activities Office.

STUDENT GOVERNMENT

The Student Senate, operating under a student approved Constitution, has vested in it all legislative functions of student government and has the primary goal of promoting the welfare of the entire student body.

The Senate levies student taxes and appropriates money for many student activities and services. At the same time, the Senate acts as the official representative of the students both on and off the campus. In coordination with the Dean of Men and the Dean of Women, the Senate has the responsibility of establishing effective rules guiding the activities of students at the University.

STUDENT ORGANIZATIONS

Academic Honor Societies

See Appendix, Page 265.

Campus Publications

The Collegian. Tri-weekly newspaper published by undergraduates.

Index. The University yearbook.

Caesura. Magazine for the publication of literary and artistic efforts of undergraduates.

Ya Hoo. Campus humor magazine, published three times a year.

Engineering Journal. Quarterly open to science and engineering students for the publication of technical articles and essays of general interest.

University Music Organizations

Campus music organizations provide experience in musical and allied activities for performers and technicians with various kinds of interest and ability. Membership is open to all students, faculty, alumni, and others in the area community.

University Symphony Orchestra. The University Symphony Orchestra is the newest of the three major performing organizations sponsored by the Department of Music. Membership is open, by audition, to all University students. The Orchestra has developed rapidly into a large ensemble capable of performing the standard symphonic literature and contemporary works as well. It has a repertoire that includes works by Handel, Mozart, Beethoven, Schubert, Bizet, Bloch, Ives, Copland, and Giannini, among others. Students who exhibit exceptional performing ability are given an opportunity, through competition, to appear as soloists with the Orchestra in performance of major solo literature. Occasionally, distinguished guest artists are invited to appear with the Symphony. Concerts are presented at Bowker Auditorium on the University campus for the student body and the general public. Membership in the University Symphony can constitute academic

enrollment in a University course, and thus carry with it University credit toward graduation.

Bands. The University Bands program offers opportunity to virtually all interested students to participate in one of the member units. The *Concert Band* is a symphonic group of qualified wind instrumentalists. The *University Marching Band* performs during the football season at all home and some away games. The *Varsity Pep Band* plays for basketball games.

Chorale. The University's choral group rehearses notable works for presentation on campus and on tour. Smaller choral ensembles are trained for special musical events.

Operetta Guild. The Guild produces standard works from the repertoire of American musical theater. Membership is open to persons interested in an art form which provides experience in many elements of musical performance as well as in staging, acting, and other theater activities. The Guild sponsors an Opera Workshop each year as well as miniature musical theater groups.

Concert Association. The Association offers students an opportunity to stage professional concerts and recitals and to administer a large-scale annual enterprise involving major financial and promotional concern. The Association each year presents distinguished attractions including national symphony orchestras, outstanding operatic performers, instrumental virtuosi, and other offerings.

The University Theatre

The University Theatre is sponsored by the Department of Speech. Dedicated to the ideal that it has an academic responsibility to every student of the University of Massachusetts as well as those studying theatre, the University Theatre schedules four great plays a year, a program designed to give every student the opportunity of seeing living examples of the dramatic heritage of Western Civilization, in all forms and styles. The University Theatre productions serve as the laboratory for all students majoring in theatre; however, all phases of work on these productions are open to all students regardless of school or major. Roister-Doisters, the student extra-curricular dramatic society (incidentally, the oldest extra-curricular student society on the campus) works in conjunction with the University Theatre and students may earn points toward admission into Roister-Doisters by working on the University Theatre productions. National Collegiate Players, The National Honorary Dramatic Society, is sponsored by the Department of Speech and membership to this society is achieved through recognition of meritorious work done in the University Theatre.

Professional and Special Interest Clubs

Numerous professional clubs, established in connection with the various major courses of study, stimulate students' professional interest in their chosen fields and afford opportunity for discussion of technical subjects of mutual interest.

Among the special-interest groups are the Debating, Flying, Parachute, Equestrian, Ski, Water Ski, and Outing clubs.

Student Honor and Service Societies

Adelphia. The men's senior honor society brings together the most representative men in college who are leaders in various branches of student activity. In recognizing men who have attained a high standard of leadership in college activities, the society strives to preserve valuable traditions and customs and to advance the University of Massachusetts in all ways. Membership is limited to a total of 20 men from the senior and junior classes.

Mortar Board. The Isogon Chapter of Mortar Board was installed at the University of Massachusetts in 1955. The purpose of the Society is to promote college loyalty, to advance the spirit of service and fellowship among University women, to maintain a high standard of scholarship, to recognize and encourage leadership, and to stimulate and develop a fine type of college woman. Membership is composed of a total of not less than five or more than 25 girls from the senior class selected on the basis of service, scholarship, and leadership.

Maroon Key. The men's sophomore honorary-service society, composed of 25 students recognized for leadership abilities and University services.

Scrolls. Women's sophomore honorary-service society, composed of 20 students elected at the end of the freshman year.

Revelers. A group of upperclassmen chosen to promote and encourage freshman interest and participation in campus activities.

Alpha Phi Omega, national service fraternity. The Kappa Omicron Chapter conducts an active program of service to the campus and the community. It is dedicated to the principles of leadership, fellowship and service. The chapter conducts or supports various projects (Used Book Exchange, Homecoming Concert, Annual Foreign Students Convocation, United Nations Week, Peace Corps) in the interests of making contributions to brotherhood throughout the world.

Gamma Sigma Sigma. A national service sorority based on the ideals of service, friendship and equality — open to all University women.

Fraternities and Sororities

Social fraternities on the campus include Alpha Epsilon Pi, Beta Kappa Phi, Alpha Sigma Phi, Kappa Sigma, Lambda Chi Alpha, Phi Mu Delta, Phi Sigma Delta, Phi Sigma Kappa, Q.T.V., Sigma Alpha Epsilon, Sigma Phi Epsilon, Tau Epsilon Phi, Tau Kappa Epsilon, Theta Chi, Zeta Nu. An Inter-Fraternity Council, consisting of representatives of these fraternities, has charge of rushing and all general matters dealing with fraternity life. A cooperative organization — The Fraternity Managers' Association — pools the financial resources of all sixteen fraternities for purposes of effecting orderly, economical purchasing and accounting procedures. A professional Fraternity Manager administers the Association's program.

Sororities include Alpha Chi Omega, Chi Omega, Iota Gamma Upsilon, Kappa Alpha Theta, Kappa Kappa Gamma, Lambda Delta Phi, Pi Beta Phi, Sigma Delta Tau, Sigma Kappa, and Sigma Sigma Sigma. The Panhellenic Council, made up of representatives from the sororities, supervises rushing and other sorority matters.

Intercollegiate and Intramural Athletics

The University believes there are educational advantages in a well-organized intercollegiate and intramural sports program. In intercollegiate athletics, the University is represented by teams in all the leading sports, including football, soccer, cross-country, basketball, swimming, wrestling, indoor and outdoor track, hockey, rifle and pistol, baseball, tennis, golf, lacrosse, gymnastics, skiing.

The University also supports a broad program of intramural activities, in which all students are encouraged to participate. The range of sports available each year includes the team sports of touch football, basketball, softball, volleyball. Individual activities include tennis, bowling, badminton and golf.

The University Intercollegiate Athletic Program is supervised by the University Athletic Council and is composed of the following members: five faculty members appointed by the President, three alumni representatives appointed by the Directors of the Alumni Association, the Executive Director of the Alumni Association, and ex officio, the Director of Athletics.

The University of Massachusetts is a member of the Yankee Conference, the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association of New England Colleges for Conference on Athletics, and the Intercollegiate Athletic Association.

Directory of Courses

The Following Directory lists offerings available in each college, school, division, and department. Students should consult the index at the back of the Catalog for the general fields under which specific courses may be found.

The course numbering system used in this Catalog is a new system approved by the Faculty Senate of the University. A summary of the system follows:

001—099	Non-credit courses with no quality-point value toward graduation (such as courses needed to make up entrance deficiencies).
100—199	Undergraduate credit only: freshman-sophomore level.
200—399	Undergraduate credit only: junior-senior level.
400—499	Professional courses open to students having the bachelor's degree.
500—699	Courses available for graduate credit.
700—999	Graduate level courses.

Under normal circumstances, undergraduate students will be concerned only with courses numbered from 001 through 399. Students interested in the University's program of graduate studies should consult the Catalog of the Graduate School.

The following numbers are assigned to special courses and other forms of scholarly activity:

195—199	Honors Colloquia, Lower Division
395—399	Honors Colloquia, Upper Division
390—394	Seminars, Undergraduate
385—389	Special Problems, Undergraduate
700	Special Problems, Graduate
800	Master's Thesis
900	Doctoral Dissertation

For purposes of providing an easy transition from the old numbering system to the current one, both the *new* and the *old* numbers are listed for each offering. The new number appears first, with the old number (in parentheses) following it.

Roman numerals indicate the semester(s) in which a course is given.

Capital letters appearing in parentheses after course titles designate various categories of courses required for graduation. For a full explanation of graduation requirements, see Page 33, 34 and 35.

COLLEGE OF AGRICULTURE

ARLESS A. SPIELMAN, *Dean*
Fred P. Jeffrey, *Associate Dean*

Students graduating from the College of Agriculture obtain both general and specialized education from a broad variety of scientific and professional disciplines. The first two years, for the most part, are spent in acquiring a liberal education in the natural sciences; mathematics, humanities, and social sciences. No person can be liberally educated unless he studies at least one discipline in depth. Students majoring in the College of Agriculture spend their junior years—again for the most part—taking specialized scientific and technical courses, which provides such education in depth.

Undergraduate students in the College of Agriculture are prepared for living and for earning a living. They are exposed to an interdisciplinary, systems-oriented, problem-solving atmosphere that has been developed to a higher degree by the College of Agriculture than by any other component of the University.

A broad choice of electives within most of the major fields of study gives the student an opportunity to prepare for a career in research, industry, business, education, conservation, services, or farming. Each curriculum has its own special requirements for graduation which are described on the following pages. Students may major in: Agricultural and Food Economics, Agricultural Engineering, the Animal Sciences, Entomology, Food Science and Technology, Forestry, Landscape Architecture, Park Administration, Plant and Soil Science, Restaurant and Hotel Management, Pre-veterinary, or Wildlife and Fisheries Biology.

Curricula in Agriculture

Students majoring in the College of Agriculture take the following curriculum during the first two years. Exceptions are Agricultural Engineering (Page 68), Landscape Architecture (Page 80), and Pre-Veterinary (Page 89).

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111, Composition	2	English 112, Composition	2
Speech 101*	2	Speech 101*	2
Mathematics	3	Mathematics	3
Chemistry 111, General	3	Chemistry 112, General	3
Botany 100, General	3	Zoology 101, General	3
(Military or Air Science 111 (Men)	1)	Elective	3
Agricultural and Food Economics 110	3	(Military or Air Science 112 (Men)	1)
Physical Education 001 a, b	0	Physical Education 002 a, b	0

*May be taken either semester or during a later year.

A foreign language may be substituted for the Agricultural and Food Economics elective sequence. Majors in Restaurant and Hotel Management take R & H 100 in place of Botany 100, and Microbiology 150 in place of Zoology 101.

SOPHOMORE YEAR

English 125 and 126 (Humane Letters), two courses from the Social Sciences, two courses from Mathematics or the Natural Sciences, Physical Education and electives.

AGRICULTURAL AND FOOD ECONOMICS

Acting Head of Department: Professor Ellsworth W. Bell, Professor Leed; Associate Professors Fitzpatrick, Foster, Rhoades, Russell, Storey; Assistant Professors Jarvesoo, Lee, Marion.

The curriculum in Agricultural and Food Economics stresses training in the social sciences, particularly economics. Modern analytical tools for use in decision-making are an important part of the training. The course of study, which leads to the Bachelor of Science degree, combines training in relevant technical subjects with courses in business management and economics. The facilities of the College of Arts and Sciences and of the School of Business are used in addition to those of the College of Agriculture in order to provide a body of course work which gives the student thorough technical training within the framework of a sound liberal education.

The Department's program is designed to: (1) prepare students for employment in executive positions with firms in the food industry or in agriculture; or for administrative positions with government agencies concerned with natural resources, agriculture or food problems; or (2) to give the essential undergraduate preparation for a career as a professional economist working in research, teaching or consulting work on natural resource problems or in agriculture or the food industry.

Majors will satisfy University and departmental graduation requirements as follows: Nine credits in humanities and fine arts, nine credits in communication subjects, six credits in mathematics, six credits in natural sciences, twelve credits in economics, six credits in other social

sciences, six credits in business courses; three credits in statistics, twelve credits in technical offerings of the College of Agriculture appropriate to the special interest of the student in resource economics, agricultural economics, or food economics; and fifteen credits in the major field. Thirty-six credits in electives are available to be used in a program consistent with the student's major interest as developed with the advisor. It should be noted that majors in this department will take six credits in social sciences in lieu of six credits in natural sciences required of other majors in the College of Agriculture.

110 (1) (I). Food and Natural Resources.

The world's agricultural and food industries, geography and economics of food and fiber production, problems in food policy, world resource and food problems. 3 class hours. Credits, 3. Mr. Foster.

206 (26) (II). Agricultural Economics.

Intensive review of the agricultural sector. Application of economic principles to problems of production and marketing, elements of price making. Income problems of agriculture. 3 class hours. Credits, 3. Mr. Fitzpatrick.

235 (75) (I). Production Economics.

Basic Decision-making principles, management tools, analysis methods and their application to management problems of commercial farms and other agricultural firms. 2 class hours, 1 2-hour laboratory. Credits, 3. Mr. Lee.

261 (55) (I). Food Marketing Systems.

Structure of food marketing systems. Operating principles, significant product characteristics, role of specialized marketing firms, government programs and policies. 2 class hours, 1 laboratory. Credits, 3. Mr. Fitzpatrick.

265 (65) (I). Food Merchandising.

Economic analysis of principal factors, internal, and external, influencing sales of food marketing firms. Practices of firm location, promotion, pricing, presentation; retailing emphasized. Legal considerations. 3 class hours. Credits, 3. Mr. Marion.

341 (71) (I). Price Theory and Analysis.

Elements of food and agricultural price making. Demand and supply theory. Methods of price analysis and forecasting. Introduction to econometric analysis. 3 class hours. Credits, 3. Staff.

352 (58) (II). Agricultural Policy.

Analysis of public policy relating to agriculture. Local, state, national, international issues. Application of economic, social and political theory. 3 class hours. Credits, 3. Mr. Storey.

368 (68) (II). Food Distribution Economics.

A critical analysis of the food industry. Factors affecting sales, costs, profits. Applications of economic principles to financing, site selection and store management. 3 class hours. Credits, 3. Mr. Leed.

373 (78) (II). Resource and Conservation Economics.

Economic and institutional factors affecting land and water use. Land use planning. Elements of conservation economics, recreation economics, and watershed management. 3 class hours. Credits, 3. Mr. Foster.

381 (72) (II). International Agricultural Development.

Economic development of low income rural economies. Relations of agriculture to national economies. Exogenous and endogenous factors in development. 3 class hours. Credits, 3. Mr. Foster.

385 (97) (I). Special Problems in Agricultural Economics.

Credits, 1–3. Staff.

386 (97) (II). Special Problems in Food Economics.

Credits, 1–3. Staff.

387 (98) (II). Special Problems in Resource Economics.

Credits, 1–3. Staff.

AGRICULTURAL ENGINEERING

Head of Department: Professor R. W. Kleis. Professors Clayton, Fitzgerald; Associate Professors C. Johnson, Norton, Whitney, Zahradnik; Assistant Professors Pira, Collins, Light, E. Johnson; Mr. Fletcher, Schulze.

Agricultural Engineering is concerned with the application of scientific engineering principles to agricultural industries. This professional field includes engineering activities related to the design, development and use of mechanical and electrical equipment; structures; and soil and water control systems for the production, processing and preservation of agricultural products and the improvement of rural living. Agricultural engineers are employed by a variety of agricultural industries and organizations for research, development, teaching, and promotional activities. The program is designed to provide sound training for the agricultural engineering profession. The student majoring in this field will take his freshman and sophomore work at the University and then, under a cooperative agreement, complete his Bachelor of Science program at the University of Maine.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111	2	English 112	2
Chem. 111 or 113	3 or 4	Chem. 112 or 114	3 or 4
Math. 135	3	Math. 136	3
Speech 101	2	Physics 105	3
Social Science Elective	3	Hum. or Soc. Sc. Elective	3
Eng. 103 Graphics	3	Engr. 104 Problems	2
Toral	16 or 17	Total	16 or 17
Physical Ed. 001a, b*	2	Physical Ed. 002a, b*	2
(Military or Air Science 111	1)	(Military or Air Science 112	1)

*Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Math. 185, Integ. Calculus	4	Math. 186 Diff. Eq.	4
Physics 106, General	3	Physics 107, General	4
Civil Eng. 101 Surveying	3	C. E. 140 Statics	3
Mech. Eng. 135	4	Approved Agr'l. Elective	3
English 125 (or elective)	3	English 126	3
	17		17
(Military 125 or Air Science 121	1)	(Military 126 or Air Science 122	1)
Physical Ed. 031a, 031b*	2	Physical Ed. 032a, 032b*	2

*Not quality point credit.

JUNIOR AND SENIOR YEARS

At University of Maine

(Consult Agricultural Engineering Department for details)

261 (51) (I). House Planning.

Space arrangement, construction materials, construction problems and discussion, utilities, financing, maintenance and remodeling. Particular emphasis on planning and evaluation procedures and factors. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. C. Johnson.

281 (53) (I). Food Service Facilities Planning.

Space organization and equipment layouts; discussions and planning relative to facilities, utilities and materials handling. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Fletcher.

356 (72) (II). Drainage and Irrigation.

The engineering factors of drainage and irrigation; study of various system types and design of systems; problems of flow and run-off. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. E. Johnson.

361 (75) (I). Structures and Related Equipment.

Fundamental aspects of planning modern farm structures with emphasis on design, environmental control and integration of mechanical equipment. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Light.

376 (76) (II). Mechanization in Crop Production.

Principles of operation, maintenance, and selection of farm tractors and field machinery; also of irrigation and drainage systems and equipment. Emphasis on management practices and discussions. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Whitney.

681 (81) (I). Unit Operations in Food Engineering.

Study of the fundamental principles of unit operations and their application to food processing; including mixing, evaporation, distillation, dehydration, freeze drying, extraction and separation. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Fletcher.

686 (82) (II). Elements of Process Engineering.

Engineering concepts related to the processing of materials with emphasis on heat transfer, fluid flow, psychrometry, rheology, strength and associated instrumentation. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Fletcher.

690 (90) (Summer). Instrumentation.

Study of Instrumentation applied to research; covering recorders, indicators, controllers and transducers in general. Special emphasis on applications and limitations. Prerequisite, Physics 4 or equivalent. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Whitney.

ENTOMOLOGY AND PLANT PATHOLOGY

Head of Department: Professor J. H. Lilly. Professors Hanson, Shaw, Sweetman, Wheeler; Associate Professors Banfield, Rohde, Miss Smith; Assistant Professors Agrios, Wave; Instructor Peters.

Entomology majors become acquainted with all aspects of insects and insect control, including apiculture. Entomologists find positions in public service and industry, such as teaching at all levels; research, quarantine and regulatory work in state or federal service; various roles in public health and pest control activities; research, sales and public relations work in the agricultural chemicals industry; and apiculture. Entomology majors take Entomology 126 and 150 and Agricultural and Food Economics 110 during their first two years, plus Zoology 135 and Chemistry 127 or 160 in the sophomore year. During the last two years, Entomology 355, 356, 357 and 382, plus one elective from Entomology 260, 266, 272, 279, 374 and 380, are required, along with Zoology 240 and Statistics 121. For those anticipating research or teaching careers which require graduate study, electives should stress basic sciences and liberal arts courses in botany, chemistry, English, modern languages, statistics and zoology. Students interested in medical entomology should include microbiology, parasitology and public health courses. For work in pest control, extension, quarantines or agricultural chemicals, electives from plant pathology and soil sciences, forestry, business, speech and applied entomology are recommended.

PLANT PATHOLOGY

Plant pathology is concerned with the nature and control of plant diseases caused by fungi, viruses, bacteria, nematodes, certain higher plants and unfavorable environmental conditions. Plant pathologists fill positions in public service and in industry, such as teaching at all levels; research in state, federal, university, and industrial laboratories and experiment stations; and extension service through federal, state and county organizations. They are employed in quarantine and regulatory work, in various roles in plant disease control, and in sales and public relations work in agricultural chemical industries.

Recommended electives for students specializing in plant pathology during the first two years are sophomore botany courses, Entomology 126 and modern language. The additional courses they are expected to take are Plant Pathology 251, 378 and 269 or 380, Zoology 240, Statistics 121, Chemistry 160 or 262, and Botany 157, 166 and 167. Recommended electives are Chemistry 127 and 220, Microbiology 250, Entomology 355 and 272, modern language, and advanced courses in botany and statistics. Since specialization in plant pathology falls under the plant and soil science major, the basic requirement of that major are expected to be fulfilled.

126 (26) (I) (II). General Entomology.

A brief survey of the entire field of entomology; structure, development, classification, biology, and natural control of insects. Formation of an insect collection. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Lilly, Miss Smith.

150 (35) (I). Principles of Applied Entomology.

A broad basic applied course for both majors and non-majors. General principles of pest control are stressed instead of "how-to-do-it" details. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wheeler.

260 (60) (II). Structural Pest Control.

Identification, biology and specific control measures of arthropod and rodent pests in structures, foods, fabrics, and miscellaneous products during transportation and in homes. Prerequisite, a course in Zoology; Entomology 126 desirable. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Sweetman.

272 (72) (II). Forest and Shade Tree Insects.

The principles and methods of controlling insects which attack trees and forest products. A study of important species, their identification, biology, and specific control measures. 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Hanson.

279 (79) (I). Animal Ecology.

Relations of animals to their physical and biotic environment, with observations and quantitive measurement of these factors and responses in the field and laboratory. Prerequisite, Entomology 126 or a course in Zoology. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Sweetman.

290 (90) (I) (II). Evolution.

The course and dynamics of both inorganic and organic evolution are treated, as are the implications of evolutionary concept on human philosophy, behavior and welfare. 3 class hours. Credit, 3. Mr. Hanson.

355 (55) (I), 356 (56) (II). Classification of Insects (1965–66).

The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; Second semester: other orders. Either semester may be elected independently. Given in alternate years. Prerequisite, Entomology 126. 3 2-hour laboratory periods. Credit, 3. Miss Smith.

357 (57) (I). Insect Morphology (1964–65).

The external and internal anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology. Given in alternate years. Prerequisite, Entomology 126. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Hanson.

374 (74) (II). Medical and Veterinary Entomology (1965–66).

Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests. Given in alternate years. Prerequisite, Entomology 126. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Shaw.

380 (80) (II). Insect Control (1965–66).

The science of pest control: chemical, biological, ecological, mechanical and legislative. The need, application, economics, effectiveness and hazards from insecticides and biological control are emphasized. Given in alternate years. Prerequisite, Entomology 150; 279 and 382 desirable. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Sweetman.

382 (81) (II). Insect Physiology (1964–65).

Detailed consideration is given to the organ systems, showing the functions such as nutrition, respiration, and growth, and the relationship of physiology to behavior. Prerequisites, Entomology 126 and Vertebrate Physiology (Zoology 135). 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Wave.

385 (97) (I), 386 (98) (II). Special Problems in Entomology.

Supervised problem work in entomology or apiculture for qualified students. Prerequisites, Entomology 126 and permission of staff. Credit, 1–3. Staff.

APICULTURE

266 (66) (II). Principles of Apiculture (1964–65).

Honeybees and their relatives, structure and biology of bees, methods of management, diseases, pollination, queen rearing, honey production, and history of beekeeping. Given in alternate years. Prerequisite, Entomology 126 or a course in Zoology. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Shaw.

RELATED COURSES—OTHER DEPARTMENTS

Agricultural and Food Economics 110—World Food Supply

Statistics 121—Elementary Statistics

Zoology 135—Vertebrate Physiology

Zoology 240—Principles of Genetics

Chemistry 127—Analytical Chemistry

Chemistry 160—Organic Chemistry

PLANT PATHOLOGY

251 (51) (I). General Plant Pathology.

A basic course in plant pathology dealing with the nature, cause and control of plant diseases; epidemiology, diagnosis and control receive special attention. Prerequisite, a course in Botany, 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Agrios.

269 (69) (I). Forest and Shade Tree Pathology.

The nature, cause and control of the principal types of disease in trees, including decay of forest products, and of standing and structural timbers. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Banfield.

378 (78) (II). Nematology (1965–66).

Anatomy, morphology and classification of plant-parasitic and other soil-inhabiting nematodes. Parasitic relationships with plants and current control measures will be stressed. Prerequisite, a year of biological science. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Rohde.

380 (90) (II). Insect Transmission of Plant Diseases (1964–65).

The interrelationships between insects, plants, microorganisms and environment are considered in relation to the development of plant diseases, emphasizing various roles played by arthropods. Prerequisite, a year of biological science. 3 class hours. Credit, 3. Mr. Banfield.

385 (97) (I), 386 (98) (II). Special Problems in Plant Pathology.

Supervised problem work in plant pathology, including nematology, for qualified students. Prerequisites, Plant Pathology 251 and permission of staff. Credit, 1–3. Staff.

RELATED COURSES—OTHER DEPARTMENTS

Entomology 126—General Entomology

Botany 157—Plant Anatomy and Histological Methods

Botany 166—General Mycology

Botany 167—Introductory Plant Physiology

Chemistry 160—Organic Chemistry

Statistics 121—Elementary Statistics

Zoology 240—Principles of Genetics

FOOD SCIENCE AND TECHNOLOGY

Head of Department: Professor William B. Esselen. Professors Fagerson, Francis, Hankinson, Hayes, Levine, Lundberg; Associate Professors Hultin, Nawar, Potter, Sawyer, Stumbo; Assistant Professors Buck, Cournoyer, Evans, Hunting, Levin, Wrisley; Mr. Sample.

The Department of Food Science and Technology offers two curricula: Food Science and Technology and Restaurant and Hotel Management (Page 87). Work in the areas of Dairy Technology and Meat Technology is included in the offerings of the Department of Food Science and Technology.

FOOD SCIENCE AND TECHNOLOGY

The curriculum in Food Science and Technology provides scientific and technological training in the principles concerned with the processing, preservation, and packaging of foods and food products. The student's training is directed to the application of modern science and technology to research and to the manufacturing and distribution of foods. Major fields open to graduates include: (1) product research and development; (2) food processing and packaging; (3) technological work and research in government, industry, and education; (4) advanced

graduate study. The selection of supporting courses depends upon the objective of the student, which should be determined as early as possible. Food Science and Technology majors should take Physics 103 (3) and 104 (4) and Chemistry 127 (27) or 129 (29) and 210 (32) in the sophomore year; also, if possible, Microbiology 250 (51). In the junior and senior year Agricultural Engineering 681 (81), Microbiology 260 (64) and Public Health 390 (90), Chemistry 151 (51) and 152 (52), 161 (61) and 162 (62), Biochemistry and Food Science 251 (51), 252 (52), 361 (61), 362 (62), 371 (91), 372 (92), 391 (95), and 392 (96) are required, plus elective courses selected with the guidance of the major advisor.

251 (51) (I). Introductory Food Science.

A basic course, primarily for department majors. Food manufacture, preservation, processing, and distribution. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Esselen.

252 (52) (II). Food Chemistry.

The composition of food products. Changes that occur in the chemistry of foods during storage and processing. Enzymes in the food industry. Prerequisite, Food Science 251 (51). 2 class hours, 1 4-hour laboratory period alternate weeks. Credit, 3. Mr. Hultin.

258 (Animal Science 58) (II). Animal Products.

Preparation, processing, packaging and marketing of animal products and by-products. Field trips cost $5.00–$10.00. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Sample, Mr. Denison.

275 (75) (I) (II). Principles of Food Technology.

Intended for those who want a survey of the field for non Food Science and Technology majors. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Esselen.

361 (61) (II). Industrial Technology.

A survey of commercial practices in the manufacture and preservation of food products. Prerequisites, Food Science 252 (52); Agric. Eng. 681 (81). 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Levine.

362 (62) (II). Industrial Technology.

A continuation of Course 361 (61). Includes senior research problems. Prerequisite, Food Science 361 (61). 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Levine.

365 (Dairy Technology 65) (I). Unit Operations.

Technical principles involved in the processing of milk and dairy products. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mr. Potter.

366 (Dairy Technology 66). Quality Control and Standards.

Relationship of composition, handling, processing, storage and market regulations to the bacteriological and chemical quality of milk and its products. 2 class hours, 2-hour laboratory periods. Credit, 4. Mr. Evans.

371 (91) (I). Analysis of Food Products.

Physical, chemical, microbiological and microscopical methods. Prerequisites, Food Science 252 (52); Microbiology 250 (51) and Analytical Chemistry. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Hunting.

372 (92) (II). Objective Analytical Methods and Instrumentation.

Continuation of Course 371 (91). Prerequisite Food Science 371 (91). 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Hunting.

384 (94) (II). Sensory Evaluation Methods.

An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretation; taste, odor, color, and texture measurements. For seniors only. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Sawyer.

385 (Dairy Technology 97) (I), 386 (Dairy Technology 98) (II). Special Problems in Dairy Technology.

Problem work under staff supervision, intended to introduce qualified seniors to research methods in some phase of Dairy Technology. Credit, 1–3. Staff.

391 (95) (I), 392 (96) (II). Food Science Seminar.

For seniors who major in Food Science and Technology. 2 class hours. Credit, 2. Mr. Sawyer.

FORESTRY AND WILDLIFE MANAGEMENT

Head of Department: Professor Arnold D. Rhodes. Professors Bennett, Gatslick, MacConnell; Associate Professors Abbott, Cole, Greeley, Mader, Scheffey, Westing; Assistant Professors Bond, Hoadley; Mr. Mawson.

FORESTRY

The curricula in forestry provide a general education and technical specialization in either of two options—Forest Management or Wood Technology. Students in Forest Management prepare for employment with state and federal agencies, conservation organizations, and private industry, and for such kinds of work as resource management and planning, consulting, public relations, research, and forest-based business enterprise. Wood Technologists are employed by wood-processing industries and service related enterprises such as chemical firms and equipment manufacturers, by research laboratories, merchandizing organizations, and to a lesser degree by public agencies. Many students in both Forest Management and Wood Technology go on for graduate work.

The curriculum in Forest Management is accredited by the Society of American Foresters. It emphasizes the multiple-use concept of forest land management for wood, water, wildlife and outdoor recreation. Students electing this option take Forestry 221 and 225 during seven weeks in the summer following their freshman year; Forestry 201, Physics 103 and 104, Economics 125, Government 100, Geology 280, Civil Engineering 100 and Soil Science 105 during their sophomore

year; Forestry 203, 223, 224, 226, 229, and 234, Wildlife Biology 261, Botany 211, and Entomology 272 during the junior year; and Forestry 231, 232, 235, 236, and 240, and Plant Pathology 269 in the senior year. Courses in mathematics, statistics, economics, and business administration are recommended as electives.

In Wood Technology the technical courses are taken mainly in the junior and senior years following the initial two years of preparation in mathematics, the social and physical sciences, and the humanities. The professional courses include Forestry 201, 202, 203, 204, 206, 208, and 210, plus appropriate supporting courses in business, engineering, and chemistry selected according to the needs and objectives of the individual student. Students in Forest Management and Wood Technology are required to have insurance for medical and surgical care such as the plan offered by the University.

112 (26) (II). Dendrology.

The taxonomic features, silvical characteristics, and distribution of the principal tree species of temperate North America; a description of the forests where they occur. Prerequisite, Botany 100. 2 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Abbott, Mr. Rhodes.

201 (25) (I). Wood Anatomy and Identification.

A basic anatomical study of wood elements, their various structural characteristics and function; identification of woods. Prerequisite, Botany 100. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Hoadley.

202 (74) (II). Primary Timber Conversion (1965–66).

Survey of operations, principally sawmilling, in the primary conversion of logs into lumber and allied by-products; drying, grading, handling and market distribution of sawmill products. Not open to students in Forest Management except by special permission. In alternate years. 3 class hours; 1 all-day field trip by arrangement. Credit, 3. Mr. Hoadley.

203 (75) (I). Forest Products.

A survey of the principal forest products, their manufacture and distribution. 3 class hours. Credit, 3. Mr. Gatslick.

204 (52) (II). Properties of Wood (1966–67).

The physical and mechanical properties of wood and their importance in wood utilization. Techniques for physical measurement and mechanical testing. Prerequisite, Forestry 201. In alternate years. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Hoadley.

206 (76) (II). Wood Machinery Theory and Practice (1965–66).

Fundamental principles of knife and saw-tooth action as applied to problems of severing, surfacing, and shaping; general survey of commercial wood machining equipment. Prerequisites, Forestry 201 and 204. In alternate years. Credit. 3. Mr. Hoadley.

208 (85) (II). Wood Seasoning and Preservation (1966–67).

Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment. Prerequisite, Foresty 204 recommended. In alternate years. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Gatslick.

210 (86) (II). Wood Coating and Adhesive Technology (1965–66).

Basic concepts and applied techniques in wood substrate surface modification and bonding; materials and methods employed in finishing and gluing wood and fibrous composites. Prerequisites, Organic Chemistry, Forestry 201 and 204. In alternate years. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Gatslick.

221 (51) (Summer). Timber Harvest and Conversion.

Timber harvesting, milling techniques, and markets; field trip of one-week duration to observe these processes in major wood industries. 4 40-hour weeks. Credit, 4. Mr. Bond, Mr. MacConnell.

223 (53) (I). Silvics.

Forest ecology as a foundation for silviculture, watershed management, wildlife management, and forest recreation; environmental factors; development of trees and forest communities; forest influences. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mader.

224 (54) (II). Forest Soils.

Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and forest recreation; forest soil description, classification and mapping. Prerequisite, Soil Science 105. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mader.

225 (55) (I) (1965–66) and (Summer). The Elements of Forest Mensuration.

The measurement of trees, stands, and forest products; field office practice in timber estimating and log scaling; collection and compilation of forest inventory data. In alternate years. 2 class hours, 1 4-hour laboratory period. Summer course, 3 40-hour weeks. Credit, 3. Mr. Mawson, Mr. MacConnell.

226 (56) (II). The Principles of Silviculture.

Culture of forest crops: regeneration and intermediate cuttings, silvicides, slash disposal; planting, direct seeding, nursery management; interactions with forest management for water, wildlife, and recreation. Prerequisite, Forestry 223 recommended. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Rhodes, Mr. Abbott.

229 (59) (I). Forest Protection.

Principles of protecting forests from fire, insects, disease, domestic animals, wildlife, and atmospheric agencies with special emphasis on the prevention and control of forest fires. 3 class hours. Credit, 3. Mr. Abbott.

231 (71) (I). Aerial Photogrammetry.

Principles of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces; photographic interpretation and map making from aerial photographs. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. MacConnell.

232 (82) (II). Forest Tree Improvement.

Tree introduction, geographic variation, tree selection, vegetative propagation, controlled pollination and hybridization, seed orchard management. Prerequisite, Forestry 112. Credit, 3. Mr. Abbott.

234 (84) (II). Advanced Forest Mensuration.

The analysis of growth and yield in forest stands; construction of standard volume tables and yield tables; plotless cruising and continuous forest inventory. Prerequisite, Forestry 225. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Mawson.

235 (87) (I). Forestry Economics.

The application of economic principles to the allocation of land, labor, and capital in forest enterprises; marketing and pricing theory of forest crops. Prerequisite, Introductory Economics. 3 class hours. Credit, 3. Mr. Bond.

236 (88) (II). Forest Resources Policy.

Forest policy in the United States: history of policy development; factors affecting forest resources management; forest taxation, credit, insurance, and resource planning. 2 class hours and 1 2-hour seminar. Credit, 3. Mr. Bond, Mr. Scheffey.

240 (80) (II). Principles of Forest Management.

Multiple-use management of forest land for wood, water, wildlife, and recreation: organization of the forest for sustained-yield management; preparation of management plans. Prerequisite for the laboratory, Forestry 225. 3 class hours, 1 4-hour laboratory period. Laboratory period optional for non-forestry majors. Credit, 5 or 3. Mr. MacConnell.

385 (97) (I), 386 (98) (II). Special Problems in Forestry.

Individual work on an assigned problem or project in forestry. For qualified upperclassmen. Total credits for two semesters not to exceed 6. Credit, 2–4. Staff.

387 (97) (I), 388 (98) (II). Special Problems in Wood Technology.

Individual work on an assigned problem or project in wood utilization and technology. For qualified upperclassmen. Total credits for two semesters not to exceed 6. Credit, 2–4. Staff.

391 (95) (I or II). Forestry Seminar.

Specialized study in a selected area of forestry. For seniors only. Credit, 3. Staff.

392 (95) (I or II). Wood Technology Seminar.

Specialized study in a selected area of wood utilization and technology. For upperclassmen only. Credit, 3. Staff.

WILDLIFE AND FISHERIES BIOLOGY

Wildlife and Fisheries Biology is concerned with the acquisition and application of knowledge concerning terrestrial and aquatic animal populations which are of recreational or commercial value. A knowledge of the dynamics of animal populations, and their responses to changes in environmental conditions (natural and man-made) is included. A broad understanding of geology, soils, agriculture, forestry, botany and zoology is required.

The activities of state and federal conservation agencies within the state provide study material and field demonstrations. The Massachusetts Cooperative Wildlife and Fishery Research Units and the Massachusetts Divisions of Fisheries and Game and Marine Fisheries

provide numerous opportunities for students to participate in and observe management and research activities. Graduates in this field find employment primarily in state and federal conservation agencies. Depending on degree of training, individuals may also find careers in teaching in public schools or higher institutions of learning.

During the first two years basic courses in liberal arts, Botany 126 or Forestry 112, and Agricultural and Food Economics 101 are taken. Students interested in Wildlife Biology take Wildlife Biology 261, Zoology 300, Soil Science 105 (or Wildlife Biology 264), Zoology 135 and Zoology 306 during the sophomore year. Juniors and seniors take Zoology 125, 221, 225 and 308, Fisheries Biology 268, Geology 101 or 280, Wildlife Biology 262, 263 and 264 (or Soil Science 105), Botany 221 or Forestry 223, Botany 306 and Statistics 121. Students interested in Fisheries Biology take Zoology 135, 300 and 302, and Wildlife Biology 261 during the sophomore year. Juniors and seniors take Zoology 125, 221, 225, and 335, Botany 335 and Botany 221 or Forestry 223, Geology 101 or Geology 280, Soil Science 105, Fisheries Biology 265, 266 and 268, and Statistics 121.

WILDLIFE BIOLOGY

101 (27) (I). Conservation of Natural Resources.

Natural resources of the United States including soil, water, forests, wildlife, and the important minerals; conservation problems in relation to national prosperity. 3 class hours. Credit, 3. Staff.

261 (61) (I). Principles of Wildlife Management.

Fundamental ecology and principles of wildlife management with emphasis on population characteristics and responses. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

262 (62) (II). Techniques of Wildlife Management.

Methods of collecting and interpreting data in wildlife management with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

263 (63) (I). Management of Wetland Wildlife (1966–67).

Life histories, identification, and habitat requirements of waterfowl and marshland furbearing animals; management of wetland habitats. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

264 (64) (II). Management of Upland Wildlife (1966–67).

Life histories, identification, and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Greeley.

385 (97) (I), 386 (98) (II). Special Problems in Wildlife Management.

Qualified seniors who have completed most of the wildlife courses may arrange for work on a special problem in a selected phase of wildlife management. Total credits for two semesters may not exceed 6. Credit, 2–4. Mr. Greeley, Mr. Sheldon.

FISHERIES BIOLOGY

265 (65) (I). Techniques of Fisheries Management.

Principles and techniques of fishery management, stressing population growth dynamics, and field procedures. Prerequisite, Zoology 86. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

266 (66) (II). Physiology of Fishes (1965–66).

Study of physiological functions relative to the environment of fishes. The adaptation of local species to particular habitats will be studied in the field. Prerequisite, Zoology 86. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

268 (68) (II). Survey of Fisheries Resources.

Review of the sport and commercial fisheries of the United States, with special emphasis on crustaceans, mollusks and fishes. Coastal field trips by arrangement. 2 class hours, 1 4-hour laboratory period. Credit, 3. Mr. Cole.

387 (97) (I), 388 (98) (II). Special Problems in Fisheries Biology.

Individual work for qualified seniors on an assigned problem or project in the field of fisheries biology. Total credits for two semesters may not exceed 6. Credit, 2–4. Mr. Cole, Mr. McCann, Mr. Reed.

LANDSCAPE ARCHITECTURE

Head of Department: Professor Raymond H. Otto. Professors King, Procopio; Associate Professors Bacon, Mosher; Assistant Professors Hamilton, Kent; Messrs. Crowe, Fabos, Whitney.

Students following this curriculum, which is accredited by the American Society of Landscape Architects, are prepared through a broad academic approach to take up work in the various phases of landscape architecture. This applied-design profession is concerned with the development of land, i.e. improving our physical environment, for human use and enjoyment. In addition to the usual areas of interest, such as site planning for private, semi-public and public works of many types, optional programs in planning and in park administration are available. The department also offers the ancillary subjects of architecture, arboriculture and park management. Because of technical requirements, the basic curriculum in this major differs considerably from the typical College of Agriculture program, and a total of 125 credits is required for graduation.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111 Composition	2	English 112 Composition	2
Mathematics 121 or Statistics 121*	3	Speech 101	2
Chemistry 111, General	3	Botany 100, General	3
Government 100, American	3	Sociology 101, Introductory	3
Art 100, Basic Drawing	3	Agronomy 105, Soils	3
(Military or Air Science 111	1)	Land. Arch. 102 Drafting	3
Physical Ed. 001 a, b	0	(Military or Air Science 112	1)
		Physical Ed. 002, a, b	0

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125 Literature	3	English 126 Literature	3
Geology 101 or 280 Physical	3	Land. Arch. 124 Construction	4
Civil Engin. 100 Plane Surveying	3	Land. Arch. 128 Basic Design	3
Land. Arch, 123 Survey of L.A.	3	Land. Arch. 130 Plant Materials	3
Land. Arch. 125 Graphics	3	Elective	3
(Military or Air Science 121	1)	(Military or Air Science 122	1)
Physical Ed. 031 a, b**	2	Physical Ed. 032 a, b**	2

*Mathematics 121 will be taken by students who have not had trigonometry in high school.
**Not quality point credit.

During the junior and senior years, Landscape Architecture 225, 231, 253, 254, 267, 268, 333, 374, 381, and 382 are required, with some adjustments for students preferring city planning as a career. The program is completed with a second social science and suitable electives.

LANDSCAPE ARCHITECTURE

102 (2) (II). Landscape Drafting.

The mechanical aspects of the designer-draftsman, including the simple projections—orthographic, perspective, and isometric. 3 2-hour laboratory periods. Credit, 3. Mr. Procopio.

123 (23) (I). Survey of Landscape Architecture.

The history and literature of landscape architecture and allied fields, including an examination of traditional styles of gardens. 3 class hours. Credit, 3. Mr. Otto.

124 (24) (II). Tapography and Construction.

Contour interpolation, grading and drainage, drive design, profiles and sections, computation of earthwork. Application of surveying to landscape construction. Prerequisites, Civil Engineering 100; Landscape Architecture 102. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Crowe.

125 (25) (I). Graphics.

The two and three-dimensional graphic expression of landscape architects, using various media, techniques, papers and reproduction processes. 3 2-hour laboratory periods. Credit, 3. Mr. Fabos.

128 (28) (II). Basic Design.

The elements and principles of design, the analysis of composition, and the application in design of forms and motifs, drawn from nature. Prerequisites, Landscape Architecture 102 and 123, or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Otto.

130 (30) (II). Plant Materials.

Detailed study of deciduous and evergreen trees, with special reference to mature form and character, means of identification, natural associations, and uses in landscape work. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Hamilton.

225 (55) (I). Construction Details.

A series of problems in architectural garden features as walks, steps, walls, fences, pools and small structures. Prerequisite, Landscape Architecture 124. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Fabos.

231 (59) (I). Plant Materials.

Detailed study of shrubs and woody vines, and their identification, with special emphasis given to their adaptability to landscape uses, methods of handling, and care. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Hamilton.

253 (53) (I). Intermediate Design.

Projects involving the fundamentals of landscape design integrating theory, analysis, research, application and graphics. Prerequisites, Landscape Architecture 102, 128. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Kent.

254 (54) (II). Intermediate Design.

Spatial organization, intuitive aspects of design, and perceptual studies within comprehensive projects. Field trip required, approximate cost $40.00. Prerequisites, Landscape Architecture 124, 253. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Kent.

267 (67) (I). Architecture.

Architectural development, including styles and forms in architecture, especially as affected by materials and methods of construction. 2 75-min. class hours. Credit, 3. Mr. Kantianis.

268 (68) (II). Architecture Design.

The relations between exterior and interior spaces and structures as a primary element in design and construction. A series of problems integrating theory, design analysis, and graphics. Prerequisite, Landscape Architecture 267. 1 class hour, 2 3-hour laboratory periods. Credit, 4. Mr. Kantianis.

333 (71) (I). Planting Design.

The utilization of plant materials in combination as applied to the many conditions and demands of landscape work. Prerequisites, Landscape Architecture 130, 231. 2 3-hour laboratory periods. Credit, 3. Mr. Procopio.

373 (73) (I), 374 (74) (II). City Planning.

The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. 3 class hours. Credit, 3. Mr. Bacon.

375 (75) (I), 376 (76) (II). Projects in Planning.

An application of the principles of modern civic development through a series of problems on the design of various types of urban land areas. Prerequisites, Landscape Architecture 173, 174, or permission of instructor. 3 2-hour laboratory periods. Credit, 3. Mr. Bacon.

377 (77) (I), 378 (78) (II). Urban Problems.

Housing, industrial location and development, decentralization, arterial systems, civic and metropolitan design, and regional planning. Open to non-majors. Prerequisites, Landscape Architecture 173, 174, or permission of the instructor. 3 class hours. Credit, 3. Mr. Bacon.

381 (81) (I), 382 (82) (II). Advanced Design.

Comprehensive site planning projects covering the major areas of landscape and urban design, plus Exchange Problems whenever applicable. Field trip required, approximate cost $40.00. Prerequisites, Landscape Architecture 253, 254. 1 class hour, 3 2-hour laboratory periods. Credit, 4. Mr. Procopio.

384 (84) (II). Presentation.

Preparation and rendering of landscape and architectural plans, elevations, perspectives, etc. 2 2-hour laboratory periods. Credit, 2. Mr. Kent.

387 (97) (I), 388 (98) (II). Special Problems.

Supervised individual work on assigned projects for qualified seniors. Elected only on permission of adviser. Credit, 1–3. Staff.

390 (96) (II). Professional Practice.

A seminar on the methods and procedures of the professional office. Prerequisite, Landscape Architecture 381, or permission of instructor. 1 class hour. Credit, 1. Mr. Otto.

PARK ADMINISTRATION

This program is designed to give the student a broad education in land use emphasizing physical organization, development and administration of parks. It makes use of various phases of landscape architecture as a basic discipline, and stresses parks as a service to society.

Graduates will find employment primarily with private, municipal, county, state or federal park agencies; and park and recreation, conservation or natural resource organizations.

Majors in Park Administration will follow the freshman core curriculum for the College of Agriculture, substituting Government 100 for Agricultural and Food Economics 101 the first semester and Landscape Architecture 102 for Mathematics the second, with Sociology 101 as the elective requirement. In the sophomore year Civil Engineering 100, Geology 101, Landscape Architecture 124, 125, 130, and 251, Park Administration 160 will be taken. In the junior and senior years, Agricultural Economics 378, Recreation 56, Entomology 272, Forestry 229, 231, Landscape Architecture 128, 231, 253, Park Administration 263, 264, 363, 364 are required. Twenty-one credits of electives permit the student flexibility in attaining his objectives.

160 (62) (II). History and Philosophy of Parks.

A study of the historical, social and economic development of parks. Initial investigation of the philosophy of private, municipal, county, state and national parks. 3 class hours. Credit, 3. Mr. Whitney.

251 (51) (I). Principles of Arboriculture.

Maintenance of shade and ornamental trees. Development of municipal and private shade tree programs. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. King.

263 (63) (I). Park Administration.

Analysis of park policies and procedures at the several governmental levels. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Whitney.

264 (66) (II). Park Management and Operation.

The principles and purposes of operational and maintenance practices. Selection and adaptability of maintenance equipment by field inspection. 2 class hours, 1 2-hour laboratory period. Field trip required, $50.00. Credit, 3. Mr. Whitney, Mr. King.

363 (61) (I). Park Fiscal and Personnel Management.

Evaluation of the methods in the preparation, presentation and justification of the financial and personnel requirements of municipal, county, state and national parks. 3 class hours. Credit, 3. Mr. Whitney.

364 (64) (II). Park Design.

A series of problems in the physical organization and development of parks. 2 3-hour laboratory periods. Credit, 3. Mr. Mosher.

PLANT AND SOIL SCIENCES

Head of Department: Professor F. W. Southwick. Professors Boicourt, Colby, Drake, Havis, Lachman, Thomson, M. E. Weeks; Associate Professors Lord, Vengris, W. D. Weeks; Assistant Professors Baker, Barker, Bramlage, Goddard, Gunner, Jester, Marsh, Maynard, Michelson, R. Southwick, Troll, Tuttle, Yegian, Zak; Messrs Anderson, Bredakis, Waddington.

Plant Pathology: Head of Department: Professor J. H. Lilly; Professor Gilgut; Associate Professor Rohde; Assistant Professors Agrios, Banfield.

The major in Plant and Soil Sciences permits specialization in agronomy, soil science, turf management, horticultural science, and plant pathology. Emphasis is on basic sciences which will prepare students for careers in research, teaching, industry, business, marketing, sales, production, and regulatory services with state and federal agencies. A major in Plant and Soil Sciences will be required to take a basic core of subjects related to the physical, biological, social sciences and humanities plus certain specified and free electives that relate to his or her major field of interest.

PLANT SCIENCE

100 (2) (II). Basic Plant Science.

An introduction to some of the important structural features, physiological principles and environmental factors that are related to the growth and development of horticultural crops. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. F. W. Southwick, Mr. Maynard, Mr. Anderson.

110 (31) (I). Plant Propagation (1965–1966).

The science of plant reproduction. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Goddard.

200 (51) (I). Deciduous Orchard Science (1965–1966).

The physiological and nutritional principles upon which deciduous tree fruit production is based. Responses of the plants to environmental influences and cultural practices. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Anderson.

205 (53) (I). Small Fruit Technology (1966–1967).

Basic principles underlying the production of small fruits. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Anderson.

210 (55) (I). Retail Floral Design.

Basic principles of design as applied to commercial floral arrangements. Non-majors excluded without special permission. 2 3-hour laboratory periods. Credit, 3. Mr. Jester.

215 (58) (II). Floricultural Science.

The science and art of this phase of horticulture for non majors. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Boicourt, Mr. Jester.

220 (59) (I). Physiology of Greenhouse Crops (1966–1967).

Fundamentals of the artificial environment of greenhouses as they influence the vegetative and reproductive growth of plants. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Coddard.

225 (65) (I). Physiology of Vegetable Crops (1966–1967).

Factors influencing the growth and culture of vegetable plants. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Maynard.

230 (73) (I). Plant Nutrition (1965–1966).

The accumulation and transport of inorganic ions in plants and their function in plant metabolism. Prerequisite, Botany 211 (67) or equivalent. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Maynard.

235 (54) (I). Taxonomy of Economic Plants (1965–1966).

Plant families, genera, species and cultivars of importance in the horticultural and agronomic fields. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Boicourt.

240 (62) (II). Plant Breeding.

Improvement of horticultural crops using established genetic principles and methods. Prerequisite, Zoology 240 (53). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Lachman.

245 (74) (II). Post-Harvest Physiology (1965–1966).

The physical and chemical processes of plants before and after harvest and the influence of environmental, chemical and storage factors on these processes. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Bramlage.

250 (52) (II). Forage and Field Crops. (1966–1967).

Analysis of the principles involved in the establishment, fertilization, and harvest management of forage and field crops. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Colby.

255 (53) (I). Agrostology.

The establishment and maintenance of turf grasses used on lawns, athletic fields, highways, airports, cemeteries and turf nurseries. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Troll.

260 (65) (I). Ecology and Control of Weeds.

Identification and ecology of common weeds and principles of weed control with emphasis on the use of chemical herbicides. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Vengris.

SOIL SCIENCE

105 (22) (II). Soils.

Fundamentals of soil science covering development, properties and management of soils and the interrelationship of soils to plant growth. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Zak.

265 (57) (I). Soil Formation.

The development of soils as related to physical, chemical, biological, climatic and geological factors. 3 class hours. Credit, 3. Mr. R. A. Southwick.

270 (79) (I). Soil Physics (1966–1967).

Physical properties of soil, including textural, structural, water, air and temperature relationships; their measurements, evaluation and influence in the soil system. Prerequisite, Soil Science 105 (22) or equivalent. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Waddington.

275 (84) (I). Soil Chemistry (1965–1966).

The inorganic and organic chemical reactions related to the nutrient supply in soils and soil nutrition of plants. Colloidal aspects of soil chemical reactions and soil-plant mineral relationships. Prerequisites, Chemistry 127 (27) and Soil Science 265 (57) or equivalent. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Baker.

280 (60) (II). Soil Plant Mineral Nutrition.

Mineral nutrition in the growth of plants; the use and interactions of fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities in plants. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Drake.

285 (I). Microbiology of the Soil (1966–1967).

Soil microorganisms; their distribution, ecology and transformation of organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium. Prerequisite, Microbiology 250 (51) or permission of the instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Gunner.

PLANT PATHOLOGY

See courses in Plant Pathology listed on page 70 under the Department of Entomology and Plant Pathology.

PLANT AND SOIL SCIENCES

385 (97) (I), 386 (98) (II). Special Problems.

Credit, 3 each semester. Staff.

390 (95) (I), 391 (96) (II). Seminar.

Credit, 1–2 each semester. Staff.

RESTAURANT AND HOTEL MANAGEMENT

Professor Lundberg, Assistant Professors Cournoyer and Wrisley

The curriculum in Restaurant and Hotel Management is offered by the Department of Food Science and Technology. The program provides technical and professional courses for persons who plan a career in ownership, management, or sales in the hotel-motel, food service or related fields. Professional courses are balanced with a selection of courses in the arts and sciences which serve to broaden the students' interests and appreciations.

In addition to the courses required of all University students, Restaurant and Hotel Management students in the freshman year take Restaurant and Hotel Management 100 (33) and 101 (78), Agricultural and Food Economics 101 (1), and General Chemistry 111 (1) and 112 (2). In the sophomore year, these courses are taken: Accounting 125 (25) and 126 (26), Restaurant and Hotel Management 102 (77), Food Preparation and Meal Planning 156 (56), and Management 201 (61). The following courses are included in the junior and senior years: Restaurant and Hotel Management 200 (81), 201 (82), 390 (95), 391 (96), Food Production Management 350 (92), Public Health 163 (63), Food Technology 275 (75), Business 260 (71), Finance 201 (65), Agricultural Engineering 281 (53). Nine hours are selected from Economics, Psychology, and Sociology, and either English 337 (51) or 334 (52). Students may elect a management emphasis or a sales emphasis. Those electing the management emphasis take Management 231 (81), 341 (89), and 371 (92). Those electing the sales emphasis take Speech 101 (51) and Marketing 253 (53), 254 (54), and 273 (73). All students are required to complete at least two summers or its equivalent of on-the-job experience before graduation.

100 (33) (I). Introductory.

An introductory course in restaurant and hotel operations. The development of the industry, current trends, and an analysis of the various types of operations that make up the industry. Credit, 3. Staff.

101 (78) (II). Food Service Management.

A study of practices used by the food service industry pertaining to purchasing, receiving, and issuing food, beverages, and other supplies. Principles of food and beverage cost control. 3 class hours. Credit, 3. Mr. Wrisley.

102 (77) (I). Personnel Management in Restaurants and Hotels.

The management of people in food services and hotels; leadership and motivation, organization, training, job analysis and work simplification. Credit, 3. Staff.

200 (81) (I). Hotel and Restaurant Administration.

Financial practices and systems used in hotels and restaurants. Controls, capital budgeting, operational budgeting, use and interpretation of financial statements, and specialized hotel accounting procedures. Credit, 3. Mr. Wrisley.

201 (82) (II). Laws of Innkeeping (Institution Law).

Law as applied to hotels and food service establishments; includes a consideration of bailments, torts, regulations, insurance and sanitation. Prerequisite, General Business 260 (71). 3 class hours. Credit, 3. Mr. Cournoyer.

300 (II). Principles of Restaurant and Hotel Sales.

Principles and practices of food service and hotel market analysis, sales and promotion. 2 class hours. Credit, 2. Staff.

390 (95) (I), 391 (96) (II). Seminar.

Survey of current food service literature and reports. Outside speakers on selected professional topics. 2 class hours. Credit, 2. Staff.

VETERINARY AND ANIMAL SCIENCES

Head of Department: T. W. Fox, Professors W. Black, Foley, Mellen, Smith, Smyth; Associate Professors Anderson, D. Black, Grover; Assistant Professors Borton, Lyford; Mr. Denison.

The Department of Veterinary and Animal Sciences offers a program of study in the Animal Sciences. The curriculum in the Animal Sciences is designed to provide the student with fundamental training and knowledge in the comparative nutrition, physiology, breeding, selection and management of various classes of livestock and to understand the role of animal production in the national and world economy. To accomplish this objective, all students are expected to take Animal Science 121 (21), 220 (50), 330 (61), 334 (64), 321 (67), 308 (68), 353 (73), 354 (74); Food Science and Technology 258; Zoology 135 (35) and 240 (53); and Microbiology 150 (1). The curriculum provides for an important degree of flexibility depending upon the students' interests and abilities. Options emphasizing commercial animal production and sales or service work are supported by electives in agricultural economics, agricultural engineering, and business administration. Students interested in graduate work in such specialized areas of the animal sciences as nutrition, physiology or genetics should elect programs with special emphasis on the basic sciences. Suggested supporting courses and program organization for the various fields of

specialization are available from the advisers. Students will be required to complete one summer of placement employment (in production agriculture, industry, or research as determined in consultation) before graduation.

Pre-veterinary students are registered with the pre-medical advisory committee and are counselled in the Department of Veterinary and Animal Science. Additional information on the curriculum is shown on page 94 under the pre-medical curriculum.

VETERINARY AND ANIMAL SCIENCES

121 (21) (I). Introductory Animal Science.

Modern Animal and Poultry Science and its role in national and world economics. 3 class hours. Credit, 3. Mr. Foley.

220 (50) (II). Animal Physiology.

A comparative study of the physiology of mammals and birds with emphasis on those aspects most pertinent to animal science. Prerequisite, Zoology 135 (35). 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. D. Black.

256 (56) (II). Livestock Production.

Beef, sheep and swine production in New England and the United States. Field trips cost approximately $5.00. 3 class hours, 1 2-hour laboratory period. Credit, 4. Mr. Borton.

330 (61) (I). Principles of Animal Nutrition.

Scientific principles of nutrition in both ruminants and non-ruminants. 3 class hours. Credit, 3. Mr. Anderson.

334 (64) (II). Applied Animal Nutrition.

Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Prerequisites, Animal Science 330 (61). 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Lyford.

321 (67) (I). Physiology of Reproduction.

Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation. 3 class hours, 1 2-hour laboratory period. Credit, 4. Mr. W. Black.

308 (68) (II). Comparative Animal Genetics.

The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation. Prerequisite, Zoology 240 (53). 3 class hours. Credit, 3. Mr. Fox.

353 (73) (I). Poultry Management.

Principles of poultry business management. Designed to give the student a comprehensive view of all phases of the poultry industry. Field trips cost $10.00–$15.00. 3 class hours. Credit, 3. Mr. Grover.

354 (74) (II). Dairy Herd Management.

Dairy cattle and milk production in New England and the United States, including a study of managerial problems concerned with successful dairying. Field trips cost $10.00–$15.00. 2 class hours, 2 2-hour laboratories. Credit, 4. Mr. Foley.

359 (79) (I). Light Horse Management.

Breeds and adaptations; feeding, training and management; tack and its care, brief introduction to equitation. Field trips cost $5.00–$10.00. Open to all University students. 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Borton.

370 (72). General Veterinary Pathology.

An introduction to the study of animal diseases. The causes, development, transmission and control, with application to diseases of animals which are of economic and/or public health importance. Prerequisites, Microbiology 150 or Zoology 35. 3 class hours. Credit, 3.

385 (97) (I), 386 (98) (II). Special Problems.

Independent study for qualified seniors in specific subject areas, involving either extensive literature review or an experimental approach to a research problem. Credit, 1–3 each semester.

390 (95) (I), 391 (96) (II). Seminar.

Review of Current Literature in Animal Science. Credit, 1 each semester.

RELATED COURSES—OTHER DEPARTMENTS

Food Science and Technology 258 (II). Animal Products and By-Products.

COLLEGE OF ARTS AND SCIENCES

I. MOYER HUNSBERGER, *Dean*

Robert W. Wagner, *Associate Dean*
Leonta G. Horrigan, *Assistant Dean*
Severt J. Savereid, *Assistant Dean*
Harry Schumer, *Assistant Dean*

A university is a community dedicated to helping man acquire and extend knowledge and put it responsibly and maturely to use. It provides its members with range and depth of experience, insists upon their thinking critically, fosters their creative abilities, and increases their power to convey ideas. The university also relates areas of specialized knowledge by the development of general and comprehensive ideas.

With respect to knowledge which is at present accepted and applied, a university offers instruction and serves as a custodian. Truth which is only vaguely defined or wholly unknown it regards as a challenge to research, particularly by advanced students and the faculty.

To produce liberally educated people is the specific task of a college of arts and sciences. It encourages its members (1) to seek mastery over language (their own and one or more foreign tongues); (2) to gain insight into the cultures which these languages express; (3) to experience the values of formal thought; (4) to acquaint themselves with the disciplines which deal with animate and inanimate nature; (5) to be aware of the methods and results of the sciences which investigate man, his institutions, and his culture; (6) to comprehend the relation of man's ideals and aspirations to his experience as interpreted by the humanities. The college encourages its members (7) to learn the importance of justifying their beliefs and actions, examining the consequences thereof, and liberating themselves from the bondage of uncritical opinion. Finally, it wishes them (8) to apply and extend knowledge. For these latter purposes, especially, the college must see that its members devote intensive study to particular areas of knowledge. All instrumentalities of the College—facilities, curriculum, influence over student life, choice and support of the faculty—are directed to these ends.

The College of Arts and Sciences offers instruction in the fine arts, the humanities, the social sciences, the natural sciences, and mathematics both for students enrolled in the College and for those in other undergraduate divisions of the University. The program provides for the breadth of intellectual development essential to a liberal education and for concentration which is the necessary foundation for competence in a selected discipline.

The College offers twenty-six undergraduate major programs listed on page 9. They are described on the following pages along with the departmental course offerings except for the pre-medical, pre-dental, and pre-veterinary programs which are described on page 94. There is no formal pre-legal program, but most students who plan to attend a law school prepare themselves by majoring in government or history.

The Bachelor of Arts degree may be earned by students majoring in any division of the College. The Bachelor of Science degree may be earned by students in the natural sciences, mathematics, or psychology. The requirements for these degrees are very similar and are listed below:

Requirements

1. The successful completion of at least 120 credits, exclusive of required physical activity.
2. Speech 101.
3. English 111 and 112 (or 113), 125 (or 127), and 126 (or 128).
4. Intermediate proficiency in a foreign language, as determined by the successful completion of the second year course at the college level or by examination. The latter may be taken during the summer orientation period prior to the freshman year, or during subsequent language study subject to the approval of the department concerned.
5. a) History 100 and 101 must be completed by candidates for the Bachelor of Arts degree.

   b) Candidates for the Bachelor of Science degree must complete at least sixty (60) credits in science, mathematics, and psychology.
6. Two courses of at least three (3) credits each chosen from the courses in the Departments of Art, English, Foreign Languages, History, Music, Philosophy, and Speech which a) are not deemed to be highly specialized or to have a strong pre-professional emphasis and b) are not courses which could be used to complete requirements 2, 3, 4, and 5, except that History 100 and 101 may be used by a candidate for the Bachelor of Science degree. A list of the excluded courses will be available to the student at pre-registration and at registration time. At least one of these courses must be from the University's C group.
7. Introductory courses in two social sciences (Economics, Government, Psychology, and Sociology) and two non-introductory courses in one or more of these departments. Of the latter, at least one must be from the University's D group.

8. Three years' work in natural science and mathematics which is made up of a) a year's work (at least 6 credits) in one of the physical sciences—Astronomy, Chemistry, Geology, and Physics —and b) a year's work (at least 6 credits) in biological science made up of courses chosen from the offerings of one or more of the Departments of Botany, Microbiology, and Zoology or Entomology 126, and c) a third year (at least 6 credits) which may be either (i) a year of mathematics, or (ii) a semester of mathematics and a semester of logic, or (iii) two science courses (biological, physical, or both).

9. Completion of one of the major programs in the College. Each of these programs except the pre-medical and pre-dental includes at least 24 credits of upper division courses in the department of the major. A student may not use more than 30 credits of upper division courses in his major department in the minimum graduation total of 120 credits unless the excess is represented by credits in a senior honors project, by requirements waived by examination without credit, or by advanced placement credits.

10. Requirements 1, 2, 3, 4, 5, 6, 7, and 8 may be partially or completely fulfilled by advanced placement or transfer credits or by advanced placement without credit.

There is no special time sequence for fulfilling the graduation requirements, but there are advantages to completing some of them early in the college program. Sample programs for the first two years for each degree are presented below:

B. A.	B. S.
Freshman Year	
English 111 and 112	English 111 and 112
Speech 101	Speech 101
Foreign Language	Foreign Language
History 100 and 101	Mathematics
Mathematics or Natural Science	Physical Science
Social Science	Biological Science
Sophomore Year	
English 125 and 126	English 125 and 126
Foreign Language	Foreign Language
Natural Science	Mathematics or Natural Science
Social Science	Social Science
Elective	Elective

The elective in the sophomore year will usually be intimately connected with the student's intended major.

Special Program for Superior Students.

Any student who at the end of the first semester of his junior year presents a quality point average of 3.0 or higher, and is recommended by his major department for release from formal requirements, may, with the approval of his adviser and the Dean, work out a special program of study for his senior year. This program can consist of any approved combination of course work and independent research or creative effort.

Pre-medical, Pre-dental, and Pre-veterinary Programs.

A student whose goal is medicine, dentistry or veterinary medicine must register as a "Pre-med," "Pre-dent" or "Pre-vet" major so that his records will be directed to that member of the Pre-medical Advisory Committee who is assigned as his adviser.

Pre-medical and Pre-dental students will earn the B.A. degree. They must select the following *minimum* science courses: Botany 100; Chemistry 111, 127, 165, 166; Mathematics 123, 124; Physics 103, 104; Zoology 101 and two advanced Zoology courses from 223, 240, 271, 221, 360. French, German or Russian only will satisfy the College language requirement.

The required courses may be arranged in the following manner:

Year I	Year II	Year III
English 111, 112	English 125, 126	Physics or Zoology
For. Lang. 101, 102	For. Lang. 107, 108	History 100, 101
Mathematics 123, 124	Chem. 165, 166	Social Science
Chem. 111 (113),	Social Science	Chem. 127
112 (114)	Physics or Zoology	Humanity
Botany 100	Phys. Ed. 031 a, b;	Elective
Zoology 101	032 a, b	
Speech 101		
Phys. Ed. 001 a, b;		
002 a, b		

Year IV—Complete concentration requirement plus free electives.

Medical schools do not look with favor on over-specialization in any field. Thus, "Pre-meds" are encouraged to elect more than the minimum required courses in languages and literature, the social sciences, fine arts and other humanities according to their interests.

Since the University requires every student to have a concentration of *at least* 15 credits of advanced undergraduate courses in a single department, the "Pre-med" should plan this concentration in that subject which he enjoys most and which would be his alternate goal if, for any reason, admission to professional school does not materialize.

The choice of department in which the concentration is done has no bearing on the student's selection by the medical school. A "science" concentration is in no sense more advantageous than a "non-science" concentration.

Pre-veterinary students may register in either the College of Agriculture or the College of Arts and Sciences, the choice being determined by alternate goals to veterinary medicine. Requirements of schools of veterinary medicine may be met in some instances with 2 years of college training if courses are selected wisely. Under this plan, Zoology 135 and 240 will be substituted for language in Year II above. Students who anticipate more than 2 years in preparation should be guided by the curriculum above.

ART

Head of Department: Professor Paul F. Norton. Associate Professors Kamys, Matheson, Perkins; Assistant Professors Coughlin, Slivka; Miss Damm, Messrs. Belz, Berube, Gongora, Townsend.

The Department of Art is interested in providing two kinds of training: first, to give each student a good general historical and aesthetic knowledge of the arts; second, to give each student an opportunity to develop his creative ability in the several media of the arts. Majors will have specialized sufficiently to allow them to enroll in a professional art school at an advanced level, or to take jobs upon graduation in business or cultural organizations where some facility in the arts is required. By arrangement with the School of Education, courses can be so arranged that an art major will secure the necessary credits in education to allow him to teach art in the public schools. All majors should take Introduction to Art, Basic Drawing and Basic Design during their first two years, and in the junior and senior years a sequence of advanced courses as advised by the department.

CREATIVE ART

100 (33). Basic Drawing. (C)

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation. 6 studio hours. Credit, 3.

120 (31). Basic Design I. (C)

Two-dimensional design concepts arising out of work with specific problems in a variety of media. 6 studio hours. Credit, 3.

122 (32). Basic Design II.

Continuation of Art 120. Specific three-dimensional problems stressing the interrelationship of materials, processes, techniques and sculptural concepts. Prerequisite, Art 120. 6 studio hours. Credit, 3.

200 (51). Water Color I.

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisites, Art 100, 120. 6 studio hours. Credit, 3.

202 (52). Water Color II.

Continuation of Art 200. Prerequisite, Art 200. 6 studio hours. Credit, 3.

220 (53). Oil Painting I.

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 100, 120. 6 studio hours. Credit, 3.

222 (54). Oil Painting II.

Continuation of Art 220. Prerequisite, Art 220. 6 studio hours. Credit, 3.

230 (34). Advanced Drawing.

Continuation of Art 100. Investigation and development of various techniques and media with special emphasis on figure drawing. Prerequisite, Art 100. 6 studio hours. Credit, 3.

240 (57). Printmaking I.

Basic study of materials, techniques, and aesthetic considerations peculiar to various graphic media. Students print their own work. Prerequisites, Art 100, 120, or permission of instructor. 6 studio hours. Credit, 3.

242 (58). Printmaking II.

Continuation of Art 240. Prerequisite, Art 240. 6 studio hours. Credit, 3.

260 (60). Sculpture I.

Experimentation with materials. Investigation into the nature of 3-dimensional form. The development of 3-dimensional order. Individual projects. Prerequisites, Art 100, 122. 6 studio hours. Credit, 3.

262 (61). Sculpture II.

Continuation of Art 260. Prerequisite, Art 260. 6 studio hours. Credit, 3.

280 (65). Ceramics I.

Involvement with form through the use of clay and related materials. Handbuilding and work on the potter's wheel stress a creative, aesthetic approach. 6 studio hours. Credit, 3.

282 (66). Ceramics II.

Continuation of Art 280. Prerequisite, Art 280. 6 studio hours. Credit, 3.

385, 386 (97, 98). Special Problems in Art.

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department. Credit, 1–3.

HISTORY OF ART

115 (14). Introduction to Art: (C)

An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles. 3 class hours. Credit, 3.

205 (71). Ancient Art and Archaeology. (C)

The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting. Students are encouraged to take Art 115 before this course. 3 class hours. Credit, 3.

225 (73). Mediaeval Art. (C)

Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West. Students are encouraged to take Art 115 before this course. 3 class hours. Credit, 3.

245 (75). Renaissance Art. (C)

Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory. 3 class hours. Credit, 3.

265 (76). Baroque Art. (C)

The art of the 17th and early 18th centuries in Italy, Spain, Germany, France and the Low Countries. It is advisable for students to take Art 115 before this course. 3 class hours. Credit, 3.

285 (79). Modern Painting and Sculpture. (C)

Origin of modern movements in art, and an analysis of contemporary techniques and styles as they relate to society. 3 class hours. Credit, 3.

291 (81). Modern Architecture. (C)

History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. 3 class hours. Credit, 3.

295 (77). American Art. (C)

Study of the earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary phases of abstract art. 3 class hours. Credit, 3.

375, 377 (95, 96). Masters of Western Art.

An intensive study of the work of a master in the field of art. Prerequisite, permission of the instructor. 1 or 2 class hours. Credit, 1–2.

385, 386 (97, 98). Special Problems in Art.

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department. Credit, 1–3.

ASTRONOMY

Head of Department: Professor Albert P. Linnell. Assistant Professors Koch, Sobieski, Stienon; Mr. Adler.

The Department of Astronomy is administered jointly with Amherst, Mount Holyoke, and Smith Colleges. The elementary courses are taught separately at each campus, but all advanced courses are given on a joint basis for students from the four participating institutions. Four College courses are identified below by ASTFC.

The Department offers courses which furnish (1) specialization for those planning a career in astronomy, and (2) a background for all students who are interested in astronomy for its cultural or scientific value. Students majoring in astronomy should plan to finish satisfactorily Astronomy 101 (1), 102 (2), 103 (3), and 104 (4); Physics 107 (7), and Mathematics 186 (32) or 174 (26) by the end of the sophomore year. During the junior and senior years the following courses should be completed: Astronomy 237 (55), 238 (56), 343 (63), and 344 (64); Physics 255 (55) and 256 (56); Mathematics 241 (92). Students who plan to go to graduate school should also take Physics 252 (52), 261 (61), 266 (66), 285 (85), and 286 (86); Mathematics 221 (71) and 341 (93). These students should also obtain a good reading knowledge of German, French, or Russian.

101 (1) (I). Elementary Astronomy. (E)

Historical perspective. The solar system, systems of coordinates, laws of motion, planets and satellites, the sun. Cosmogony and current theories on the origin of life. Supplemented by occasional hours of evening observation. 3 class hours. Credit, 3. Mr. Sobieski.

102 (2) (II). Elementary Astronomy. (E)

The astronomical universe. Astronomical instruments. Stellar distances and motions, star clusters and nebulae. Cosmology. Supplemented by occasional hours of evening observation. 3 class hours. Credit, 3. Mr. Sobieski.

103 (3) (I). Analytical Elementary Astronomy.

Introduction to spherical trigonometry with applications to solutions of the Astronomical Triangle, celestial coordinate systems, precession, and nutation. Civil and astronomical timekeeping, use of the astronomical almanacs. Elementary discussion of the Bohr model of the atom and thermodynamic equilibrium to interpret the stellar spectral sequence. Prerequisites, concurrent enrollment in Astronomy 101 (1), Mathematics 135 (5) or 123 (9). 1 class hour. Credit, 1. Mr. Sobieski.

104 (4) (II). Analytical Elementary Astronomy.

Continuation of elementary astrophysics discussion relating observed data and stellar properties; the radiation laws and their application to stellar luminosity, color, and spectral type; the Hertzsprung-Russell diagram and Mass-Luminosity relation. Practical theory and general design of astronomical instruments. Prerequisites, concurrent enrollment in Astronomy 102 (2), Astronomy 103 (3), Mathematics 136 (6) or 124 (10), and Physics 105 (5) or 108 (8). 1 class hour. Credit, 1. Mr. Sobieski.

237 (55) (I). Astronomical Observation, Reduction, and Analysis I. (ASTFC 37)

Fundamental astronomical catalogues and their uses; theory of the transit telescope; visual observation with the equatorial telescope and the transit; photography with the equatorial telescope; photographic photometry. Prerequisite, Astronomy 101 (1) and 102 (2). Required of all astronomy majors. 3 class hours. Some classroom hours will be replaced by observing sessions to be arranged. Credit, 3. Staff.

238 (56) (II). Astronomical Observation, Reduction, and Analysis II. (ASTFC 38)

Astronomical spectroscopy including line identification, plate calibration and radial velocity determination; photography of objective grating spectra; photoelectric photometry including determination of atmospheric extinction and extrapolation to stellar color indices and magnitudes outside the atmosphere, photoelectric light curves of variable stars. Prerequisite, Astronomy 101 (1) and 102 (2). Required of all astronomy majors. 3 class hours. Some classroom hours will be replaced by observing sessions to be arranged. Credit, 3. Staff.

343 (63) (I). Mathematical Astronomy I. (ASTFC 43)

Basic topics in astronomy and astrophysics. Astronomical topics in atomic spectroscopy. Physics of radiation and radiative transfer. Basic considerations in the treatment of stellar interiors and atmospheres. Prerequisites, Astronomy 101 (1) and 102 (2); one year of differential and integral calculus; concurrent enrollment in Physics 255 (55). 4 class hours. Credit, 4. Staff.

344 (64) (II). Mathematical Astronomy II. (ASTFC 44)

Basic topics in astronomy. The restricted three body problems; advanced concepts in mechanics applicable to astronomical problems; stellar motions and stellar statistics. Prerequisites, Astronomy 343 (63), or permission of the department. 4 class hours. Credit, 4. Staff.

385 (95) (I), 386 (96) (II). Special Problems in Astronomy.

An individual research project approved by the department. Prerequisite, consent of the department. Credit, 3. Staff.

BOTANY

Head of Department: Professor Seymour Shapiro. Professors Gentile, Livingston, Schuster, Tippo; Associate Professors Bigelow, Davis, Stein; Assistant Professors Putala, Rowley, Wilce; Instructors Mrs. Bigelow, Mrs. Davis, Mrs. Skillings, Mrs. Stein, Mrs. Wilce.

Programs in botany prepare students for teaching and research in biological sciences in high schools, universities, industry, and experimental stations. Students majoring in botany who do not plan to teach in secondary schools should complete the following courses prior to their junior year: Botany 100, Botany 125, 126, Chemistry 111, 112, Zoology 101, and Physics 103, 104. Students interested in plant morphology, anatomy or systematics will take the following prescribed courses: Botany 211, 221, 291 and Zoology 240 and a minimum of 3 courses will be required from the following: Botany 231, 241, 251, 281, 301 and 311. Majors planning a preprofessional course in plant physiology and plant ecology will be required to take Botany 211, 221, 291, Chemistry 160 and Zoology 240 with additional courses as determined by the major adviser.

Botany majors planning to teach in secondary schools must complete Botany 100, 125, 126, Zoology 101, 135, and Chemistry 111 and 112 prior to the junior year. Psychology 301 and Education 251 should be completed in the junior year and Education 252, 385, 388 must be completed in one semester of the senior year. Required courses in botany will include a selection of at least 5 courses from the following: Botany 211, 221, 231, 241, 251, 291, and 311; some additional courses in related disciplines will be prescribed by the department adviser.

100 (1) (I) and (II). Introductory Botany. (E)

Structure, function and reproduction of plants, dealing primarily with the flowering plants. Basic biological principles are emphasized. 2 class hours; 1 quiz hour; 1 2-hour laboratory period. Credits, 3. Staff.

125 (25) (1). The Plant Kingdom. (E)

A general survey of the morphology, reproduction, distribution and importance of the slime molds, bacteria, algae, fungi, lichens, liverworts, mosses, ferns and seed plants. Prerequisite, Botany 100. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Davis, Mr. Bigelow.

126 (26) (II). New England Flora. (E)

Identification of tracheate plants (lycopods, horsetails, ferns, gymnosperms, angiosperms) and the families they represent. Prerequisite, Botany 100; Botany 125 recommended. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Livingston, Mr. Schuster.

211 (67) (I). Introductory Plant Physiology.

Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration. Prerequisites, Botany 100, and at least one semester of Organic Chemistry. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Gentile.

212 (68) (II). Plant Metabolism.

A study of the chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants. Prerequisites, Botany 211, Chemistry 160 or equivalent. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mr. Gentile.

221 (81) (I). Plant Ecology.

Interrelationships between plants and their environment, with special emphasis on the structure and development of plant communities. Prerequisite, Botany 100; Botany 126 and 211 recommended. 2 3-hour class-laboratory periods. Credit, 3. Mr. Livingston.

226 (82) (II). Plant Geography.

Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America. Prerequisite, Botany 221; Botany 281 recommended. 3 class hours. Credit, 3. Mr. Livingston, Mr. Schuster.

222 (84) (II). Autecology.

Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants. Prerequisites, Botany 211 and 221. Credit, 3. Mr. Livingston.

231 (66) (II). General Mycology.

Survey of the various fungi, their life history and distribution, their significance in disease, their utilization by man. Prerequisite, Botany 125, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Bigelow, Mrs. Bigelow.

241 (61) (II). Phycology.

The phylogeny, taxonomy, morphology and ecology of the major groups of the marine and fresh-water algae. Field work in marine and fresh-water environments. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wilce.

251 (62) (II). The Archegoniates.

The morphology, evolution and systematics of brophytes, ferns and their allies. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Schuster.

281 (59) (I). The Angiosperms.

The evolution and systematics of flowering plants, emphasizing families and their 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Schuster.

291 (57) (I). Plant Anatomy and Histological Methods.

Study of origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies. Prerequisite Botany 125, or permission of instructor. 2 class hours, 3 2-hour laboratory periods. Credit, 4. Mr. Putala.

301 (60) (II). Morphogenesis.

The development of plant form and structure at the level of cells and organs. Illustrations drawn from controlled experiments on the contribution of internal and external factors. 2 class hours, 1 3-hour laboratory-discussion period. Credit, 3. Mr. Davis, Mr. Shapiro.

311 (89) (I). Developmental Plant Cytology.

Emphasis on development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Rowley, Mr. Stein.

335 (80) (I). Aquatic Vascular Plants.

Systematics, ecology and fundamental importance of aquatic plants. A course designed for majors in Wildlife. Prerequisites, Botany 100, 126. 2 3-hour class-laboratory periods. Credit, 3. Mr. Wilce.

385 (97) (I), (98) (II). Special Problems.

Supervised problem work for qualified students. Hours by arrangement. Credit, 1–3. Staff.

CHEMISTRY

Head of Department: Professor William E. McEwen. Professors Cannon, Hunsberger, Little, Richason (Associate Head), Roberts, Smith, Stein; Associate Professors Carpino, Gawienowski, Ragle, Rausch, Robinson; Assistant Professors Brandts, Chandler, Curran, George, Lillya, McWhorter, Mortensen, Oberlander, Olver, Rowell, Stengle, Stidham, Williams, Zajicek; Mrs. Fessenden, Mrs. Parkinson, Messrs. Bernasconi, Turner, Wynne.

The prime purpose of the Department of Chemistry is to offer sound preparation for graduate study in chemistry. Accordingly, emphasis is placed upon intellectual accomplishment and broad understanding rather than on terminal training for specific chemical tasks. The program designed for this purpose also affords sound preparation for direct entry into chemical industry, chemical institutes, or governmental laboratories. A slightly modified program permits preparation for secondary school teaching.

Effective with the class of 1967, students planning to major in chemistry should take Chemistry 113, 114 (3, 4); German 101, 102 (1, 2); Mathematics 135, 136 (5, 6) or 123, 124 (9, 10); Botany 100 (1) and Zoology 101 (1) in the freshman year. Microbiology 150 (1) or Entomology 126 (26) may be substituted for one of the biological sciences in the curriculum. An advanced chemistry program is available to students selected by examination and conference during summer counseling. These students take Chemistry 125, 126 (25, 26) in the freshman year, replacing 113, 114 and 210 (3, 4, and 32).

The sophomore year should include Chemistry 165, 166, 167, 168 (51, 52, 53, 54); Mathematics 185, 186 (31, 32) or 173, 174 (25, 26); Physics 103, 104 (3, 4) or 105, 106 (5, 6) and later 107 (7); German 107, 108 (7, 8). The junior chemistry major takes Chemistry 210 (32) and 285 (65) during the first semester; and 169 (55), 286 (66), and 287 (67), second semester. Chemistry 288 (68) is to be taken during the first semester of the senior year.

To complete requirements for the B.S. degree with a major in chemistry and to qualify for certification to the American Chemical Society the student must take Chemistry 213 (83) and 246 (86), and two additional courses selected from the listing below. One of these two additional courses must be selected from either the "Physical Group" or the "Organic and Biochemistry Group".

(1) Physical Group: 290 (76), 295 (77), 388 (98), Honors (and certain advanced physics and mathematics courses by approval of the Head of Department).

(2) Inorganic, Analytical, and Radiochemistry Group: 213 (83), 215 (85), 244 (84), 246 (86), 247 (87), 388 (98), Honors.

(3) Organic and Biochemistry Group: 223 (93), 224 (94), 271 (81), 272 (82), 388 (98), Honors.

Students in secondary education may use the Education Block to substitute for the two additional courses.

A student may qualify for the B.S. Degree in chemistry (but not for certification to the American Chemical Society) without completing Chemistry 169 (55), 213 (83), or 246 (86). However, the curriculum must then include four courses selected from the above listing. One of these must be a laboratory course, and two different groups must be represented by the selection. Students in secondary education may use the Education Block to substitute for two of the non-laboratory courses in the above groups.

Students may satisfy requirements for the B.A. degree by completing the following: Chemistry 113, 114 (3, 4) or 111, 112, 129 (1, 2, 29); 165, 166, 167, 168 (51, 52, 53, 54); 210 (32); 285, 286, 287 (65, 66, 67); and 6 credits in Chemistry courses numbered higher than 200, one of which must be a laboratory course. The same supporting courses are required as listed for the B.S. curriculum, except that German is not required. The B.A. degree requirements also include History 100 (5) and 101 (6).

111 (1) (I), 112 (2) (II). General Chemistry. (E)

A study of the fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry. 2 class hours; 1 quiz hour, 1 2-hour laboratory period. Credit, 3. Mr. Richason and Staff.

113 (3) (I), 114 (4) (II). General Inorganic Chemistry. (E)

A study of the fundamental chemical laws and theories, and including the elements of qualitative analysis. For students planning to major in chemistry and others for whom the course is a departmental requirement. Prerequisite, secondary school chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Richason and Staff.

120 (71) (II). Introduction to Biochemistry.

A brief introduction to biochemistry as a terminal course for students whose professional objectives do not necessitate more extensive training in chemistry. Prerequisite, Chemistry 112 (2). 3 class hours, 1 3-hour laboratory period. Credit, 4. Biochemistry Staff.

125 (25) (I), 126 (26) (II). Principles of Chemistry. (E)

For students who qualify by examination. A study of fundamental laws and theories including the theory and practice of qualitative and quantitative methods of analysis. 2 class hours, 6 laboratory hours. Credit, 4. Mr. Richason and Staff.

127 (27) (I, II). Analytical Chemistry. (E)

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Not acceptable for major credits except by special arrangement. Prerequisite, Chemistry 112 (2) or 114 (4). 2 lectures, 2 3-hour laboratory periods. Credit, 4. Analytical Staff.

129 (29) (I). Qualitative Analysis. (E)

The fundamental principles of ionic equilibria and the chemistry of important cations and anions, with particular reference to semimicro qualitative analysis. Prerequisite, Chemistry 112 (2). 2 class hours, 6 laboratory hours. Credit, 4. Mr. Wynne.

160 (33) (I, II). Organic Chemistry. (E)

A short course intended to satisfy the requirements in this field for all students who do not specialize in chemistry. Prerequisites, Chemistry 112 (2). 3 class hours, 1 3-hour laboratory period. Credit, 4. Organic Staff.

165 (51) (I), 166 (52) (II). Organic Chemistry for Majors.

261 (51) (I), 262 (52) (II). Organic Chemistry for Non-Majors.

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 112 (2) or 114 (4). Concurrent enrollment in Chemistry 167, 168 or 263, 264 (53, 54) is required. 3 class hours. Credit, 3. Organic Staff.

167 (53) (I), 168 (54) (II). Organic Lab for Majors.

263 (53) (I), 264 (54) (II). Organic Lab for Non-Majors.

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 165, 166 or 261, 262 (51, 52). 1 3-hour laboratory period. Credit, 1. Organic Staff.

169 (55) (II). Organic Chemistry Laboratory.

Continuation of Chemistry 168 (54). Study of preparations involving special techniques and use of the literature of organic chemistry. Prerequisite, Chemistry 166, 168 (52, 54). Limited to Chemistry majors. 2 3-hour laboratory periods. Credit, 2. Organic Staff.

210 (32) (I). Quantitative Chemical Analysis. (E)

A detailed study of the principles and practices of titrimetric and gravimetric analysis; separation methods; introduction to physical methods. Primarily for chemistry majors and others needing a more detailed treatment than is given in Chemistry 127 (27). Prerequisite, Chemistry 114 (4) or 129 (29), and 166 (52). 2 lectures, 2 4-hour laboratory periods. Credit, 4. Analytical Staff.

213 (83) (I). Instrumental Analysis.

The theory and technique of colorimetry, spectrography, potentiometry, microscopy, polarography, chromatography and other special analytical methods. Prerequisites, Chemistry 210 (32), 286 (66). 2 class hours, 1 4-hour laboratory period. Credit, 3. Analytical Staff.

215 (85) (II). Theory of Analytical Processes.

A detailed consideration of analytical topics, as chemical equilibrium, precipitate formation, chelating agents, multistage separation, etc., having general applicability in chemical investigations. Prerequisites, Chemistry 166 (52) and 286 (66). 3 class hours. Credit, 3. (Laboratory optional, 1 extra credit.) Analytical Staff.

219 (80) (I). Electronics Instrumentation for Scientists.

Laboratory oriented course designed for scientists which begins with electronic principles and leads through servo-systems, operational amplifiers, digital circuits, and other measurement devices. Prerequisite, one year of physics and permission of instructor. 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Curran.

220 (79) (I). Elementary Biochemistry.

The more important facts relating to the chemistry of biological materials and processes. Designed primarily for students not eligible for Chemistry 223 (93). Not open to chemistry majors. Prerequisite, Chemistry 160 (33) or 261 (51). 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Robinson.

223 (93) (I), 224 (94) (II). General Biochemistry.

A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field. Prerequisites, Chemistry 166 (52) or equivalent. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Little.

244 (84) (II). Radiochemistry.

The character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radionuclides. Prerequisite, Chemistry 127 (27) or 210 (32), or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Richason.

246 (86) (I, II). Theoretical Inorganic Chemistry.

A survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanisms. Prerequisite, Chemistry 285 (65). 3 class hours. Credit, 3. Inorganic Staff

247 (87) (II). Inorganic Chemistry of the Common Elements.

A systematic consideration of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices. Prerequisite, Chemistry 246 (86), or permission. 3 class hours (6 laboratory hours optional). Credit, 3 (or 5). Inorganic Staff.

271 (81) (II). Organic Chemistry.

An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 3 class hours. Credit, 3. Organic Staff.

272 (82) (I). Qualitative Organic Chemistry.

Identification of unknowns, both single and mixtures of organic compounds, by physical properties, reactions and preparation of derivatives. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Organic Staff.

281 (61) (I). Elementary Physical Chemistry.

A study of the basic principles of physical chemistry designed for students with a limited mathematical background. Not open to chemistry majors. Prerequisites, Chemistry 112 (2) or 114 (4); Physics 104 (4); Mathematics 124 (10). 3 class hours. Credit, 3. Physical Staff.

282 (62) (II). Elementary Physical Chemistry.

A continuation of Chemistry 281 (61). 2 class hours, 1 3-hour laboratory period. Credit, 3. Physical Staff.

285 (65) (I), 286 (66) (II). Physical Chemistry.

A study of the fundamental theories and laws of physical chemistry. Prerequisites, Mathematics 186 (32) or 174 (26); Physics 104 (4) or 106 (6). Co-requisites, Chemistry 210 (32) or 127 (27). 3 class hours. Credit, 3. Physical Staff.

287 (67) (I, II), 288 (68) (I, II). Physical Chemistry Laboratory.

Experience in modern physico-chemical techniques. Prerequisites, Chemistry 210 (32); Mathematics 186 (32) or 174 (26); Physics 104 (4) or 106 (6); or permission of instructor. Concurrent enrollment in Chemistry 285, 286 (65, 66). 1 4-hour laboratory period. Credit, 2. Physical Staff.

290 (76) (II). Advanced Physical Chemistry.

A survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas. Prerequisites, Chemistry 286 (66). 3 class hours. Credit, 3. Physical Staff.

295 (77) (I). Advanced Physical Chemistry.

Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids. Prerequisites, Chemistry 286 (66). 3 class hours. Credit, 3. Physical Staff.

385 (91) (I). Chemical Literature.

Intended to give facility in the location of information of a chemical nature. Prerequisites, Chemistry 166 (52), 286 (66), and a reading knowledge of German, or permission of instructor. 1 class hour. Credit, 1. Mr. Oberlander.

388 (98) (II). Introduction to Research.

Admission only by permission of the department. To each student is assigned some special subject or problem in one of the several fields of chemistry. Hours by arrangement. 10 laboratory hours. Credit, 5. Staff.

THE CLASSICS

The curriculum in the Classics is offered by the Department of Romance Languages. (See page 147).

ECONOMICS

Acting Head of Department: Professor Bruce R. Morris, Professors Gamble, Howard, Schoeffler; Associate Professor Blackman; Assistant Professors Gandhi, Martin, Wickman; Messrs. Aitken, Gelfand, Miller, Smith.

The major in economics serves as the undergraduate preparation for a variety of possible careers in business, government, teaching, or research and also serves as a pre-law or pre-graduate-business program. The emphasis is on a thorough grounding in the techniques of economic analysis and in their application toward important problems of business, government, or economic policy. Fields of emphasis include: Banking and finance, international trade, underdeveloped economies, labor and

personnel relations, business research, economic forecasting, industrial economics, decision-making, and the social control of business. The training in economics takes place in the context of a sound general education in the arts and sciences.

The economics major consists of Economics 201 (73) and 211 (53), Statistics 121 (21), Accounting 125 (25), and at least 15 additional credit-hours from the economics curriculum. Up to 33 junior-senior credit-hours may come from economics, business administration or agricultural economics. Economics 125 (25) is a prerequisite for all other courses (except for Economics 112 [12]); and it, as well as Economics 126 (26), is best taken in the sophomore year.

112 (12) (II). Economic History of the United States. (D)

Important aspects of the evolution of our modern economic system; social technological, and other changes which have affected economic institutions; public policy problems involved. Credit, 3. Mr. Gelfand.

125 (25) (I) (II). Elements of Economics. (D)

A study of the basic principles which govern the allocation of resources and behavior of markets in the American economy. Credit, 3. Staff.

126 (26) (II). Problems of the National Economy. (D)

The determinants of stability and growth of the national economy and of the world economy. Credit, 3. Staff.

201 (73) (I). Modern Economic Theory and Analysis. (D)

Micro-economic analysis: types of markets; theory of the firm and the industry under a variety of market conditions; theory of business decisions under conditions of certainty. Credit, 3. Mr. Martin.

211 (53) (I). Money, Banking and Credit. (D)

The development and operation of the monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. Credit, 3. Mr. Gamble.

212 (54) (II). Money, Income and Monetary Policy. (D)

The relationship among money, income and monetary policy. An examination of the relationships among individuals, banks, money markets, governments and central banks. Prerequisites, either Economics 211 (53) or Finance 210 (55). Credit, 3. Mr. Gamble.

214 (56) (II). Business Fluctuations and Forecasting. (D)

Nature and causes of business fluctuations; methods of forecasting; government policy for stability; utility of available statistical data as guides to private and public policy. Prerequisites, Economics 211 (53) or Finance 210 (55). Credit, 3.

221 (71). The International Economy.

A historical and analytical introduction to the study of international institutions, trade, finance, and policy. Credit, 3. Mr. Aitken.

222 (72). International Trade and Economic Policy.

Intermediate theory of international trade, including the analysis of the balance of payments mechanism, pure-non-monetary theory and its application to problems of commercial policy. Credit, 3. Mr. Aitken.

231 (83) (I). Social Control of Business. (D)

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation or public enterprises for competition. Credit, 3. Mr. Howard.

232 (70) (II). The Structure of American Industry.

Business enterprise, market competition, and economic development in American industries, The social effectiveness of industries analyzed through measures of industrial structure and market performance. Credit, 3. Mr. Howard.

241 (79) (I). Labor Problems. (D)

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them. Credit, 3. Mr. Blackman.

242 (80) (II). Labor Law and Legislation. (D)

Economic effects and historical survey of Federal and state laws and an analysis of important court decisions. Prerequisites, Economics 241 (79), or consent of the instructor. Credit, 3. Mr. Blackman.

248 (55) (I). Economics of Consumption and Personal Finance. (D)

Patterns of consumption, standards of living and the sources and expenditure of individual and family incomes. Credit, 3. Mr. Morris.

251 (75). Mathematical Methods in Economics.

The applications of various mathematical concepts and techniques in macro-economic and micro-economic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economic phenomena. Prerequisites, Economics 126 (26), Mathematics 111 (1), 112 (2), or consent of the instructor. Credit, 3.

252 (76). Econometrics.

The application of mathematical and statistical methods to economic theory. Special emphasis is placed on the application to both micro- and macro-economic policy issues. Prerequisites, Statistics 121 (21) and Economics 251 (75), or permission of the instructor. Credit, 3.

261 (81). European Economic Evolution. (D)

Evolution of economic organization in agriculture, industry and commerce; the surrounding social and institutional life. Prerequisites, History 100 (5) and 101 (6), or consent of the instructor. Credit, 3. Mr. Gelfand.

266 (82) (II). Economic Development. (D)

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. Credit, 3. Mr. Morris.

271 (84) (I). Comparative Economic Systems. (D)

The structure, operation, and underlying ideology of the major contemporary forms of social-economic organization. Emphasis on the Soviet Union and the United States. Credit, 3. Mr. Schoeffler.

281 (85) (I). Regional Economics. (D)

Examination of the process of regional economic development; application of location theory and basic techniques of regional analysis. Credit, 3. Mr. Wickman.

304 (88). Finoncial Aspects of Economics. (D)

The application of modern flow-of-funds analysis to the financial behavior of the various economic sectors. Special emphasis is placed on capital theory, and on rational planning for business decisions in regard to capital budgeting and financing. Credit, 3. Mr. Martin.

306 (86). Doctrinal Backgrounds of Contemporary Theory.

The evolution of contemporary theory from its classical beginnings; neoclassicism and its chief variants; dissenters Marx, German historical school, Veblen. Emphasis is placed on the relation of economic thought to other kinds of social theories. Credit, 3. Mr. Martin.

312 (78) (II). Public Finance. (D)

Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment, economic growth and price stability. Credit, 3. Mr. Gamble.

391 (95) (I), 392 (96) (II). Seminar.

Research in economic theory; problems of labor, commerce, and industry. If desirable, some other economic study may be substituted. Prerequisites, Economics 126 (26). 1 or 2 2-hour conferences. Credit, 1 to 3. Staff.

RELATED COURSES—OTHER DEPARTMENTS

352 (58). AGRICULTURAL POLICY (Agricultural and Food Economics)

373 (78). RESOURCE AND CONSERVATION ECONOMICS (Agricultural and Food Economics)

381 (72). INTERNATIONAL AGRICULTURAL DEVELOPMENT (Agricultural and Food Economics)

ENGLISH

Head of Department: Professor Howard O. Brogan, Professors Copeland[2], *Helming, Kaplan, Koehler,*[1] *Langland, Musgrave, O'Donnell,*[1] *B. Spivack, Varley; Associate Professors Campbell, Chametzky, Clark, Duckert, Golden, Haven, McCarthy,*[1] *Mitchell, Page,*[1] *Silver,*[2] *Weston,*[2] *A. Williams; Assistant Professors Barron, Collins, Gozzi, Halpern, J. Hicks,*[2] *Hogan, Horrigan, Kim, McDonald, Moser, Porter, Rabel, Ratner*[1]*, Rudin*[1]*, Sweeney, Tucker*[1]*, R. Williams, Wolf; Mrs. Boas, Mrs. Burstein, Mrs. A. Chametzky, Mrs. DuBois, Mrs. Grahame, Mrs. P. Hicks,*[2] *Mrs. Michelman, Mrs. Oppenheim, Mrs. Reid, Mrs. Rowe, Miss Smith, Mrs. Wright; Messrs. Adams, Fetler, French, Kenseth, Knight, Stone.*[1] *Visiting Lecturers Aninger, Beaty, Dunn, Gaull, Hofer, Lesser, Mayer,*[1] *Oickle, Raymond, Saagpakk, Spaulding, C. Spivack.*

The student who majors in English will gain a considerable knowledge of Western literature; he will develop his skill in expository and creative

[1]On leave second semester of 1964–65.

[2]On leave first semester of 1965–66.

writing; and he will increase his capacity to read literary works with perception and to judge them by critical standards. Such a program has maximum value as liberal education, and is especially useful to students whose interests are in writing, editing, criticism, and teaching.

The Department of English offers courses in composition, literature, and language. Students majoring in English must (1) elect a semester of English history; (2) elect 30 hours in departmental electives, of which 15 must conform to the distribution requirements of the department; and (3) maintain a quality-point average of 2.0 or better in all departmental electives from the beginning of the junior year on.

111 (1), 112 (2). English Composition. (B)

Training in effective composition; readings. 2 class hours. Credit, 2.

113 (3) (I). Special Freshman Composition.

Exemption from English 1. 2 class hours. Credit, 2.

116 (F) (I) (II). English for Foreign Students.

Rapid grammar review with special emphasis on typical errors of foreign students; oral recitation in class, written compositions; readings from contemporary British and American literature. Foreign undergraduates may substitute one semester of this course for English 111 or 2 semesters for English 111 and 112 respectively. 3 class hours. Credit, 2.

125 (25) (I), 126 (26) (I) (II). Masterpieces of Western Literature.

A study of selected masterpieces. The course aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues. Prerequisite, English 2 or 3; English 125 or 127 is prerequisite to English 126 and to elective courses in the Department. An elective course may, however, be taken concurrently with English 126; for prospective majors, this elective should be English 201. 3 class hours. Credit, 3.

127 (27) (II), 128 (28) (I). Special Course in Masterpieces of Western Literature.

A study of the texts read in English 125, 126 with additional outside readings; for freshmen who have taken English 3, or are otherwise specially qualified. English 125 or 127 is prerequisite to English 128 and to elective courses in the Department. An elective course may, however, be taken concurrently with English 128 for prospective majors, this elective should be English 201. 3 class hours. Credit, 3.

201 (61) (I) (II). History of English Literature. (C)

A study of the major phases of English literary history. Representative writers from Chaucer to Dryden will be examined. English majors are expected to include English 201 among their first Departmental electives; it may be taken concurrently with English 126 or 128. 3 class hours. Credit, 3.

202 (62) (II). History of English Literature. (C)

A study of representative English writers from the eighteenth century to the present. A continuation of English 161 but may be elected independently. 3 class hours. Credit, 3.

205 (72) (II). Greek Classics (in translation). (C)

Homer, lyric poetry, the major dramatists, selected dialogues of Plato, Thucydides, and their relations to the classical tradition in English literature. 3 class hours. Credit, 3.

216 (66) (II). Chaucer. (C)

The major works, especially *Troilus* and selected *Canterbury Tales*, as combinations of medieval art and thought with pre-Renaissance motifs and Chaucer's genius for realism. 3 class hours. Credit, 3.

221 (67) (I). Shakespeare. (C)

Examination of Shakespeare's dramatic art and leading ideas through a careful study of approximately a dozen plays. 3 class hours. Credit, 3.

222 (68) (II). Shakespeare. (C)

Follows the same method as English 221 but with a different group of plays. Either semester or both can be taken for credit. 3 class hours. Credit, 3.

225 (69) (I). The Renaissance in England. (C)

The non-dramatic literature of Tudor and Jacobean England in terms of emergent forms and literary ideas. Special attention to More, Spenser, Bacon, and Thomas Browne. 3 class hours. Credit, 3.

226 (70) (II). Elizabethan and Jacobean Dramatics. (C)

Non-Shakespearian dramatists of the English Renaissance. A study of the major plays of Marlowe, Jonson, Beaumont, Fletcher, Tourneur, Webster, and Ford. 3 class hours. Credit, 3.

233 (73) (I). Seventeenth-Century Poetry, 1600-1660. (C)

A study of such representative poets as Donne, Jonson, Herrick, Lovelace, Suckling, Herbert, Vaughan, Crashaw, Traherne, and Marvell, with emphasis upon the Metaphysical Tradition. 3 class hours. Credit, 3.

236 (74) (I). Milton. (C)

Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance with emphasis on *Paradise Lost*. 3 class hours. Credit, 3.

241 (77) (I). English Literature of the Eighteenth Century. (C)

The literature of the Augustan Age, with special emphasis on the writings of Swift and Pope. 3 class hours. Credit, 3.

242 (78) (II). English Literature of the Eighteenth Century. (C)

The literature of the later eighteenth century with special emphasis on the Johnson Circle. A continuation of English 241 but may be elected independently. 3 class hours. Credit, 3.

243 (83) (I). The English Novel from Defoe through Austen. (C)

The reading and discussion of significant representative novels, including works of such authors as Richardson, Fielding, Sterne, and Smollett. 3 class hours. Credit, 3.

251 (79) (I). The Romantic Poets. (C)

A study of the Romantic Movement as revealed in the poetry of Wordsworth, Coleridge, and the other early Romantics. 3 class hours. Credit, 3.

252 (80) (II). The Romantic Poets. (C)

A further study of the Romantic Movement, with particular attention to Byron, Shelley, and Keats. 3 class hours. Credit, 3.

253 (86) (II). The English Novel from Scott through Hardy.

The reading and discussion of significant representative novels, including works of such authors as Dickens, Thackeray, the Brontës, Eliot, and Hardy. 3 class hours. Credit, 3.

255 (81) (I). English Prose of the Romantic Period. (C)

A study of the techniques and ideas of the chief prose writers (from 1798 to 1837), including Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey and the early Carlyle. 3 class hours. Credit, 3.

256 (82) (II). English Prose of the Victorian Period. (C)

The chief Victorian prose writers (from 1837 to 1900), including Macaulay, Carlyle, Newman, Arnold, Mill, Ruskin, Huxley and Pater. 3 class hours. Credit, 3.

259 (84) (II). Victorian Poetry. (C)

The chief poets from 1840 to 1900 with emphasis on Tennyson, Browning, Arnold, and the Pre-Raphaelite Movement. 3 class hours. Credit, 3.

261 (87) (I). Modern Novel: 1890-1930. (C)

The expanding form of the novel and increasing interest in social causes as exhibited in some twelve novels. 3 class hours. Credit, 3.

262 (88) (II). Modern Novel: 1930-1960. (C)

An analytical presentation of some twelve novels. A continuation of English 261 but may be elected independently; no English major may, however, elect both English 261 and 262. 3 class hours. Credit, 3.

263 (90) (II). Modern British and American Drama. (C)

A study of representative dramatists since the late nineteenth century, including Shaw, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art. 3 class hours. Credit, 3.

264 (85) (I). Modern European Drama (in translation). (C)

Major modern dramatists beginning with Ibsen and including Chekhov, Pirandello, Strindberg, Giraudoux, and others. Emphasis on comparative currents in various European nations. 3 class hours. Credit, 3.

266 (89) (I). Modern Poetry. (C)

An analysis of twentieth-century poetry developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson to those of the present. 3 class hours. Credit, 3.

271 (55) (I). Early American Literature. (C)

Significant American writing during the Colonial, Revolutionary, and early Federalist periods. Given in alternate years. 3 class hours. Credit, 3.

272 (56) (II). American Poetry. (C)

American poetry from 1800 to the emergence of a modern style early in the twentieth century. 3 class hours. Credit, 3.

275 (57) (I) (II). Major American Writers. (C)

Selected major American writers of the nineteenth and twentieth centuries, including Emerson, Hawthorne, Longfellow, Lowell, James, Adams, Fitzgerald, and Hemingway. 3 class hours. Credit, 3.

276 (58) (I) (II). Major American Writers. (C)

Selected major American writers of the nineteenth and twentieth centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Crane, Dreiser, Wolfe, and Faulkner. 3 class hours. Credit, 3.

282 (63) (I). Literary Criticism.

An examination and application of theories and techniques of criticism, with special consideration of the twentieth century. 3 class hours. Credit, 3.

312 (60) (II). History of the English Language.

The development of English, including a study of vocabulary and usage levels, grammars, and dictionaries. Special attention to matters crucial to the teaching of English in secondary schools. 3 class hours. Credit, 3.

331 (50) (I) (II). Technical Writing.

For majors in engineering. A course in factual and inductive exposition with special emphasis upon research, federal, and industrial reports. 2 class hours. Credit, 2.

334 (52) (II). Advanced Technical Writing.

Case studies in engineering and industrial reporting, advertising and promotional literature, scientific journalism, and graphic techniques. Given in alternate years. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

337 (51) (I) (II). Advanced Expository Writing.

The writing of informative prose in the forms expected in the students' major fields: reports, articles, essays. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

341 (53) (I) (II). Creative Writing.

Intensive practice in writing prose fiction, with some attention to other forms, supplemented by discussion of ideas and techniques in contemporary literature. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

345 (54) (I or II as enrollment warrants). Creative Writing.

A continuation of English 341, with emphasis upon fiction. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

346 (54) (I or II as enrollment warrants). Creative Writing.

A continuation of English 341, with emphasis upon poetry. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

347 (54) (I or II as enrollment warrants). Creative Writing.

A continuation of English 341 with emphasis upon drama. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

390 (95) (I). Seminar in English Literature or Comparative Literature in Translation.

For English majors, but open to others. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

391 (96) (II). Seminar in American Literature.

For majors but open to others. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

GEOLOGY

Head of Department: Professor H. T. U. Smith. Professor Farquhar; Associate Professors Motts, Webb; Assistant Professors Burke, McGill, Nelson, Pitrat, Robinson; Messrs. Hayes, Rice.

For students considering geology as a career, the opportunities are many. Those interested primarily in basic science may look to positions in teaching, in museum work, on state and federal surveys, and in various research organizations. Those concerned mainly with applied science may direct their efforts toward work in mining geology, petroleum geology, engineering geology, and ground-water geology, and industrial mineralogy.

For a major in geology leading to the Bachelor of Science degree, requirements are: one year each of chemistry, physics, and biologic science; Mathematics 135 (5) and 136 (6) or 123 (9) and 124 (10) and one additional mathematics course; 33 credits in geology including courses 101 (1) or [280 (50)], 102 (2), 130 (33), 110 (42), 220 (56), 240 (63), 250 (74), 345 (78), and an approved summer field course; and at least 12 additional hours in mathematics, engineering, geology, or other sciences, elected on consultation with the departmental adviser. German or Russian is recommended for the foreign language.

The Bachelor of Arts degree in geology is admirably suited for those planning to teach general science in secondary schools, and may be useful for those planning to be executives in technical industries. Although the Bachelor of Science degree is intended for those considering a professional career in geology, the Bachelor of Arts degree is also adequate, though less thorough, preparation for graduate work in geology.

For a major leading to the Bachelor of Arts degree, requirements are: one year each of chemistry and physics; one semester of zoology; Mathematics 135 (5) or 123 (9); and 30 credits in geology, including courses 101 (1), 102 (2), 130 (33), 110 (42), 220 (56), 231 (72), and 250 (74). Strongly recommended also is additional work in related sciences and mathematics, together with a summer field course (which may be substituted for course 231 [72]).

An interdisciplinary program to prepare students for careers and certification in the teaching of Earth Science at the Secondary Level is being developed in cooperation with the School of Education and the Natural Science Departments of the College of Arts and Sciences. Students in this program will have an adviser from the School of Education in addition to their adviser in the Geology Department. The program is being planned to provide sufficient flexibility for fundamental training in both Geology and Education with strong support in related sciences.

All students majoring in the department are required to maintain a quality point average of at least 2.0 for advanced courses in geology. Students interested in combining geologic and engineering training may consult the department head for special provisions relating to their programs.

101 (1) (I) (II). Physical Geology. (E)

The nature and origin of the landscape features of the earth, and their underlying rocks and structures, including the work of rivers, waves and currents, wind, and glaciers; and the role of earthquakes, volcanoes, and the processes of mountain-building. 2 class hours, 1 3-hour laboratory period, and field trips. Credit, 3. Staff.

102 (2) (I) (II). Historical Geology. (E)

Origin and age of the earth; interpretation of the geologic time scale; development of continents and oceanic basins and their relief features; evolution of life. Prerequisite, Geology 101 (1). 2 class hours, 1 3-hour laboratory period and field trip. Credit, 3. Staff.

110 (42) (I). Mineralogy. (E)

Chemical composition, physical properties, crystal form, occurrence, and identification of common minerals. Prerequisites, Chemistry 111 (1) and 112 (2). 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Nelson.

130 (33) (II). Structural Geology. (E)

Principles of deformation of the earth's crust, occurrence and recognition of rock structures; graphic solution of structural problems; field observations. Prerequisite, Geology 101 (1). Credit, 3. Mr. Robinson.

220 (56) (II). Lithology.

Study of rocks with emphasis on constituent minerals, textural and structural features, mode of occurrence, and origin. The laboratory work will include an introduction to petrographic methods. The course is a sequel to Geology 110 (42) as the second half of a one year study of minerals and rocks. Prerequisites, Geology 101 (1), 110 (42). 3 class hours, 1 3-hour laboratory period, and field trips by arrangement. Credit, 4. Mr. Nelson.

231 (72) (I). Geologic Field Mapping.

An introduction to the instruments and techniques used in field mapping, and their application to the geologic mapping of selected areas. Prerequisites, Geology 130 (33), 220 (56); 8 field hours. Credit, 3. Mr. McGill.

240 (63) (I). Invertebrate Paleontology.

A study of the history, development, and identification of invertebrate animal fossils. Field trips by arrangement. Prerequisites, Geology 102 (2); Zoology 101 (1). 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Pitrat.

250 (74) (II). Sedimentology.

A study of the composition, classification, and origin of sedimentary rocks, including discussion of source area, mode of transportation and deposition, and diagenesis. Prerequisites, Geology 101 (1), 102 (2), 110 (42). 2 class hours and laboratory period. Credit, 3. Mr Hayes.

280 (50) (II). Engineering Geology.

Not open to geology majors. Materials and surface features of the earth with emphasis on engineering problems; map reading as related to the phenomena of physical geology. 2 class hours, 1 3-hour laboratory period or field trip. Credit, 3. Mr. Farquhar.

311 (81) (I). Optical Mineralogy.

Principles of optics, optical properties of minerals, and methods for their measurement, relationship between optical properties and crystallography, and mineral identification by the immersion method. Prerequisites, Geology 110 (42), Physics 103 (3) and 104 (4). Credit, 3. Mr. Farquhar.

321 (82) (II). Petrography.

Study of minerals and common igneous, sedimentary, and metamorphic rocks in thin section; petrographic calculations and measurements; introduction to petrogenetic theory. Field examination of selected igneous and metamorphic rocks. Prerequisites, Geology, 220 (56), 311 (81). Credit, 3. Mr. Robinson.

345 (78) (I). Principles of Stratigraphy.

The principle uses of stratigraphic correlation and their application to the problems of the major rock units, primarily of the United States. Prerequisites, Geology 101 (1), 102 (2). Course 130 (33) and 250 (74) recommended. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Webb.

355 (80) (I). Physical Oceanography.

Physical properties of sea water and their variations; water masses and their circulation patterns; interaction between ocean and atmosphere; dynamics of waves, tides, and ocean currents; techniques of oceanographic study. Prerequisites, Physics 103 (3) and 104 (4) or 105 (5), 106 (6), and 107 (7). 3 class hours, field trips by arrangement. Credit, 3. Mr. Hayes.

360 (89) (I). Geomorphology.

Origin and development of landforms in relation to geological processes, climatic environment, and tectonic history. Application of geomorphic methods to interpretation of Cenozoic geologic history. Prerequisites, Geology 101 (1), 102 (2), 130 (33). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Smith.

366 (94) (II). Pleistocene Geology.

Geochronology of Pleistocene time as related to climatic changes and their influence on glaciology, landforms, sedimentary deposits, sea level, and the paleontological record. Prerequisite, Geology 102 (2), or permission of the instructor. Course 360 (89) recommended. 2 class hours; field trips by arrangement. Credit, 3. Mr. Motts.

368 (91) (II). Photogeology.

A laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos. Prerequisites, Geology 130 (33). 2 2-hour periods. Credit, 3. Mr. Smith.

370 (85) (II). Geophysics.

The physics of the earth and the gravitational, magnetic, electrical and seismic methods of geophysical exploration. Laboratory work consists of problems and computations. Prerequisites, Geology 130 (33), 220 (56); Mathematics 135 (5) or 123 (9); Physics 103 (3) and 104 (4). Credit, 3. Mr. Rice.

388 (97, 98) (I) (II). Special Problems.

For seniors specializing in geology. Total credit may not exceed 6. Prerequisite, 21 hours of geology, or permission of department. Credit, 1–6.

389 (99). Field Problems.

Directed field study and/or research. Prerequisites, Geology 130 (33), 220 (56). Credit, 2-6. Staff.

390 (96) (I) (II). Seminar.

Review of current literature or discussion of selected topics. Credit, 1.

GEOGRAPHY

135 (35) (I) (II). Fundamentals of Geography. (E)

A systematic introduction to the study of physiography, climate, mineral resources, and man's use of his natural environment. 2 class hours, 1 2-hour laboratory period, and field trips. Credit, 3. Mr. Burke.

150 (50) (II). Geography of North America.

A regional approach to the study of the physical geography of the continent and its development by man. 3 class hours. Credit, 3. Mr. Burke.

255 (55) (I). Economic Geography. (D)

The distribution, production and utilization of the natural resources and commodities on which man's livelihood depends and the problems which they pose. 3 class hours. Credit, 3. Mr. Burke.

281 (81) (II). World Political Geography. (D)

The human and physical environments in which states exist and the problems which these environments pose in their current and likely future behavior. 3 class hours. Credit, 3. Mr. Burke.

GERMAN

Head of Department: F. C. Ellert. Professors Heller, Weigand; Assistant Professors: Haas, Hauser, Lea, Schaefer, Schiffer. Mrs. Ehrlich, Miss Koppitz, Miss Starr. Messrs. Folkers, Jacoby, Wendel, Wittmann.

The elementary and intermediate courses in German are intended to serve as a foundation for a practical knowledge of the language aiming toward wider reading in literature, toward mature oral communication and as an aid to research in the various other disciplines. The German major then examines the full range of German literature and culture and comes to grips with the history of the German language and its development within the framework of the Indo-European languages, and, therefore, in terms also of the close relationship between German and English. To fulfill an undergraduate major in German, a student must complete 30 credits in the department's junior-senior courses. German 59 is required of all major students; also German 79 and 80 (or their equivalent). For students planning to go on to graduate work, German

57, 77 and 78 and also History 66 are strongly recommended. Moreover, students are strongly urged to supplement the courses taken here at the University with at least one summer session at an approved school of German or by study abroad.

101 (1) (I), 102 (2) (II). Elementary German.

Conversation, reading, grammar, and composition. 3 class hours, 1 laboratory hour. Credit, 3.

103 (3) (II). Accelerated German.

Intensive and accelerated course in oral communication, reading, grammar, composition. For students selected on the basis of superior achievement in German 101. Covers the equivalent of German 102 and German 107. 6 class hours, 1 laboratory hour. Credit, 6.

107 (7) (I), 108 (8) (II). Intermediate German. (C)

Reading, conversation, composition. Grammar review. Prerequisites, German 101, and 102. 3 class hours, 1 laboratory hour. Credit, 3.

151 (51) (I). Nineteenth Century Prose.

The *Novelle* from early realism to naturalism. Emphasis on literary and social forces in Heine, Stifter, Keller, Storm, C. F. Meyer. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

152 (52) (II). Poetry and Drama of the Nineteenth Century.

Plays of Kleist, Grillparzer, Buchner, Hebbel, Hauptmann. The poetry of Morike, Lenau, Droste-Hulshoff, Nietzsche. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

153 (53) (I). Twentieth Century Prose.

Main literary currents from Nietzsche to Hesse. Particular attention to the works of Thomas Mann, Kafka and Werfel. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

154 (54) (II). Poetry and Drama of the Twentieth Century.

Poetry of Hofmannsthal, George and Rilke. Plays of Hauptmann, Kaiser, Brecht and others. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

155 (55) (I). Storm and Stress.

Eighteenth century Titanism in German literature centering in the early Goethe. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

156 (56) (II). Romanticism.

Poetry and prose of the romantic period from Holderlin to Heine. Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

157 (57) (I). Goethe's Faust.

Prerequisites, German 107 and 108. 3 class hours. Credit, 3.

159 (59) (I). The Germanic Languages.

Introduction to general and Germanic philology. Historical development particularly of German and English and their relationship to other languages of the Indo-European family. 3 class hours. Credit, 3.

167 (67) (I). German Masterpieces in Translation. (C)

Literary works ranging from the Middle Ages to the present. Admission by permission of department. 3 class hours. Credit, 3.

170 (70) (II). Scientific German.

Expository prose. Prerequisites, German 107, 108 or equivalent. 3 class hours. Credit, 3.

177 (77) (I). Survey of German Literature I.

German literature from the Middle Ages to the Age of Enlightenment. Prerequisites, German 107, 108 or equivalent. 3 class hours. Credit, 3.

178 (78) (II). Survey of German Literature II.

German literature from 1770 to the present. Prerequisites, German 107, 108 or equivalent. 3 class hours. Credit, 3.

179 (79) (I), 180 (80) (II). German Conversation and Composition.

Practice in the oral and written language. Readings. Prerequisites, German 107 and 108, or permission of instructor. 4 class hours. Credit, 3.

197 (97) (I), 198 (98) (II). Special Problems.

Guided reading and research in areas of specialization. For qualified seniors. Credit, 3.

German 258 (58). Klopstock, Wieland, Lessing.

The major preclassical figures and works in the poetry, novel, and drama of 18th century German literature, with special emphasis on Lessing. Prerequisite: German 108. 3 class hours. Credit, 3.

German 260 (60). The Classical Goethe.

Egmont, Iphigenie, Tasso; poetry; selections from Goethe's novels and expository prose. Prerequisite: German 108. 3 class hours. Credit, 3.

German 261 (61). Schiller.

Representative plays of the early and of the classical phase; selected poetry and essays. Prerequisite: German 108. 3 class hours. Credit, 3.

RELATED COURSES

Comparative Literature 171 (71)

Comparative Literature 191 (91)

Linguistics 193 (93)

GOVERNMENT

Head of Department: Professor William C. Havard. Professors Beth, Fenton, Harris, Oppenheim, Vali; Associate Professors Braunthal, Houn, Lewy, Mainzer, Syed; Assistant Professors Allen, Gordon, Mayhew; Messrs. Coulter, Ryavec, Steeper, Sweeney; Lecturers: Abu-Lughod, Gere, Grady, Rothman, Shanley.

Courses in government are designed to aid the student in gaining a knowledge of the nature, functions and problems of political systems, and of the place of politics in the modern world. These courses can be broadly grouped into the fields of political theory, public law, international relations, both American and foreign governments and politics, and public administration.

Students taking work in government may prepare themselves for a wide range of careers, such as: graduate study in political science, leading to academic or research careers; careers in public service at the federal, state or local level; political careers; the study and practice of law; the foreign service or international organizations; and secondary school teaching.

Majors in government begin with Government 25 and 26, preferably in their freshman or sophomore years. A minimum of eight additional courses is required, including one course in political theory and one in public law. In addition, the department requires some supporting work in history, economics, sociology, psychology or philosophy.

100 (25) (I) (II). American Government. (D)

Political institutions and processes, as illustrated by the American governmental system. 3 class hours. Credit, 3.

150 (26) (I) (II). European Governments. (D)

A survey of the politics and governmental institutions of Great Britain, France, Germany and Soviet Russia. 3 class hours. Credit, 3.

201 (71) (I). Ancient and Medieval Political Thought. (D)

A study of the development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages. 3 class hours. Credit, 3. Mr. Lewy, Mr. Oppenheim, Mr. Havard.

202 (72) (II). Modern Political Thought. (D)

A study of the development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present. 3 class hours. Credit, 3. Mr. Lewy, Mr. Oppenheim, Mr. Havard.

218 (63) (I) (II). Political Parties and Elections. (D)

A study of the American political process, with emphasis on parties, pressure groups, and public opinion. 3 class hours. Credit, 3. Mr. Fenton, Mr. Mayhew, Mr. Gordon, Mr. Shanley.

219 (54) (II). State Government. (D)

A study of state politics, organization and functions, with emphasis on the role of the state in our Federal system. 3 class hours. Credit, 3. Mr. Mayhew, Mr. Fenton, Mr. Coulter.

220 (51) (1). Municipal Government. (D)

A survey of the governmental structure and function of American municipalities. 3 class hours. Credit, 3. Mr. Grady.

221 (93) (I) (II). The Practice of American Politics.

A course in practical American politics, given by a prominent political leader under the University Distinguished Professorship in Public Affairs. Prerequisite, Government 100. Credit, 3.

236 (57) (I) (II). The Government and Politics of Russia. (D)

Organization and functioning of the Communist party; the administrative process: terror as a system of power; Soviet foreign policy, its formation and execution. 3 class hours. Credit, 3. Mr. Vali, Mr. Ryavec.

237 (85) (I) (II). Major Governments of Asia.

Comparative analysis of the government and politics of selected democratic and non-democratic countries in Asia–Japan, India, Pakistan, Indonesia and Communist China. 3 class hours. Credit, 3. Mr. Houn, Mr. Syed.

254 (53) (I) (II). International Relations. (D)

The nation-state system and conceptions of national interest in modern world politics. Forms and distribution of power. Making of foreign policy and adjusting international conflict. Prerequisite, Government 150 or History 101. 3 class hours. Credit, 3. Mr. Braunthal, Mr. Vali, Mr. Allen, Mr. Ryavec.

272 (61) (I) (II). Public Administration. (D)

The organization of bureaucracy; the bureaucratic life; the constitutional position and political role of government bureaucracy. 3 class hours. Credit, 3. Mr. Mainzer, Mr. Sweeney.

273 (83) (II). Public Personnel Administration.

The Personnel function in bureaucracy; patronage and merit; career service and political executives; authority and informal organization; employee rights and collective action. Prerequisite, Government 100 or 272. 3 class hours. Credit, 3. Mr. Mainzer, Mr. Sweeney.

290 (65) (I) (II). Constitutional Law. (D)

An historical study of the United States Constitution as interpreted by decisions of the Supreme Court. Prerequisite, Government 100. 3 class hours. Credit, 3. Mr. Beth.

291 (64) (I) (II). The Law and Practice of Civil Liberties. (D)

Development in American Constitutional Law of the concept of civil liberty, including free speech and religion, fair trial, and race discrimination. Prerequisite, Government 100. 3 class hours. Credit, 3. Mr. Beth, Mr. Lewy.

303 (66) (I). American Political Thought. (D)

A study of the development of American political thought from colonial times to the present. 3 class hours. Credit, 3. Mr. Syed, Mr. Havard.

321 (55) (II). The Presidency in American Government. (D)

Constitutional and political aspects of the presidency in legislation, administration and conduct of foreign and military affairs. The president as party leader. Prerequisite, Government 100. 3 class hours. Credit, 3. Mr. Gordon.

322 (56) (II). The Legislative Process. (D)

The functions of national and state legislative procedures, and the role played by political parties and pressure groups in the legislative process. Prerequisite, Government 100, or 218. 3 class hours. Credit, 3. Mr. Mayhew.

323 (76) (II). Public Opinion in Politics. (D)

A study of opinion and communication as aspects of the political process with emphasis upon communication through mass media. 3 class hours. Credit, 3. Mr. Fenton.

324 (89) (I). Metropolitan Politics.

A study of the problems of metropolitan areas from the standpoint of the actual and possible political approaches to their solution. Includes the role of parties, development of political leadership, existing political institutions, pressure group activity, and other relevant political phenomena. Prerequisite, Government 218, or equivalent. 3 class hours. Credit, 3. Mr. Coulter.

355 (52) (II). American Foreign Policy. (D)

An analysis of the principles of American foreign policy. Constitutional, political, and administrative considerations which influence the formulation and execution of American foreign policy. 3 class hours. Credit, 3. Mr. Allen, Mr. Braunthal.

356 (68) (II). International Law. (D)

A study of the origin, character, and function of international law. Prerequisite, Government 254 or History 211. 3 class hours. Credit, 3. Mr. Allen, Mr. Vali.

357 (70) (II). International Organization. (D)

A study of international organization in the twentieth century, with emphasis upon the United Nations and regional organizations. Prerequisites, Government 150 or History 101, and Government 254, or History 211. 3 class hours. Credit, 3. Mr. Braunthal, Mr. Vali.

374 (62) (II). Administrative Law. (D)

A study of governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate. 3 class hours. Credit, 3. Mr. Mainzer.

391 (95) (I), 392 (96) (II). Seminar.

A study of special problems in the field of government. 3 class hours. Credit, 3.

HISTORY

Head of Department: Professor Howard H. Quint; Professors Caldwell, Cary, Gordon, Potash; Associate Professors Davis, Gagnon, Greenbaum, Ilardi, Powers, Williams; Assistant Professors Bernhard, Cantor, Mrs. Chrisman, Cody, De Pillis, Dilkes, Leonard, Thompson, van Steenberg, Miss von Oppen, Ware, Wickwire; Instructors, Mrs. Gordon, Mrs. Wickwire, Beitzell, Evans, Miss Fagan, McFarland; Visiting Associate Professor Carter.

Courses in history are designed to provide an understanding of man through a study of patterns of development in the past. The study should also give the student an introduction to major problems in world affairs. A major in history has value to the general student as a humanistic discipline. It has application as preparation for careers in fields of teaching, law, government, journalism, ministry, library and business.

Majors must take as basic required courses History 100, 101, 150, and 151 in their freshman and sophomore years, History 360 in their junior year. The History major will select one of three areas of specialization (European, American, or Latin American History) and take within it a minimum of 15 or a maximum of 18 hours of upper-level course work. Students specializing in European History will be required to include in their program at least 3 hours of coursework in Ancient or Medieval History and an additional 3 hours of coursework in the Early Modern period (from the Renaissance through the 18th century).

100 (5) (I), 101 (6) (II). Modern European Civilization. (C)

The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently. 3 class hours. Credit, 3.

150 (25) (I), 151 (26) (II). The Development of American Civilization. (C)

A survey of the American national growth. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3.

200 (51) (I). The Ancient World to Alexander the Great. (C)

From the neolithic background of civilization to the dissolution of Alexander's Empire. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Williams, Mr. Ware.

201 (52) (II). The Ancient World: The Hellenistic Period to Constantine. (C)

From the development of Hellenistic civilization to the stagnation of Graeco-Roman culture. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Williams, Mr. Ware.

202 (61) (I). Early Middle Ages (300–1100). (C)

Spread of Christianity; pagan and early Christian culture; Germanic kingship; the Carolingian world; early feudalism; monasticism and ecclesiastical centralization. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Williams, Mr. Ware.

203 (62) (II). The Later Middle Ages (1100–1350). (C)

Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Williams, Mr. Ware.

204 (65) (I). Tudor-Stuart England, 1485–1688. (C)

Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Caldwell.

205 (73) (I), 206 (74) (II). The Age of the Renaissance and Reformation, 1300–1600. (C)

A study of the changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Ilardi.

207 (75) (I). Europe in the Enlightenment, 1685–1789. (C)

Civilization of Western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions, and the growth of the revolutionary spirit. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Greenbaum.

208 (94) (II). The French Revolution and Napoleon. (C)

Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Greenbaum.

209 (76) (II). History of Europe, 1815–1870. (C)

Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-Prussian War. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gagnon.

210 (69) (I). Europe, 1870–1918. (C)

Internal developments of the principal countries; a detailed study of conditions and diplomacy which led to the World War; and military and diplomatic history of the war years. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. van Steenberg.

211 (70) (II). Europe since 1918. (C)

Major developments in the internal and international affairs of the European states since World War I. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Caldwell.

212 (85) (I). European Intellectual History in the Nineteenth Century. (C)

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Powers.

213 (86) (II). European Intellectual History in the Twentieth Century. (C)

Philosophical, academic, literary, aesthetic, political and popular currents since 1900. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Powers.

214 (55) (I), 215 (56) (II). The History of Russia. (C)

A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Dilkes.

216 (I). The Russian Revolution.

An intensive study of the origins, course, and impact of the Bolshevik revolution. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Dilkes.

217 (II). Eastern Europe.

Formation of the Slavic states; interaction of Latin and Greek cultures; Turkish preponderance; Westernization. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Dilkes.

218 (I). Early Modern Germany.

From the end of the Thirty Years' War to the collapse of the Napoleonic hegemony. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gordon, Miss von Oppen.

219 (66) (II). The History of Modern Germany. (C)

The evolution and development of Germany since The Congress of Vienna, with emphasis upon diplomatic, political, military and social-economic trends and problems. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gordon, Miss von Oppen.

220 (I). History of Spain Since the Fifteenth Century.

Emergence of the Spanish kingdom; the era of empire; Bourbon Spain; the Republic and its aftermath. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Leonard.

221 (31) (I), 222 (32) (II). English History. (C)

Emphasis on economic, social, and cultural influences, as well as on constitutional development. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Caldwell, Mr. Wickwire.

223 (92) (II). History of the British Empire and Commonwealth since 1783. (C)

Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent empire; role of the Empire in world politics. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Wickwire.

224 (77) (I). Modern Britain. (C)

A study of selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Caldwell.

225 (78) (II). France Since 1789. (C)

A study of selected, formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gagnon.

226 (II). The Atlantic Community in the Twentieth Century.

Ideas and institutions affecting the unification of the Atlantic and Western European peoples since 1900. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gagnon, Miss von Oppen.

227 (93) (I). Military History of Modern Europe. (C)

Development of European military theory and practice from the Napoleonic era to the present. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Gordon.

300 (57) (I). Colonial Latin America. (C)

A study of Spanish and Portuguese expansion into the New World, the Indian cultures, the development of political, social, and economic institutions, and the growth of the independence movement to 1810. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Potash.

301 (58) (II). Brazil and Argentina in the Nineteenth and Twentieth Centuries. (C)

The emergence of the major South American states. Particular attention will be paid to the themes of political organization and economic change, and in the contemporary period to the growth of nationalism and mass-based political movements. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Potash.

302 (59) (I). The History of Mexico. (C)

A study of Mexico from the end of the eighteenth century to the present. Emphasis will be given to political, economic, and social developments. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Potash.

303 (II). The Caribbean.

The Caribbean as a focus of conflict and adjustment from the fifteenth century to the present. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Leonard.

304 (I). History of Gran Colombia.

Colombia, Venezuela and Ecuador from colonial settlement to the present. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Leonard.

320 (87) (I). American Colonial History to 1763. (C)

Discovery and exploration; early European settlements; systems of political and economic control; religious and intellectual development; and Anglo-French rivalry. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Bernhard.

321 (88) (II). The American Revolutionary Era. (C)

Coming of the Revolution; War for Independence; evolution of American federalism. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Bernhard.

322 (89) (I). Jeffersonian and Jacksonian America. (C)

Political, economic and social developments in the National Period. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cantor.

323 (91) (I). Civil War and Reconstruction, 1860–1877. (C)

Conduct of the war; political problems; national reunification. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. McFarland.

324 (83) (I). The Progressive Age (1900–1920). (C)

A study of the political response to the changing economic and social conditions in American life. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Thompson.

325 (84) (II). Conservatism and Reform (1920–1945). (C)

American political, economic and intellectual life between the two World Wars. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Thompson.

326 (63) (I), 327 (64) (II). History of American Thought and Culture. (C)

The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Quint.

328 (67) (I). United States Constitutional History to the Civil War. (C)

Origins and development of American constitutionalism from the 17th century to the outbreak of sectional armed conflict. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cantor.

329 (68) (II). United States Constitutional History from the Civil War to the Present. (C)

Evolution of constitutional power in modern America. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cantor.

330 (60) (II). Social History of the United States. (C)

The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. De Pillis.

331 (72) (II). History of American Westward Expansion, 1763–1893. (C)

Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions. Prerequisite, History 150, or permission of instructor. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Davis, Mr. De Pillis.

332 (71) (I). The South in American History. (C)

From early settlement to contemporary regional problems. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Thompson.

333 (79) (I). New England to 1860.

A study of the colonial and early national periods, with emphasis on the political, social, and economic aspects of life in this region. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cary, Mr. Bernhard.

334 (81) (I), 335 (82) (II). Diplomatic History of the United States. (C)

The development of American foreign relations, 1776 to the present. Either semester may be elected independently. Prerequisites, History 150, 151, or permission of the instructor. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cary.

350 (53) (I), 351 (54) (II). History of Far Eastern Civilization. (C)

The first semester will stress traditional and modern China, the second, Japan and Korea. Either semester may be elected independently. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Cody.

360 (90) (II). Historiography and Bibliography.

Training in location, appraisal, and handling of source materials. Critical evaluation of technique and ideas of representative historians from Thucydides to Toynbee. Admission by permission of instructor. 3 class hours. Credit, 3. Mr. Greenbaum, Mr. Gagnon, Mr. Powers.

390 (95) (I). Seminar in European History.

A problems course intended to give training in historical research and writing. The field of study will vary from semester to semester. Prerequisites, History 100 and 101. Admission by permission of instructor. 3 class hours. Credit, 3. Staff.

391 (96) (II). Seminar in American History.

Similar to History 390, but dealing with fields of American and Latin American history. Admission by permission of instructor. 3 class hours. Credit, 3. Staff.

JOURNALISTIC STUDIES

The journalism program is concerned with (1) the study of writing and of communication problems relevant to the media of mass communication, and (2) the best utilization of the University's liberal education resources by students who plan careers in newspaper work, communications research, public relations, magazine and radio journalism, or some other field of communications. The courses may have special value also for students who plan to go into government service, law, education, and similar fields in which knowledge of the process and effects of communication is particularly useful.

To provide students who have a professional interest in journalism with the broadest and most liberal training, an interdepartmental major is available. These majors take 15 credit hours in journalism, 15 hours of junior-senior courses in one other liberal arts area, and an integrated program of elective courses. As a rule this major is limited to students who have a 2.5 quality point average at the end of their sophomore year.

Because of the similarity in the process of writing regardless of the type of writing produced, any advanced writing course is acceptable in meeting the requirement of 15 credit hours in journalism. No more than one writing course should be elected in any one semester. Two content courses in journalism—Journalism 201 and Journalism 329—are required of all interdepartmental majors or journalism minors.

JOURNALISTIC STUDIES

Professor Musgrave, Mr. Oickle.

201 (55) (I). Introduction to Mass Communication.

Topics include the communications revolution and freedom of the press, the communication process, methods of reporting and writing, communication theory and research. 3 class hours. Credit, 3. Mr. Musgrave.

202 (56) (II). Language and Communication.

Analysis of several major approaches to language study. Stress is given to problems of style and meaning. 3 class hours. Credit, 3. Mr. Musgrave.

334 (52) (II). Advanced Technical Writing. Same as English 334.

337 (51) (I). Advanced Expository Writing. Same as English 337.

339 (59) (II). Article Writing.

A study of magazine journalism combined with instruction in the writing of feature or magazine articles. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

341 (53) (I) (II). Creative Writing. Same as English 341.

345 (54) (I or II as enrollment warrants). Creative Writing. Same as English 345.

346 (54) (I or II as enrollment warrants). Creative Writing. Same as English 346.

347 (54) (I or II as enrollment warrants). Creative Writing. Same as English 347.

391 (95) (I). Seminar.

Writing for publication and training in copy editing. University student publications and town newspapers are used as laboratories. 2 class hours, 1 laboratory period. Credit, 3. Mr. Musgrave.

392 (96) (II). Freedom of the Press.

Seminar in freedom of the press: (1) its history, (2) major theories, (3) key cases in Anglo-American law, and (4) recent trends toward its redefinition. 3 class hours. Credit, 3. Mr. Musgrave.

MATHEMATICS

Head of Department: Professor Wayman Strother. Professors Andersen, Azpeitia, Azumaya (visiting), Jacob, Kundert, Wagner; Associate Professors Boutelle, Cullen, Dickinson, Martindale; Assistant Professors Allen, Bauer, Bernstein, Crabtree, Hachigian, Kertzner, Killam, Lavallee, McHaffey, Melter, Norvig, Sayied, Stockton; Mr. Bucuzzo, Mr. Bunuel, Mr. Bussel, Mr. Call, Mrs. Cook, Mr. Efroymson, Mr. Jacobs, Mr. L'heureux, Miss Mannarino, Mr. Naylor, Mrs. Ratay, Mrs. Rice, Mr. Zimmerman.

The requirements for a major in mathematics are the successful completion of: 1) Mathematics 174 or its equivalent, and 2) a minimum of eight upper division courses in mathematics, exclusive of Mathematics 205, 285, and 286, but which must include Mathematics 211 and 212 and at least one of the courses Mathematics 321, 325, or 341. At most two of the courses Mathematics 233 and Statistics 255 and 256 may be counted in the minimum of eight upper division courses.

011 (01). Elementary College Algebra.

Intended for those students who offer only one unit of algebra for entrance. A review of elementary algebra and a more thorough study of such topics as quadratic equations, exponents and radicals, and progressions. No college credit is given for this course. 3 class hours. Credit, 0.

111 (1). Introductory Mathematics. (E)

Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions, by the methods of algebra and analytic geometry. 3 class hours. Credit, 3.

112 (2). Finite Mathematics. (E)

Probability, vectors and matrices, and an introduction to linear programming. Prerequisite, Mathematics 111 (1). 3 class hours. Credit, 3.

113 (22). Survey of Calculus. (E)

Differentiation, integration, and applications. Not recommended for students who can take a more complete course in calculus; a student cannot receive credit for this course and either of the courses 123 or 135. Prerequisite, Mathematics 111. Credit, 3.

121 (7). Algebra and Trigonometry. (E)

Fractions, quadratic equations, exponents, logarithms, variation, determinants of the second and third orders, and plane trigonometry. Students who have entrance credit in trigonometry cannot take Mathematics 121 for university credit. 3 class hours. Credit, 3.

123 (9). Analytic Geometry and Calculus I. (D)

Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivatives, differentiation of algebraic functions, tangent and normal lines. 3 class hours. Credit, 3.

124 (10). Analytic Geometry and Calculus II. (D)

Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Mathematics 123 and Trigonometry. 3 class hours. Credit, 3.

135 (5). Introductory Engineering Mathematics. (E)

Introduction to analytic geometry and calculus. 3 class hours. Credit, 3.

136 (6). Introductory Calculus for Engineering. (E)

Continuation of Mathematics 135. Prerequisite, Mathematics 135. 3 class hours. Credit, 3.

173 (25). Analytic Geometry and Calculus III. (E)

Techniques of integration, further applications of calculus, basic properties of continuous and differentiable functions, parametric equations, polar coordinates, infinite series. Prerequisite, Mathematics 124. 3 class hours. Credit, 3.

174 (26). Analytic Geometry and Calculus IV. (E)

Solid analytic geometry, partial differentiation, multiple integrals with applications, introduction to differential equations. Prerequisite, Mathematics 173. 3 class hours. Credit, 3.

185 (31). Applied Calculus for Engineers. (E)

Parametric equations, vectors, determinants, partial differentiation, multiple integrals. Prerequisite, Mathematics 136. 3 class hours. Credit, 3.

186 (32). Applied Calculus for Engineers. (E)

Infinite series, expansion of functions, hyperbolic functions, differential equations. Prerequisite, Mathematics 185. 3 class hours. Credit, 3.

205 (55). Mathematics of Finance.

The mathematical principles of simple and compound interest, annuities, depreciation, valuation of bonds, and insurance. May not be counted for Mathematics major credit. Prerequisites, Mathematics 111, 121, 123, or 135. 3 class hours. Credit, 3.

211 (53). Introduction to Modern Algebra I.

Basic concepts, groups, rings, the real and complex fields. Prerequisites, Mathematics 174 or 185. 3 class hours. Credit, 3.

212 (54). Introduction to Modern Algebra II.

Continuation of Mathematics 211. Polynomials, cyclic groups, finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants. Prerequisite, Mathematics 211. 3 class hours. Credit, 3.

213 (52). Introduction to Vector Spaces.

The last two-thirds of Mathematics 212. Finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants. Prerequisite, Mathematics 124, or permission of the department head. 3 class hours for the last two-thirds of a semester. Credit, 2.

221 (71). Vector Analysis.

The algebra and calculus of vectors. Applications to physics and other fields will be considered. Prerequisite, Physics 104 or 106; corequisites, Mathematics 174 or 185. 3 class hours. Credit, 3.

233 (63). Probability.

A postulational study of probability, including counting methods, random variables; additional topics chosen from Bayes theorem, statistical independence, laws of large numbers and Markov processes. Corequisite, Mathematics 174. 3 class hours. Credit, 3.

241 (92). Differential Equations.

Prerequisite, Mathematics 174. 3 class hours. Credit, 3.

251 (83). Numerical Analysis.

Approximation and error evaluation; finite differences; approximation by polynomials using finite difference methods and minimal criteria; special reference to sets of orthogonal polynomials. Prerequisites, Mathematics 174 or 186; and Computer Science 121 previously or concurrently. 3 class hours. Credit, 3.

252 (84). Numerical Analysis.

Evaluation of definite integrals; solution of differential equations, polynomial equations, other conditional equations, and systems of linear equations with related matrix manipulations. Prerequisites, Mathematics 186 or 241, and 251. 3 class hours. Credit, 3.

257 (57). Linear Programming and Theory of Games.

The Simplex Method and extensions, duality theorems, transportation problems and other applications. Finite two-person zero-sum games and the fundamental theorem. Prerequisite, junior-senior standing in Mathematics or permission of the instructor. 3 class hours. Credit, 3.

259 (58). Introduction to Digital Computers.

The basic digital computing system, introduction to Boolean Algebra, logical design of computers, programming, coding, utility programs, criteria for evaluation of computers. Prerequisite, Mathematics 174, or permission of instructor. 3 class hours. Credit, 3.

285 (75). Survey of Advanced Mathematics for Engineers.

Series solution of differential equations, boundary value problems, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in Mathematics. Prerequisite, Mathematics 241 or 186. 3 class hours. Credit, 3.

286 (76). Survey of Advanced Mathematics for Engineers.

Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in Mathematics. Prerequisite, Mathematics 241 or 186. 3 class hours. Credit, 3.

311 (68). Linear Algebra.

Row equivalence, linear transformations and matrices. Similarity. Invariant subspaces, canonical forms. Inner product spaces, linear functionals, the spectral theorem. Bilinear forms. Prerequisite, Mathematics 212 or 213. 3 class hours. Credit, 3.

312 (69). Theory of Groups and Group Representations.

Axiom systems. Lagrange theorem, generators, relations. Conjugate classes, normal subgroups, quotient groups. Sylow theorems. Abelian groups. Unitary and irreducible representations. Characters, orthogonality relations. Prerequisite, Mathematics 311. 3 class hours. Credit, 3.

313 (74). Theory of Numbers.

Euclid's Algorism, theory of prime numbers, aliquot parts, congruences, further topics in number theory. Prerequisite, Mathematics 211. 3 class hours. Credit, 3.

321 (81). Complex Analysis.

The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration, Taylor series, and residues. Prerequisite, Mathematics 174 or 186. 3 class hours. Credit, 3.

325 (85). Introductory Modern Analysis I.

Real and complex numbers. Basic Topology of the real number system. Limit concept and continuity. Differentiation. Partial differentiation. Prerequisite, Mathematics 174. 3 class hours. Credit, 3.

326 (86). Introductory Modern Analysis II.

Bounded variation. Riemann-Stieltjes integration. Multiple integrals. Line integrals. Infinite series. Sequences of functions. Improper Riemann-Stieltjes integrals. Prerequisite, Mathematics 325. 3 class hours. Credit, 3.

341 (93). Fourier Series and Orthogonal Functions.

Solutions of boundary value problems by Fourier series, Bessel functions, Legendre polynomials; convergence of representations by orthogonal functions. Prerequisite, Mathematics 241 or 186. 3 class hours. Credit, 3.

361 (61). Projective Geometry.

A study from both the synthetic and analytic viewpoints, of properties invariant under projection, with emphasis on the real plane. Equivalence of Desarguesian and coordinate projective geometries. Prerequisite, Mathematics 211. 3 class hours. Credit, 3.

362 (62). Higher Geometry.

A study along the lines of Klein's *Erlanger Program* of various geometries and their groups of transformations, emphasizing Projective, Affine, and Euclidean. Prerequisites, Mathematics 212 and 361, or permission of instructor. 3 class hours. Credit, 3.

371 (88). Sets and Ordered Structures.

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic. Corequisite, Mathematics 325, or permission of instructor. 3 class hours. Credit, 3.

395 (97), 396 (98). Advanced Topics.

Several topics intended for individuals or small groups of students. Admission by permission of the Head of the Department. Credit, 1, 2, or 3 each semester.

MICROBIOLOGY

Head of Department: Professor C. D. Cox. Assistant Professors Canale-Parola, Czarnecki, Kessel, Mortlock, Pfau; Miss Boggs.

The major program in microbiology is designed to offer students sound preparation for more intensive graduate study and research in microbiology, as well as basic preparation for a wide variety of positions as microbiologists in research and non-research laboratories. In either event microbiology majors should immediately begin preparation in chemistry. Microbiology majors are required to have broad training in collateral sciences, and minimum requirements include chemistry through quantitative analysis and organic, and one year each of introductory biological science, physics, and mathematics. Those students contemplating graduate study will be advised to emphasize stronger training in these collateral sciences, which is basic and essential for understanding and mastery of advanced graduate courses in microbiology. Courses in microbiology are designed to offer fundamental training in the basic core areas and disciplines of this field.

150 (1) (I) (II). Introductory Microbiology. (E)

General and broad considerations of microorganisms, their activities, and their significance to health. Prerequisite, 1 year of college chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Czarnecki.

250 (51) (I). General Microbiology I.

General considerations of microbial structure, growth and physiology, and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and other science majors. Prerequisites, organic chemistry or concurrent registration and one semester of biological science. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Canale-Parola, Mr. Mortlock.

260 (64) (I). General Microbiology II.

Principles of selective enrichment and isolation; morphological, physiological and ecological characteristics of a number of microbial groups isolated from nature. Prerequisite, Microbiology 250, or Microbiology 150 and organic chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Canale-Parola.

280 (54) (II). Pathogenic Bacteriology.

Correlation of physiologic and metabolic properties and processes of bacteria with the pathogenesis of disease. Prerequisite, Microbiology 150 or 250. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Kessel.

310 (55) (I). Immunology.

Fundamental study of the nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity. Prerequisite, Microbiology 250, or Microbiology 150 and organic chemistry. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Cox.

320 (57) (II). Virology.

The structure, and the chemical, physical and biological properties of viruses, with emphasis on the bacterial viruses. Prerequisite, Microbiology 250, or permission of the instructor. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Pfau.

340 (66) (II). Microbial Physiology.

Fundamental study of the growth, nutrition, metabolism and respiration of microorganisms. Prerequisite, Microbiology 250 or permission of the instructor. 2 class hours, 2 3-hour laboratory periods. Credit, 4. Mr. Mortlock.

387, 388 (97, 98) (I) and (II). Special Problems.

Prerequisites, 8 credits of Microbiology and departmental permission. Credit, 2-4. The Staff.

391, 392 (95, 96) (I) and (II). Seminar.

Prerequisite, Microbiology 150 or 250. Credit, 1. The Staff.

MUSIC

Head of Department: Professor Philip Bezanson. Professors Alviani, King; Associate Professor Contino. Assistant Professor Jenkins: Messrs. Steele, Stern, Miss Ornest.

The undergraduate music program is pre-professional serving the needs of both the music major and the student who wishes to broaden his cultural background. Courses are offered in Music History and Appreciation, Music Theory, Applied Music, and Music Education.

All majors will take Music 111, 112, 113, 114, 201, 202, 211, 212, and must register for Applied Music and either Band, Orchestra, or Chorale every semester. The student will choose his area of concentration (Music History, Theory, Applied Music, or Music Education) by the end of the sophomore year. The junior-senior years will include a sequence of advanced courses as advised by the Department. Students whose major area is applied music are required to present a senior solo recital.

Prospective teachers must take Music 221, 222, and 223, Education 251, Psychology 301, and the secondary teaching block (Education 388, Music 321 and Education 385.

Majors in other departments may elect a minor in music. This program should include Music 111, 112, 201, 202, and 4 credits in ensemble and individual applied music.

The Band, Orchestra, Chorale, and various small ensemble groups are open to all University students who wish to participate in a performing organization.

HISTORY AND APPRECIATION

101 (1) (I) (II). Music Appreciation—Introduction to Music. (C)

Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and the cultural significance of representative works from the ninth Century to the present are studied and discussed. 3 class hours. Credit, 3.

201 (53) (I), 202 (54) (II). Music History—Historical Survey of Music.

History and literature of music: Music 201, from early religious chant through Bach and Handel; Music 202, from 1750 through vocal and instrumental music of the 20th Century. Prerequisite, Music 101. 3 class hours. Credit, 3.

203 (55) (I). Music History—Music from Monteverdi to Bach.

The Baroque and Rococo periods, including the music of such composers as Monteverdi, Schutz, Lully, Purcell, Corelli, Couperin, Rameau, the Scarlattis, Bach, Handel. 3 class hours. Credit, 3. Prerequisite, Music 202.

205 (57) (I). Music History—Gothic and Renaissance Music.

Chant and organum through Renaissance motet and madrigal. Reading, listening score study, analysis. Prerequisite, Music 203. 3 class hours. Credit, 3.

209 (59) (I) (II). Music History—Music of the 20th Century.

A study of music, both European and American, written since 1900, including Stravinsky, Bartok, Hindemith, Copland, jazz, electronic music. Prerequisite, Music 101. 3 class hours. Credit, 3.

301 (62) (II). Music History—Haydn, Mozart and Beethoven.

Reading, listening, score study. 3 class hours. Credit, 3. Prerequisite, Music 101.

302 (64) (II). Music History—Music from Schubert to Debussy.

An historical study of 19th Century romantic music in small and large forms, and various media including Lieder, chamber music, symphony, opera. Reading, listening, score study. Prerequisite, Music 202. 3 class hours. Credit, 3.

303 (51). History of Opera.

History of Opera from the late XVIth to the present Century. Prerequisite, Music 101 or 111. 3 class hours. Credit, 3.

THEORY

111 (3) (I), 112 (4) (II). Elementary Music Theory. (111C)

A study of diatonic harmony and the development of skills in sight singing, ear training, analysis and composition. Prerequisites, Ability to read music, elementary skill at playing the piano, or permission of the instructor. Music 111 prerequisite to Music 112. Credit, 3.

113 (5) (I), 114 (6) (II). Intermediate Music Theory.

Studies in harmony and modulation, including further studies in sight singing and ear training. Further analysis of musical forms, including contrapuntal forms, and practice in writing original compositions. Prerequisite, Music 112 or its equivalent, Music 113 prerequisite to Music 114. Credit, 3.

211 (73) (I), 212 (74) (II). Music Theory—Harmonic and Contrapuntal Techniques.

A continuation of Music 72. Systematic study of chromatic harmony; use of various contrapuntal procedures. Some study of 20th Century styles and opportunities for free composition. Playing and score reading. Prerequisite, Music 72 or equivalent, Music 73 prerequisite to Music 74. 3 class hours. Credit, 3.

215 (71) (I). Counterpoint.

The study of the techniques of counterpoint, and analysis of polyphonic music of the 18th Century. Composition in small forms, utilizing contrapuntal techniques. Prerequisite, Music 114 or consent of the instructor. 2 class hours. Credit, 2.

216 (72) (II). Orchestration.

Problems in scoring for various ensembles including full orchestra. Prerequisite, Music 114 or consent of the instructor. 2 class hours. Credit, 2.

385 (97) (I), 386 (98) (II). Special Problems in Music.

Advanced studies in Composition and Theory, History, or Literature may be pursued by qualified students under the direction of a faculty member of the department. Credit, 1-3.

MUSIC EDUCATION

221 (81) (I). Music Education—Basic Instrumental Music—Woodwinds.

Tone production, technical dexterity, acoustical principles of the woodwind family with emphasis given to the clarinet, flute, oboe, bassoon. Literature and materials studied and evaluated. Prerequisite, Music 112. 3 class hours. Credit, 2.

222 (82) (II). Music Education—Basic Instrumental Music—Brasswinds and Percussion.

Tone production technical dexterity, acoustical principles of the brasswind and percussion groups with emphasis given to the cornet, French horn, trombone, and tuba. Literature and materials studied and evaluated. Prerequisite, Music 112. 3 class hours. Credit, 2.

223 (83) (I). Music Education—Basic Instrumental Music—Strings.

Tone production, technical dexterity, acoustical principles of the string family with emphasis on the violin, viola, and cello. Literature and materials studied and evaluated. Prerequisite, Music 112. 3 class hours. Credit, 2.

231 (85) (I) (II). Music Education—Music for Elementary Teachers.

For the classroom teacher having little or no formal training in music. Principles of musical development with particular emphasis on classroom presentation. Rote and reading songs examined; processes of presentation evaluated. 3 class hours. Credit, 3.

321 (87) (I) (II). Music Education—Music Curriculum.

Organization and administration of the music program and curriculum in the elementary and secondary school. Observation of area schools. Admission by permission of instructor. 3 class hours. Credit, 3.

361 (89). Score Reading.

Orchestral, choral, vocal and band scores are studied, analyzed, and played at the keyboard. Prerequisite, Music 114. 3 class hours. Credit, 3.

362 (90). Conducting.

The study of conducting techniques for various choral and instrumental ensembles. Prerequisite, Music 114. 3 class hours. Credit, 3.

APPLIED MUSIC

Pre-Registration in Applied Music courses must be approved.

021 (12) (I) (II). Applied Music—Individual Instruction.*

The study of piano, voice, or an instrument to gain proficiency. The course may be repeated several times until credit level is achieved. A grade is recorded. 7½ hours or its equivalent. Credit, 0.

121 (13) (I), 122 (14) (II). Applied Music—Individual Instruction.*

A study of literature and instrumental technique or voice production. Prerequisite, intermediate level of proficiency as determined by examination. 7½ hours or its equivalent. Credit, 1.

123 (15) (I), 124 (16) (II). Applied Music—Individual Instruction.

Further study of literature and instrumental technique or voice production. Prerequisites, Music 121, 122. 7½ hours or its equivalent. Credit, 1.

125 (17) (I), 126 (18) (II). Applied Music—Individual Instruction.

Advanced study of literature and instrumental technique or voice production. Prerequisites, Music 123, 124. 7½ hours or its equivalent. Credit, 1 each semester.

127 (19) (I), 128 (20) (II). Applied Music—Individual Instruction.

Advanced study of literature and instrumental technique or voice production. Prerequisites, Music 125, 126. 7½ hours or its equivalent. Credit, 1 each semester.

181 (21) (I) (II), 182 (22) (I) (II). Applied Music—Band.

Preparation and performance of distinctive music for band. 1 credit for each completed sequence of 281, 282. Professor Jenkins.

183 (21) (I) (II), 184 (22) (I) (II). Applied Music—Orchestra.

Preparation and performance of orchestral literature of various styles and periods. 1 credit for each completed sequence of 283, 284. Mr. Steele.

185 (23) (I) (II), 186 (24) (I) (II). Applied Music—Chorale.

Preparation of various choral works to concert standard. Additional opportunities for instrumental accompanists and vocal soloists. 1 credit for each completed sequence of 285, 286. Professor King.

187 (I) (II), 188 (I) (II). Applied Music—Ensemble.

Preparation and performance of appropriate literature for small instrumental and vocal ensembles. 1 credit for each completed sequence of 287, 288. Staff.

A maximum of four credits earned in courses 122, 123, 124, 125, 126 127, 128, 181, 182, 183, 184, 185, 186, 187, and 188 may be counted as credit toward graduation.

PHILOSOPHY

Head of Department: Professor Clarence Shute. Professors Moore, Oppenheim (Government); Associate Professor Swanson; Assistant Professors Brentlinger, Ehrlich; Miss Ferguson, Mr. Clay.*

Philosophy seeks a comprehensive understanding of the various areas of man's experience in their interrelatedness. In the context of historically important theories, the courses concentrate on methods of inquiry into the persisting questions of philosophy, standards of thought, clarification of ethical and aesthetic values, and the basis of criticism.

Students majoring in philosophy will complete a minimum of 30 semester hours of credit in courses offered by the department, exclusive of honors work. Normally there should be included 105 (25), 125 (31), 110 (42), 201-204 (53-56), and at least one course from 295 (91), 385 (97), 386 (98), 390 (95), 391 (96).

Philosophy is closely related to many other academic disciplines; it is therefore advisable for every student majoring in this field to carry his study of one other area to a depth sufficient for the exploration of its relations with philosophy. When desirable for this purpose, the minimum of 30 credits in philosophy may be reduced, with departmental approval, to 24. Within the limits of the desirable concentration suggested above, a wide range of supplementary courses is advised among which the following are suggested as typical: Anthropology 104 (63); Art (historical courses); Education 251 (51); English 205 (72), 282 (63); German 256 (56), 257 (57); Government 303 (66), 201 (71), 202 (72); History of Science 360 (60); Mathematics 211 (53), 212 (54); Music (historical courses); Psychology 235 (90), 281 (61); Sociology 282 (82); Speech (historical courses).

For an introduction to the field as a whole, it is advised that a course be selected from 105 (25), 110 (42), 161 (51) and/or 162 (52); but students planning to take advanced work will do well to select from 105 (25), 110 (42), 201-204 (53-56).

105 (25) (I) (II). Introduction to Philosophy. (C)

An introduction to some of the most important of the general questions, ideas, theories, and methods of inquiry which have given direction to western thought. Prerequisites, none. 3 class hours. Credit, 3. The Staff.

110 (42) (I) (II). Ethics. (C)

An examination of classical and contemporary theories concerning policy formation and the justification of personal decisions and ways of life. Prerequisites, none. 3 class hours. Credit, 3. Miss Ferguson.

**On leave, 1965–66.*

125 (31) (I) (II). Introduction to Logic. (E)

An inquiry into the nature of critical thinking, including (1) the functions of language, (2) the structure of deductive arguments, (3) a glimpse at inductive methods. Prerequisites, none. 3 class hours. Credit, 3. Miss Ferguson, Mr. Clay.

161 (51) (I). History of Philosophy—Ancient and Medieval. (C)

The development of Western thought from its earliest beginnings to the flowering of medieval scholasticism. Emphasis on the contribution of important movements and great thinkers. Prerequisites, none. 3 class hours. Credit, 3. Mr. Brentlinger.

162 (52) (II). History of Philosophy—Modern. (C)

Continuation of Philosophy 161 (51) from the Renaissance and the rise of modern science to 19th century idealism, positivism and voluntarism. Prerequisites, none. 3 class hours. Credit, 3. Mr. Brentlinger.

201 (53) (I). Plato and Aristotle. (C)

The major works of Plato and Aristotle in ethics, logic, and metaphysics will be read for the systematic character of their thought and its contemporary relevance. Prerequisites, none. 3 class hours. Credit, 3. Mr. Brentlinger.

202 (54) (II). Philosophy in the Middle Ages. (C)

The writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought. Prerequisites, none. 3 class hours. Credit, 3. Mr. Ehrlich.

203 (55) (I). European Philosophy from Montaigne to Rousseau. (C)

A study of representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal. Prerequisites, none. Not offered 1965–66. 3 class hours. Credit, 3. Mr. Ehrlich.

204 (56) (II). British Philosophy from Bacon to Hume. (C)

A study of representative philosophical texts, with emphasis on Locke, Berkeley, Hume and their historical influence, especially on contemporary empiricism. Prerequisites, none. Not offered 1965–66. 3 class hours. Credit, 3. Mr. Clay.

218 (67) (II). American Philosophy. (C)

Examination, by means of a study of selected original texts by the outstanding American philosophers, of their contribution to Western thought and American civilization. Prerequisites, none. 3 class hours. Credit, 3. Mr. Moore.

225 (68) (I). Indian Philosophies. (C)

Theories of reality, of knowledge, of art and of human destiny in the leading schools of Indian Asia; traditional and contemporary political theory. Prerequisites, none. 3 class hours. Credit, 3. Mr. Shute.

226 (69) (II). Far Eastern Philosophies.

Theories of human nature, society, and the state in philosophies of Chinese and Japanese origin; the modification of Buddhism under the influence of Chinese thought. Prerequisites, none. Not offered 1965–66. 3 class hours. Credit, 3. Mr. Shute.

230 (72) (II). Philosophy of Science.

A critical analysis of the structure of scientific method and the language of science, the respective roles of induction and deduction in science, and the status of theoretical terms. Prerequisites, none. 3 class hours. Credit, 3. Mr. Swanson.

241 (81) (I). Philosophy of Religion. (C)

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience. Prerequisites, none. 3 class hours. Credit, 3. Mr. Shute.

243 (82) (II). Aesthetics. (C)

Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism. Prerequisites, none. 3 class hours. Credit, 3. Mr. Shute.

261 (61) (I). Contemporary Analytic Philosophy. (C)

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine. Prerequisite, one semester course in philosophy. 3 class hours. Credit, 3. Mr. Clay.

264 (64) (II). Existential Philosophies. (C)

Examination by means of a study of selected original texts, of the main problems peculiar to this movement as a whole and to its main exponents individually. Prerequisite, one semester course in philosophy other than 125 (31). Not offered 1965–66. 3 class hours. Credit, 3. Mr. Ehrlich.

281 (75) (I). Mathemotical Logic.

Turing machines, theory of computability, effective procedures. combinatorial systems, natural deduction, completeness of quantification theory. Prerequisite, Philosophy 125 (31) or consent of the instructor. 3 class hours. Credit, 3. Mr. Clay.

282 (76) (II). Theory of Formal Systems.

Equivalence, completeness, incompleteness, decision procedures, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic. Prerequisite, Philosophy 281 (75), its equivalent, or the instructor's approval. Not offered 1965–66. 3 class hours. Credit, 3. Mr. Clay.

290 (84) (I). Political Philosophy.

A systematic approach to major controversies in philosophy of political science and political ethics; e.g., rationalism vs. empiricism, natural law vs. legal positivism. Prerequisite, one semester course in philosophy, or the approval of the instructor. 3 class hours. Credit, 3. Mr. Oppenheim.

295 (91) (I). Contemporary Problems.

A consideration of selected persistent philosophical problems—e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc. Prerequisite, one semester course in philosophy. 3 class hours. Credit, 3. Mr. Clay.

385 (97) (I), 386 (98) (II).

Individual study of a selected problem in philosophy, with written report of results. Prerequisite, two semester courses, one, at least, numbered above 200, or permission of the department. Credit, 3. The Staff.

390 (95) (I), 391 (96) (II).

A study of one major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry. Prerequisite, two semester courses, one, at least, numbered above 200, or permission of the department. Credit, 3. The Staff.

PHYSICS

Head of Department: Professor Robert L. Gluckstern. Professors Rosen, Ross, Trimmer; Associate Professors Foland, Jones, Soltysik; Assistant Professors Kang, Lin, Mathieson, Patten, Sastry, Thiebaux; Messrs. Crooker, Gray, King.

Courses are designed to accommodate students who desire specialized training in physics, and also to provide required or elected courses for students majoring in engineering, mathematics, chemistry, or other fields. Majors should take Mathematics 123, 124, 173, 174, beginning if possible at the start of the freshman year. The preferred start in physics is in Physics 108, 109, a restricted enrollment course for physics majors, beginning with the second semester of the freshman year. In some cases the (first freshman semester, or later) choice of Physics 105, 106, 107 or of Physics 103, 104 may be advisable or acceptable. Selection of the first physics course should be made in consultation with an adviser from the Physics Department. The freshman year should include Chemistry 111, 112 or, for students who may wish to include considerable chemistry in their later studies, Chemistry 113, 114. (For B.A. degree candidates, this means that the History 100, 101 requirement must be met later.) Required upper-division courses are Physics 251, 252, 255, 256, 285, 286. Mathematics courses should include advanced calculus, differential equations, and vector analysis.

103 (3) (I), 104 (4) (II) Introductory Physics. (E)

Mechanics, Sound, Heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for premedical, predental, preveterinary, and some science major students. Prerequisites, Mathematics 121 previously or concurrently for Physics 103; Physics 103 for Physics 104. 3 class hours, 1 2-hour laboratory period. Credit, 4.

105 (5) (II) General Physics. (E)

Mechanics. For students primarily interested in physics, engineering, chemistry, or mathematics, who, in general, have had high school physics. Prerequisite, Mathematics 135 previously. 2 class hours, 1 2-hour laboratory period. Credit, 3.

106 (6) (II). General Physics. (E)

Heat, electricity, and magnetism. Prerequisites, Mathematics 135; Physics 105; Mathematics 136. 2 class hours, 1 2-hour laboratory period. Credit, 3.

107 (7) (I) (II). General Physics. (E)

Electromagnetic radiation, atomic and nuclear physics. Prerequisites, Mathematics 136; Physics 106. 3 class hours, 1 2-hour laboratory period. Credit, 4.

108 (8) (II), 109 (9) (I). Advanced Introductory Physics for Physics Majors. (E)

A limited-enrollment course for Physics majors or others interested in an introductory course at an advanced level. Prerequisites, Mathematics 123 or 135 or 173, and consent of Physics Department. 3 class hours, 1 2-hour laboratory period. Credit, 4.

251 (51) (I). Electricity and Magnetism.

The basic laws of electricity and magnetism applied to DC and AC circuits and an introduction to electrical measurements. Two class hours; 1 3-hour laboratory period. Prerequisites, Physics 104 (4) or 106 (6) or 109 (9); Mathematics 173 (25). Credit, 3.

252 (52) (II). Electricity and Magnetism.

Classical field theory, conservative force fields, the electrostatic field, the magnetic field of steady currents, time varying fields and Maxwell's equation. 3 class hours. Prerequisites, Physics 104 (4) or 106 (6) or 109 (9); Mathematics 173 (25). Credit, 3.

254 (54) (II). Meteorology.

Theoretical treatment of various atmospheric phenomena, with correlation of observation and theory. Weather observations, preparation of weather charts, and weather forecasting. Prerequisites, Physics 104 or 106; Mathematics 185 or 186. 3 class hours. Credit, 3.

255 (55) (I), 256 (56) (II). Mechanics.

Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation. Prerequisites, Physics 104 or 106; Mathematics 185 or 186. 3 class hours. Credit, 3.

260 (60) (II). Sound and Acoustics.

Vibrations, coupled systems, sound structure, and acoustic properties; principles and applications. Prerequisites, Physics 104 or 107; Mathematics 185 or 186. 3 class hours. Credit, 3.

261 (61) (II). Heat and Thermodynamics.

Heat exchanges and related energy changes in systems of matter. Prerequisites, Physics 104 or 106; Mathematics 185 or 186. 3 class hours. Credit, 3.

263 (63) (II). Optics.

An intermediate course in geometrical and physical optics. Prerequisites, Physics 104 and 107; Mathematics 185 or 186. 2 classs hour, 1 2-hour laboratory period. Credit, 3.

266 (66) (I). Kinetic Theory.

Classical kinetic theory of gases, with an introduction to phenomena in a non-uniform gas. Prerequisite, Physics 255. 3 class hours. Credit, 3.

267 (67) (II). Statistical Mechanics and Information Theory.

A study of the concepts of entropy, information, and order. Prerequisite, Physics 261. 3 class hours. Credit, 3.

285 (85) (I), 286 (86) (II). Modern Physics.

Twentieth-century physics, the first-semester devoted principally to atomic aspects, the second to nuclear. Prerequisites, 252, 255, 256. 3 class hours. Credit, 3.

288 (88) (II). Solid State Physics.

An introduction to theoretical and experimental physics of the solid state. Prerequisite, permission of the instructor. 3 class hours. Credit, 3.

291 (91) (II). Gaseous Electronics.

Electrical conduction in gases, interactions of space charge and electromagnetic waves, plasmas. Prerequisite, Physics 252. 3 class hours. Credit, 3.

297 (97) (I), 298 (98) (II). Advanced Experimental Work.

Selected experiments and projects are investigated, according to the needs of the individual student. Prerequisites, Physics 251 or 255. 3 2-hour laboratory periods. Credit 1 to 3.

PSYCHOLOGY

Head of Department: Professor Claude C. Neet. Professors Epstein, Feldman, Field, Goss, Kates, Southworth; Associate Professors Berenson, Myers; Assistant Professors Carkhuff, Dzendolet, Goldin, Harmatz, Harrison, Himmelfarb, Jarmon, Moore, Moss, Price, Schumer, Trowill; Mr. Manley; Research Associates Mrs. Jensen, Mrs. Myers, Mrs. Suydam, Messrs. Burstein, Volkmann. Visiting Lecturers Christ, Corbin, Shapiro, Rohan, Simon, Trehub.

The courses in the Psychology Department are planned (1) to impart an understanding of the basic principles, methods and data of psychology as a science and the application of this knowledge to problems of human adjustment; (2) to prepare some majors for graduate study which may lead to a professional career in psychology; and (3) to help prepare others for non-professional careers. In carrying out these aims, majors are urged to elect, with the help of a departmental adviser, a broad program of courses. Careers open to psychology majors include: guidance and counseling, psychometrics, child welfare, clinical psychology, school psychology, social work, statistical analysis, opinion polling, personnel and industrial work, engineering psychology, nursery school teaching, elementary and secondary school teaching, college and university teaching and research, and research in federal and state agencies. Graduate training is required for certain of these careers.

Majors must elect Psychology 105 (5) and 106 (6) in the freshman year and any two of Psychology 211 (51), 221 (52), 231 (53) and 215 (63) in the sophomore year. Students taking Psychology 101 (1) who then decide to major in psychology go directly into Psychology 105 (5) or 106 (6). Statistics 241 (50) and Psychology 235 (90) are required. In addition, at least one course must be elected from each of three of the following groups: (1) Psychology 281 (61), 286 (62), 261 (65), 263 (66), 275 (67); (2) Psychology 251 (72), 245 (75); (3) Psychology 321 (79), 311 (81), 312 (82), 325 (83), 331 (92); (4) Psychology 301 (56), 341 (85), 351 (86), 361 (87), 365 (88). Each student must elect a minimum of 24 and a maximum of 30 sophomore-junior-senior credits in psychology. By taking appropriate programs of courses, psychology

majors may qualify for either the Bachelor of Arts or the Bachelor of Science degree.

101 (1) (I) (II). General Psychology. (D)

An introduction to the principles and study of behavior. Topics considered include development of behavior, sensation, learning, thinking, motivation, intelligence, attitudes, and personality. 3 class hours. Credit, 3. Mr. Burstein, Mr. Feldman, Mr. Moss, Mr. Price.

102 (28) (II). Psychology of Adjustment. (D)

Problems of personality development and adjustment are emphasized. Psychological nature of man, conflict, fantasy and thinking and adjustment. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Kates.

105 (5) (I). General Psychology I. (D)

Introduction to basic concepts and methods of psychology. Topics include neural mechanisms, sensation, perception, emotion and motivation, learning and thinking, and problem solving. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mrs. Shapiro.

106 (6) (II). General Psychology II. (D)

A continuation of Psychology 105 (5). Topics include intelligence, human development, attitudes conflict, personality, group processes and personality change. Prerequisites, Psychology 101 (1) or 105 (5). 2 class hours, 1–2 hour laboratory period. Credit, 3. Mr. Epstein.

211 (51) (I). Sensation and Perception. (D)

A study of the data, theories and methods of studying sensation and perception. Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6) or 101 (1) or 105 (5) and consent of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Dzendolet.

215 (63) (I). Physiological Psychology.

The neurophysiological bases of behavior. The structural and functional relationships among the nervous system, sense organs and drives. Prerequisites, Psychology 101 (1) or 105 (5), Zoology 135 (35). 3 class hours. Credit, 3. Mr. Feldman.

221 (52) (II). Learning and Thinking. (D)

A consideration of the effects of practice and conditions of practice on acquisition, generalization, discrimination, transfer, retention and extinction phenomena. Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6) or 101 (1) or 105 (5) and consent of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Moore.

231 (53) (II). Motivation. (D)

The data, theories and the methods of investigating motivation. Topics include primary drives, emotions, frustration and conflict, and learned drives. Prerequisites, any two of Psychology 101 (1), 105 (5), 106 (6), or 101 (1) or 105 (5) and consent of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Trowill.

235 (90) (II). Contemporary Psychologies. (D)

A logical, historical, and systematic analysis of contemporary psychological theories including structuralism, functionalism, Gestalt and organistic psychologies, psychoanalysis, and behaviorisms. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Goss.

241 (50) (I). Elementary Statistics.

An introduction to statistical principles and techniques as applied to psychological data. 2 class hours, 1 2-hour laboratory. Credit, 3. Mr. Manley.

245 (75) (I). Statistics in Psychology.

The application of statistical procedures to the analysis of psychological data and to problems of measurement in psychology and related fields. Prerequisites, Psychology 101 (1) or 105 (5), Statistics 241 (50) or 256 (56). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Myers.

251 (72) (II). Advanced Experimentol Psychology.

The literature, techniques, and apparatus of experimental psychology. Selected projects carried out individually by the members of the class. Prerequisites, Psychology 211 (51) or 221 (52) or 231 (53), Zoology 135 (35). 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Dzendolet.

261 (65) (I). Child Psychology. (D)

The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Price.

263 (66) (II). Psychology of Adolescence. (D)

A consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Price.

275 (67) (I). Introduction to the Study of Exceptional Children. (D)

Emphasis is on the etiology, diagnosis, characteristics, education and prognosis of deviations in mental, physical and socio-emotional development. Prerequisites, Psychology 101 (1) or 105 (5), 261 (65), or consent of the instructor. 3 class hours. Credit, 3. Mr. Jarmon.

281 (61) (I). Social Psychology I. (D)

Development, interrelationships, and functions of attitudes. Emphasis upon religions and political behavior, psychoanalytic and behavioristic theories of prejudice, attitude measurement, propaganda, group persuasion. Survey project. Prerequisites, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Himmelfarb.

286 (62) (II). Social Psychology II. (D)

Individual behavior in groups. Interpersonal perception and communication. Norms, power, leadership, and coalition formation. Individual motivation and group problem-solving. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Himmelfarb.

301 (56) (I) (II). Educational Psychology.

Psychological facts and principles of development, learning and measurement as applied to educational situations. Prerequisite, Psychology 101 (1) or 105 (5). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Schumer.

311 (81) (I). Psychological Tests.

Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationale, construction, characteristics, uses and evaluation are emphasized. Prerequisite, Psychology 101 (1) or 105 (5). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Corbin.

312 (82) (II). Psychological Tests.

A study of theories of intelligence and of individual intelligence tests. Prerequisite, Psychology 101 (1) or 105 (5). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Goldin and Mr. Harrison.

321 (79) (I). Personality. (D)

An introduction to the scientific study of personality. Topics include psychoanalytic and cognitive approaches, the influence of social-cultural conditions, personality types and learning. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Kates.

325 (83) (I). Abnormal Psychology. (D)

The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Neet.

331 (92) (II). Clinical Psychology.

An introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual. Prerequisite, Psychology 325 (83) or consent of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Epstein.

341 (85) (I). Industrial Psychology I.

Psychological principles underlying personnel selection and training, communication and decision-making in industry. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Moss.

351 (86) (II). Industrial Psychology II.

Principles and applications of human factors data related to the analysis, design, evaluation and use of man-machine systems and equipment. Prerequisite, Psychology 101 (1) or 105 (5). 3 class hours. Credit, 3. Mr. Moss.

361 (87) (I). Psychology of Occupations.

A study of interests, abilities and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized. Prerequisite, Psychology 311 (81). 3 class hours. Credit, 3. Mr. Field.

365 (88) (II). Theories and Practice in Counseling.

The theories, techniques and tests necessary in counseling and guidance. Practice in organization and evaluating relevant data in the analysis of illustrative cases. Prerequisite, Psychology 311 (81), or 321 (79), or permission of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Berenson.

385 (97) (I), 386 (98) (II). Problems in Psychology.

For qualified seniors. Independent work on special problems or in certain fields of psychological interest. By arrangement with the members of the department. Credit, 1–3.

ROMANCE LANGUAGES

Head of Department: Professor Robert E. Taylor. Professors Goding, R. B. Johnson (Associate Head for French and Principal French Adviser), Molina, Weiner; Associate Professors Bancroft, Greenfield (Associate Head for Spanish and Principal Spanish Adviser), Mankin, Mermier, Rothberg, Wexler; Assistant Professors Boudreau, DePuy, Haddad, P. J. Johnson, Niedzielski, Raymond, H. L. Smith, Jr.; Mesdames Bradford, Canale-Parola, Cannon, Chen, Galichon, Galvin, Humphrey, Lasher, Maris, Miller; Misses Danahar, Mora, V. Smith, Spangler, Speckels; Messrs. Aliberti, Benais, Brown, Busi, Cuneo, Labrie, Lamontagne, MacCombie, McAdam, Pineau, Yoken.

Two majors are offered: French and Spanish. The courses of these two curricula are intended to give (1) a thorough training in the language skills, (2) an appreciation of the aesthetic and intellectual qualities of the literatures, and (3) a serious insight into the cultures of the nations concerned. Students majoring in French or Spanish are required to complete 30 approved junior-senior credits, six of which may be in English literature above Sophomore level or in the original literature of another foreign language, or in other courses approved by the Department. Majors should also be guided by the appropriate Departmental document: Requirements for the Major in French (Spanish).

FRENCH

003 (3) (I) (II). Non-Credit French.

An intensive review of basic matter. For students who have had some French but who 1) have failed to achieve the minimum passing placement test score for French 107, 2) present only a single year of secondary school French, or 3) are deemed unprepared for French 107 by the department. Sequence: French 003 (non-credit), 107, and 108. Credit, 3.

101 (1) (I), 102 (2) (II). Elementary French.

For those who have no previous creditable training in French, Intensive practice in the four language skills. Sequence: French 101, 102, 107, 108. 3 class hours, 2 laboratory periods. Credit, 3.

107 (7) (I) (II). Intermediate French; French Life and Culture.

An intensive review and study of the language. Readings in modern French literature. Sequence: French 107, 108. Prerequisite, French 102 or equivalent. 3 class hours, laboratory. Credit, 3.

108 (8) (I) (II). Intermediate French; French Life and Culture. (C)

A study of some important literary works of the 19th and 20th centuries. Compositions. Prerequisite, French 107. 3 class hours. Credit, 3.

125 (25) (I), 126 (26) (II). Great Works in French Literature. (C)

A study of selected complete works of several periods. 3 class hours, 1 laboratory hour. Credit, 3.

127 (27) (I), 128 (28) (II). Oral Practice.

An advanced-level course designed to bring students to an accurate and mature grasp of French thought and expression. 3 class hours, 2 laboratory hours. Credit, 3. The Staff.

250 (79) (I). French Civilization.

A course designed for an intelligent understanding of France's life and culture. Given in alternate years. 3 class hours. Credit, 3. Mr. Mankin.

260 (80) (II). Advanced Language Study.

A thorough examination of professional requirements and needs for the teaching of French in the U. S. 3 class hours. Credit, 3. Mr. Goding.

290 (65) (I) or (II). Masterpieces in Translation. (C)

The vision of man in French literature from the Renaissance to the XXth century. Not open to French majors or to students who have completed either French 125 or 126. 3 class hours. Credit, 3. Mrs. Johnson.

320 (77) (I). The French Renaissance.

A study of the major writers of the XVIth century with appropriate attention to important humanistic and artistic developments. 2 class hours. Credit, 3. Mr. Mermier.

325 (55) (I). French Literature of the Seventeenth Century.

A study of the major works of pre-classicism, classicism and the transition, except the theater. Given in alternate years. 3 class hours. Credit, 3. Mr. Taylor.

330 (56) (II). French Literature of the Seventeenth Century: Theater.

A study of French drama in the seventeenth century. Given in alternate years. 3 class hours. Credit, 3. Mr. Johnson.

340 (51) (I). French Literature of the Eighteenth Century.

Development of the ideas of the French Enlightenment. Given in alternate years. 3 class hours. Credit, 3. Mr. Taylor.

345 (52). The Drama of the French Enlightenment.

Readings in the French theater from LeSage to Beaumarchais. 3 class hours. Credit, 3. Mrs. Raymond.

355 (57). French Romanticism.

A study of the Romantic period. Given in alternate years. 3 class hours. Credit, 3. Mr. Goding.

356 (58). French Literature of the Nineteenth Century.

A study of the main genres, schools and movements after the Romantic period. Given in alternate years. 3 class hours. Credit, 3. Mr. Goding.

360 (53). The French Theater of the Twentieth Century.

A critical study of the French theater from Scribe to the present. Given in alternate years. 3 class hours. Credit, 3.

365 (59). Major Figures of the Contemporary French Novel.

A study of the novels of Romains, Martin du Gard, Duhamel, Gide, Proust, Montherlant, Giraudoux. Credit, 3.

366 (60). Major Figures of the Contemporary French Novel.

A study of the novels of Malraux, Camus, Sartre, Simone de Beauvoir, Bernanos, Mauriac and Julion Green. Credit, 3. Mrs. Johnson.

375 (81). Contemporary French Poetry.

The works of Nerval, Baudelaire, Mallarmé, Rimbaud, Verlaine, etc. Credit, 3. Mr. Johnson.

376 (82). Contemporary French Poetry.

The works of Valéry, Claudel, Apollinaire, Saint-John Perse, etc. Credit, 3. Mr. Johnson.

390, 391 (78). Advanced French Studies.

A special study of a French author or genre under independent guidance. Elected only by permission of the department. Credit, 1–3. The Staff.

395 (96). Senior Seminar.

Advanced study in French literature for advanced students. Subject of the seminar is announced the preceding semester. Credit, 1–3. The Staff.

ITALIAN

101 (1) (I), 102 (2) (II). Elementary Italian.

For students with no previous creditable training in Italian. Intensive practice in the language skills. 3 class hours, 2 laboratory sessions. Credit, 3. Mr. Aliberti.

107 (7) (I), 108 (8) (II). Intermediate Italian. (108C)

For students with one year of college Italian or equivalent. Training in the language skills; emphasis on speaking and understanding; readings in cultural and literary texts. 3 class hours, 2 laboratory sessions. Credit, 3. Mr. Aliberti.

125 (25) (I), 126 (26) (II). Introduction to Italian Literature. (C)

Selected masterpieces of Italian literature presented integrally, in literary-historical perspective. Conducted in Italian. Either semester may be elected independently. Prerequisites, Italian 108 or permission of the department. 3 class hours. Credit, 3.

127 (27) (I), 128 (28) (II). Oral Italian.

The oral aspect of the language; pronunciation, vocabulary building, speeches, discussions, debates. Prerequisites, Italian 108 or permission of the department. 3 class hours, laboratory. Credit, 3.

PORTUGUESE

101 (1) (I), 102 (2) (II). Elementary Portuguese.

For students with no previous creditable training in Portuguese. Intensive practice in the language skills. 3 class hours, laboratory. Credit, 3.

107 (7) (I), 108 (8) (II). Intermediate Portuguese.

For students with one year of college Portuguese or equivalent. Training in the language skills; emphasis on speaking and understanding: readings in cultural and literary texts. 3 class hours, laboratory. Credit, 3.

125 (25) (I), 126 (26) (II). Introduction to Portuguese Literature. (C)

Selected masterpieces of Portuguese literature presented integrally, in literary-historical perspective. Conducted in Portuguese. Either semester may be elected independently. Prerequisite, Portuguese 108 or permission of the department. 3 class hours. Credit, 3.

SPANISH

101 (1) (I), 102 (2) (II). Elementary Spanish.

For students with no previous creditable training in Spanish. Intensive practice in the language skills. To fulfill the language requirement, upon completion of this course most students are required to continue by taking Spanish 107 and 108. 3 class hours, 2 laboratory sessions. Credit, 3.

107 (7) (I), 108 (8) (II). Intermediate Spanish. (108C)

For upperclassmen who have completed Spanish 101–102, and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 108 fulfill the language requirement. 3 class hours. Credit, 3.

109 (9) (I), 110 (10) (II). Grammar and Composition.

A review of basic elements of grammar. For Spanish majors and others who plan to continue with Spanish beyond Spanish 108. To be taken concurrently with Spanish 107 and 108. One class session and one laboratory hour. Credit, 1.

125 (25) (I), 126 (26) (II). Introduction to Spanish Literature. (C)

Selected great works of Spanish literature studied in complete text in literary-historical perspective. Conducted in Spanish. Either semester may be elected independently. Prerequisite, Spanish 108 or permission of the department. 3 class hours. Credit, 3.

127 (27) (I), 128 (28) (II). Oral Spanish.

The oral aspects of the language; pronunciation, vocabulary building, speeches, discussions, debates. Grammatical elements required for correct and fluent use of American and Peninsular Spanish. Prerequisite, Spanish 108 or permission of the department. 4 class hours. Credit, 3. Mr. Wexler.

251 (51) (I). Conversational Spanish. (Course 1)

For Spanish majors and others interested in further developing fluency in the spoken language. Prerequisite, Spanish 127–128, or permission of the department. One class session and one laboratory hour. Credit, 1.

252 (52) (II). Conversational Spanish. (Course 2)

For Spanish majors and others interested in further developing fluency in the spoken language. Prerequisite, Spanish 127–128 and Spanish 251 or permission of the department. One class session and one laboratory hour. Credit, 1.

253 (53) (I). Conversational Spanish. (Course 3)

For Spanish majors and others interested in further developing fluency in the spoken language. Prerequisites, Spanish 127–128 and Spanish 251 and 252, or permission of the department. One class session and one laboratory hour. Credit, 1.

290 (66) (II). Spanish Masterpieces in Translation. (C)

A detailed study of masterpieces of Spanish literature from the Middle Ages to the present. Not open to majors in Spanish nor to students who have taken or plan to take Spanish 125-126. 3 class hours. Credit, 3.

310 (64) (I). Advanced Composition and Syntax.

Intensive study of Spanish grammar, syntax and stylistics. Open to Spanish majors and other qualified students by permission of the department. 3 class hours. Credit, 3.

320 (83) (I). Prose and Poetry of the Sixteenth Century. (1966–67)

Masterpieces of Spanish prose of the 16th Century; development of poetry in the major poets from Garcilaso to Herrera. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

330 (84) (II). Cervantes. (1966–67)

Intensive reading of *Don Quijote* Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

340 (85) (I). Drama of the Golden Age. (1965–66)

Deals primarily with the *comedia* during the period of maximum creation, 1556–1681. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Wexler.

350 (86) (II). Prose and Poetry of the Seventeenth Century. (1965–66)

Masterpieces of Spanish prose of the 17th Century, excluding the *Quijote*; Gongora and the Baroque poets. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Rothberg.

360 (79) (I). Spanish Literature of the Nineteenth Century. (1965–66)

A detailed study of the major writers and literary movements of the period. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125–126, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

370 (80) (II). Spanish-American Literature to 1900. (1965–66)

Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3.

380 (81) (I). Twentieth-Century Spanish Literature. (1966–67)

Major writers of Spain in the late nineteenth and twentieth centuries. Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

390 (82) (II). Twentieth-Century Spanish-American Literature. (1966–67)

Conducted in Spanish. Given in alternate years. Prerequisites, Spanish 125 and 126, or permission of the department. 3 class hours. Credit, 3. Mr. Greenfield.

395 (95) (I). Senior Seminar.

Independent work under guidance on special problems in certain areas of interest, including research and bibliographical techniques. A senior course for Spanish majors. Credit, 3.

THE CLASSICS

Assistant Professor Duval

GREEK

101 (1) (I), 102 (2) (II). Elementary Greek.

For students with no previous creditable study of Greek. Elements of the language and readings in prose and poetry. Given in alternate years. 3 class hours. Credit, 3.

107 (7) (I), 108 (8) (II). Intermediate Greek. (108C)

For students with one year of college Greek or its equivalent. Intensive grammar review. Reading of selected pieces of Greek literature, mainly Homer. Given in alternate years. 3 class hours. Credit, 3.

LATIN

101 (1) (I), 102 (2) (II). Elementary Latin.

For students with no previous creditable study of Latin. Elements of the language and introductory reading. 3 class hours. Credit, 3.

107 (7) (I), 108 (8) (II). Intermediate Latin (108C).

For students with one year of college Latin or its equivalent. Intensive grammar review. Reading of selected pieces of Latin literature. 3 class hours. Credit, 3.

RUSSIAN

Associate Professor Pressman; Assistant Professor Tikos; Mr. Stawiecki

The curriculum in Russian is offered by the Department of German and Russian (see page 117).

Students choosing Russian as their field of major concentration will receive training in reading, writing, speaking and understanding the language, and a knowledge of Russian literature. Russian majors will also acquire a background of the history and government of Russia and its economy—a background necessary for an understanding of the literature and culture of the Russian people. Russian majors will be prepared to continue their education on the graduate level in the fields of Russian, Slavic Languages and Literatures, or Russian Area Studies. Russian majors who choose to become teachers or translators will have the necessary preparation and background in the history of the language, or experience in translating scientific, technical and academic material.

Prerequisite for a major in Russian is the successful completion of four semester courses in the language (12 credits): Russian 101, 102, 107, 108 or the equivalent. Requirements for a major are the successful completion of:

(a) Four semester courses of language study at the junior-senior level (12 credits): Russian 261, 262, 271 and either 263, 264.

(b) Five semester courses of Russian literature study at the junior-senior level (15 credits): Russian 251, 252, 253, 254, and one of 256, 257, 258.

(c) Seminar course Russian 297.

(d) Two semester courses in Russian History: History 255, 256.

101 (1) (I), 102 (2) (II). Elementary Russian.

Grammar, exercises in composition and conversation, selected readings. Prerequisite, previous language training. 3 class hours, 1 laboratory hour. Credit, 3.

107 (7) (I), 108 (8) (II). Intermediate Russian. (108C)

A review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation, and readings in Russian fiction. Prerequisites, Russian 1 and 2. 3 class hours, 1 laboratory hour. Credit, 3.

251 (51) (I), 252 (52) (II). Introduction to Russian Literature. (C)

Survey course in Russian prose. Written reports. Conducted in English. Readings in English and Russian, research in Russian for majors. Prerequisite, junior standing. 3 class hours. Credit, 3.

253 (53) (I), 254 (54) (II). Dostoevsky and Tolstoy in their European Setting. (C)

Historical and literary background. Close text analyses. Student reports. Reading of selected works in the original required of Russian majors. Prerequisite, junior standing. 3 class hours. Credit, 3.

255 (55) (I). Masterpieces of Russian Literature in Translation.

A selection from classics of Russian romanticism and realism, culminating in novels of Dostoevsky and Tolstoy. Majors are required to read some texts in Russian. Prerequisite, junior standing. 3 class hours. Credit, 3.

256 (56) (I). Russian Drama.

Russian Drama in the originals, from the beginnings to the establishment of a Russian national repertoire and theatre. Plays of Ostrovskij, Checkhov, and Gorky. Prerequisites, Russian 7 and 8, or the equivalent. 3 class hours. Credit, 3.

257 (57) (I). Soviet Literature.

Beginnings and development of Soviet prose, drama, criticism from Gorki to Sholokhov and Pasternak. Conducted in English, no knowledge of Russian required. Majors are required to do research in Russian. Prerequisite, junior standing. 3 class hours. Credit, 3.

258 (58) (I). Russian Poetry.

Russian poetry in the originals: 19th century to the present: Classical Heritage, Golden Age, Utilitarian poetry, Proletarian verse, Modernism, Symbolism Mysticism, Acmeism, Futurism Imagism, Constructivism. Prerequisites, Russian 107 and 108, or the equivalent. 3 class hours. Credit, 3.

261 (61) (I), 262 (62) (II). Advanced Russian.

Building vocabulary and improving reading ability through selections from the Classical and Soviet Periods. Compositions and classroom discussions in Russian on reading material. Prerequisites, Russian 107 and 108. 3 class hours, 1 laboratory hour. Credit, 3.

263 (63) (I). Scientific Russian.

Intensive experience in translating scientific exposition, academic and journalistic prose. Prerequisites, Russian 107 and 108, or the equivalent. 3 class hours. Credit, 3.

264 (64) (I). The History of the Russian Language.

Historical development of the Russian language, its relation to other languages, changes in sound, form and vocabulary from the earliest period to the present. Prerequisites, Russian 261 and 262. Junior or senior standing. 3 class hours. Credit, 3.

271 (71) (I). Russian Conversation.

A semester course devoted to developing fluency in speaking Russian and a conversational vocabulary. Prerequisites, Russian 261 and 262. 3 class hours, 1 laboratory hour. Credit, 3.

297 (97) (I). Problems in Russian Language and Literature.

A semester involving intensive and independent work on special problems in Russian Language and Literature, with results to be presented in writing form. Required of majors. Prerequisites, Advanced Russian 261 and 262 and senior standing. Credits, 1–3.

SOCIOLOGY AND ANTHROPOLOGY

Head of Department: Professor J. Henry Korson. Professors Gordon, King, Driver; Associate Professors Sussmann*, Wilkinson*; Assistant Professors Fortier, Fraser, Kay, Manfredi, O'Rourke, Park, Stanfield, Spores, Yaukey; Visiting Associate Professor Medalia; Visiting Assistant Professors Golden, Hagopian.*

Sociology and Anthropology

The courses in sociology and anthropology are planned with two aims in view: to give the student an understanding of the factors which influence men in their activities and interests as members of society, and to help prepare students for a wide variety of occupational outlets. Students interested in teaching at the elementary or high school level should take a minor in the School of Education and at least 6 credits in American history with as many credits in American government as can be arranged.

**On leave 1964–65*

Of the many opportunities in the field of social work, some are available to college graduates while others require graduate training in a school of social work. Aside from opportunities in the business world, many federal agencies and private research organizations seek people who are trained in the research techniques of sociology.

Sociology Major

All majors must elect Sociology 101 (1) and 102 (2); two semesters of Mathematics or one semester of Mathematics and Philosophy 125 (31); and two of the following: Economics 125 (25), Government 100 (25), or Psychology 100 (1); a minimum of 24 and a maximum of 30 Junior-Senior credits in Sociology and Anthropology, of which the following should be taken in the Junior Year: Anthropology 104 (4), Sociology 282 (82), and 295 (95). Students who plan to enter the research field or continue their training in sociology at the graduate school level, are advised to elect Statistics 247 (50) in the Junior or Senior year and to begin to develop a reading knowledge of French and German. Students majoring in Sociology must maintain a minimum quality point average of 2.0 (C grade) or better in Sociology and Anthropology courses.

Anthropology Major

Anthropology majors must elect Anthropology 103 (3), 104 (4) and Sociology 101 (1); two semesters of Mathematics or one semester of Mathematics and Philosophy 125 (31); and two of the following: Economics 125 (25), Government 100 (25), or Psychology 100 (1); they are strongly recommended to elect Zoology 101 (1) in partial fulfillment of their biological science requirement. All majors will also be required to elect a minimum of 24 and a maximum of 30 Junior-Senior credits in Anthropology, of which the following must be taken: Anthropology 360 (60), 364 (64) and 365 (65). With approval of the student's adviser, an Anthropology major may be permitted to substitute for part of his required Junior-Senior credits up to nine credits elected from course offerings in Sociology, or *non-duplicating* courses in Anthropology given at another of the cooperating valley institutions. Students majoring in Anthropology must maintain a minimum quality point average of 2.0 (C grade) in major courses.

Social Work

The American Association of Schools of Social Work indicates that the pre-professional subjects most closely related to professional work in this field are economics, political science, psychology, and sociology.

The Association recommends that prospective students of social work or social administration take not fewer than 12 semester hours in one of these subjects while taking less in others. It also recognizes the value of courses in biology, history, English, as well as other subjects contributing to a broad cultural background for the student.

SOCIOLOGY

101 (1) (I) (II). Introduction to Sociology. (D)

A study of the social order and of the individual considered as a member of his various groups. 3 class hours. Credit, 3. The Department.

102 (2) (I) (II). Principles of Sociology. (D)

A study of the operation of basic sociological principles and some contemporary theories as they apply to two substantive areas not otherwise treated in undergraduate courses. Prerequisite, Sociology 101 (1). Credit, 3. Mr. O'Rourke.

247 (50) (II). Elementary Statistics.

An introduction to principles and techniques with special reference to application in Sociology. Credit, 3. Mr. Park.

251 (51) (I). Urban Sociology. (D)

A study of urban American social conditions with reference to population, ecology, health, and the classically defined institutional complexes and their problems of adjustment. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mrs. Golden.

252 (52). Rural and Peasant Societies. (D)

A study of rural and peasant societies from the standpoint of their population and institutions, their emerging needs, and their relation to mass society. Credit, 3. Prerequisite, Sociology 101 (1).

254 (54) (II). Industrial Sociology.

The role, status, and function of the worker in the industrial community. A consideration of changing technology and the adjustment made in the industrial community. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. Korson.

255 (55) (I). Sociology of Religion.

The relationship of religious beliefs and institutions to cultures and societies. Prerequisite, Sociology 101 (1). Credit, 3. Mr. Manfredi.

256 (56) (II). Race Relations. (D)

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration of similar problems in Africa and Asia. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. Gordon.

257 (57) (I) (II). The Family. (D)

The development of the customs of courtship and marriage and of the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. King, Mr. Korson.

258 (58). Social Interaction.

A study of the processes leading to the socialization of the group member, with emphasis on role properties, play, control models, power definitions and allocation. Prerequisites, Sociology 101 (1) and 102 (2). 3 class hours. Credit, 3.

259 (59) (I). Social Stratification. (D)

The factors which make for institutionalized inequality in social life. A consideration of castes and classes in American society. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3.

261 (61) (I). Population Problems. (D)

An analytical study of population composition, focusing upon the causes and consequences of changes in the basic demographic variables: fertility, mortality, and migration. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. Wilkinson.

270 (70). Social Structure of India. (D)

The origins, distribution, and cultural traits of the major groups in India. Special attention given to marriage, family, caste patterns, and positions in the economic and political system. 3 class hours. Credit, 3. Mr. Driver.

272 (72) (I). Social Change. (D)

A consideration of changes arising from culture contact, social reform, and technical inventions. Planned and unplanned change, particularly with respect to underdeveloped countries. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. King.

275 (75) (I). Social Problems. (D)

The distribution and interrelationships among some types of deviance and disorganization: crime, mental disorders, addiction, suicide, family tensions. Theories of causation; research projects; field trips. Prerequisite, Sociology 101 (1). Credit, 3. Mr. Stanfield.

278 (78) (I) (II). Criminology. (D)

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. Driver, Mr. Stanfield, Miss Kay.

282 (82) (II). Sociological Theory. (D)

An examination of contributions of European and American writers who have concerned themselves with theories of the origin, growth, and development of human social organization. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Mr. Manfredi.

292 (92) (II). Introduction to Social Welfare.

Methods of caring for adult and child dependents and defectives. Public and private agency administration and techniques. Federal, state, and local community programs. Prerequisite, Sociology 101 (1). 3 class hours. Credit, 3. Miss Kay.

295 (95) (I) (II), 296 (96) (II). Seminar, Research Methods.

A consideration of research methods and techniques employed in sociology. Each student is required to design and complete a research project of limited scope. Prerequisite, Sociology 101 (1). Credit, 3. Mr. Park, Mr. Yaukey.

ANTHROPOLOGY

103 (3) (I). Introduction to Physical Anthropology and Archaeology. (D)

An introduction to the fields of Anthropology. This course will deal with human evolution, race and racism, prehistoric archaeology, culture history and the nature of culture. 3 class hours. Credit, 3. Mr. Spores.

104 (4) (I) (II). Introduction to Cultural Anthropology. (D)

An introduction to social and cultural Anthropology dealing with variations among societies in technology and economics, social and political organization, art, religion and ideology. 3 class hours. Credit, 3. Mr. Fortier, Mr. Fraser, Mr. Spores.

360 (60) (II). Archaeology. (D)

An introduction to the history, methods and theory of archaeology, with an outline of the main characteristics of the prehistoric record throughout the world. Prerequisite, Anthropology 103 (3) or permission of instructor. 2 class hours, 1 two-hour lab. Credit, 3. Mr. Spores.

364 (64) (II). Problems in Anthropology. (D)

Examination of selected problems in physical anthropology, archaeology, social and cultural anthropology. Illustrative material will be drawn from both non-literate and peasant societies. Prerequisite, Anthropology 104 (3) or permission of instructor. 3 class hours. Credit, 3. Mr. Fraser.

365 (65) (I). World Ethnography (D)

The study of selected societies of Africa, the Americas, Asia and Oceania. Problems of comparing societies, especially with regard to their environmental contexts and levels of productivity. Prerequisite, Anthropology 104 (3) or permission of instructor. 3 class hours. Credit, 3. Mr. Fraser.

366 (66) (II). The Individual and Society. (D)

Selected approaches to the interrelations of individual behavior and social patterns, with consideration of data on "Western" and "non-Western" societies. Prerequisite, Anthropology 104 (3) or permission of instructor. 3 class hours. Credit, 3. Mr. Fortier.

367 (67) (II). Cultures of Africa. (D)

This course is directed toward an extensive survey of the cultures of Africa, a comparison of their social, political, religious, and economic patterns, and toward consideration of the evolution and interrelationships of the cultures of the area. Prerequisite, Anthropology 104 (3) or permission of instructor. 3 class hours. Credit, 3. Mr. Spores.

373 (73). Cultures of Southeast Asia. (D)

An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role in the development of modern Southeast Asian states. Prerequisite, Anthropology 104 (3) or permission of instructor. Credit, 3. Mr. Fraser.

374 (74) (II). Cultures of the Far East. (D)

A survey of culture-history and ethnography of representative peoples of East Asia; peasant sub-cultures of traditional contemporary China, Japan, and Korea. Prerequisite, Anthropology 104 (3) or permission of instructor. Credit, 3. Mr. Fortier.

376 (76) (I). Cultures of Latin America.

The course will analyze the prehistoric, colonial and contemporary cultures of Middle America, the Caribbean and South America. Special emphasis will be placed on consideration of long-range cultural developments and interrelationships. Prerequisite, Anthropology 104 (3) or permission of instructor. 3 class hours. Credit, 3. Mr. Spores.

379 (79) (II). Cultural Dynamics and Applied Anthropology.

A consideration of theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development. Prerequisite, Anthropology 104 (3) or permission of instructor. Credit, 3. Mr. Fraser.

SPEECH

Head of Department: Professor Arthur E. Niedeck. Associate Professors Green, Hegarty; Assistant Professors Abramson, Brann, Catalano, Harper, Mahnken, Peirce, Savereid; Misses Hanifan, Labelle, Messrs. Amlund, Biddle, Orr, Price, Sarno, Stromgren, Wells.

Speech

An undergraduate major in speech may be earned by completing thirty semester hours of course work in the department. Psychology 101 should be elected as a basic requirement. The student must select an area of concentration in (1) Rhetoric and Public Address, (2) Theatre, (3) Radio and Television, (4) Speech Education, (5) Speech and Hearing Therapy. Students concentrating in Speech and Hearing Therapy may fulfill all the certification requirements of the American Speech and Hearing Association and the Massachusetts State Department of Education. Students interested in preparation as public school therapists should plan to minor in the School of Education. For those interested in work in a rehabilitation or hospital setting, a minor in psychology should be planned.

101 (3) (I) (II). Oral Communication. (B)

Introductory instruction and practice in oral self-expression: literary interpretation and public speaking. 2 class hours. Credit, 2. The Department.

115 (15) (I) (II). Introduction to Theatre. (C)

An introduction to the art of the theatre: A survey of its aesthetics, elements, forms and contributing artists; its influences and place in the culture of our society. 3 class hours, 10 laboratory hours per semester by arrangement. Credit, 3. Mr. Catalano.

135 (35) (I) (II). Fundamentals of Play Production.

A study of the methodology and techniques of play production through lectures, demonstrations and practical laboratory work. The responsibilities and contributions of all participating artists will be examined in detail through an extensive study of every aspect of production from script to stage. 3 class hours. Credit, 3. Mr. Niedeck.

140 (40) (I) (II). Fundamentals of Stagecraft.

The study of the fundamental principles of construction, rigging, shifting, and painting of scenery through lectures, demonstrations and practical laboratory work. Prerequisite, Speech 115 (15). 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Wells.

141 (41) (I) (II). Fundamentals of Stage Lighting.

The study of aesthetics, fundamentals and facets of stage lighting through lectures, demonstrations and practical laboratory work. Prerequisite, Speech 115 (15). 1 class hour, 1 2-hour laboratory period. Credit, 2, Mr. Wells.

142 (42) (I) (II). Principles of Stage Makeup.

The study of the principles of stage makeup through a lecture-demonstration-laboratory practicum. Prerequisite, Speech 115 (15). 1 2-hour laboratory class. Credit, 1. Mr. Amlund.

200 (50) (I) (II). Voice and Diction and Oral Interpretation.

Training and drill in the correct production of speech; practice in the fundamentals of vocal interpretation of literature. 3 class hours. Credit, 3. Miss Abramson and Mr. Brann.

201 (51) (I) (II). Public Speaking.

The study and application of principles governing the composition and delivery of public speeches. 3 class hours. Credit, 3. The Department.

202 (52) (II). Discussion.

The study of the principles of group discussion and their application to major contemporary problems. 3 class hours. Credit, 3. Mr. Savereid.

203 (53) (I). Argumentation and Debate.

The study and application of reasoning and evidence as it is used in public deliberation. Prerequisite, Speech 201 (51) or permission of instructor. 3 class hours. Credit, 3. Mr. Biddle.

204 (54) (II). Persuasion.

Advanced study and practice in appeals to beliefs and action through extemporaneous speech. Prerequisite, Speech 201 (51) or permission of instructor. 3 class hours. Credit, 3. Mr. Price.

205 (55) (I). History of Rhetorical Theory.

A study of rhetorical theory from Plato and Aristotle to the present with particular emphasis on the Greeks and Romans. Prerequisite, Speech 201 (51) or permission of instructor. 3 class hours. Credit, 3. Mr. Savereid.

207 (57) (I). American Public Address.

Reading and analysis of speeches taken from the American political platform, academic platform, pulpit, courtroom, and ceremonial platform. Lectures, discussions, written reports, and listening to contemporary addresses over the radio or on tape. Prerequisite, Junior standing or permission of instructor. 3 class hours. Credit, 3. The Department.

208 (58) (II). Advanced Rhetorical Composition.

An intensive study of the departments of invention, disposition, and style. Practice in the application of principles studied in classical and modern treatises by the preparation and revision of outlines and manuscripts for speeches. Prerequisite, Speech 201 (51) or permission of instructor. 3 class hours. Credit, 3. The Department.

221 (61) (I) (II). Broadcasting in America.

An intensive analysis of broadcasting in America emphasizing its evolution, economic structure, nature of the programming, and its impact on the American society. 3 class hours. Credit, 3. Mr. Harper.

222 (62) (II). Radio Production.

A laboratory course which emphasizes practical experience in all aspects of radio production and includes all the basic formats of radio programs. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Brann.

223 (63) (I). Television Production-Direction.

A laboratory course emphasizing T.V. studio procedure and technique. Practical experience is provided in all studio crew assignments other than those involving electronics. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Harper.

224 (64) (II). Advanced Television Production-Direction.

An advanced laboratory course which builds on the basic skills and techniques developed in the basic production course. Prerequisite, Speech 223 (63). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Harper.

225 (65) (I). History of Film.

A study of the evolution of the motion picture through its high points of artistic growth in representative countries. 3 class hours. Credit, 3. Mr. Stromgren.

241 (71) (II). Introduction to Scene Design.

The study of the aesthetics, fundamentals and facets of scene design through lectures, class projects and practical laboratory work. Prerequisite, Speech 140 (40) and 141 (41), or permission of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Amlund.

243 (73) (I). Fundamentals of Acting Techniques.

The study of the principal techniques of the art of acting with emphasis on individual development; the examination of the basic tenets of this art through practical application and exercises. Prerequisite, Speech 115 (15). 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Catalano.

244 (74) (II). Fundamental Theories of Acting.

The study of the principal theories of acting; the investigation and application of the historical and contemporary theories of character analysis, development and performance. Prerequisite, Speech 243 (73). 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Catalano.

245 (75) (I). Fundamental Techniques of Play Directing.

The study of the fundamental techniques of the art of play directing; the Director's media, the arrangement of the stage picture and production procedures. Prerequisite, Speech 243 (73). 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Mahnken.

246 (76) (II). Fundamental Theories of Play Directing.

The study of the principal theories of play direction with emphasis on the Director as an interpretative artist; a study of the audience and the play in terms of the nature of the dramatic and the theatrical. Prerequisite, Speech 245 (75). 1 class hour, 1 2-hour laboratory period. Credit, 2. Mr. Mahnken.

247 (77) (I). History of Theatre of Western Civilization I.

The study of the History of the Theatre of Western Civilization from its beginnings to 1642; an investigation of the Classical, Medieval and Renaissance Theatres with emphasis on the origins and development of Drama, Spectacle, Theatre Production and Theatre Architecture. 3 class hours. Credit, 3. Mr. Mahnken.

248 (78) (II). History of Theatre of Western Civilization II.

A continuation of Speech 247 (77) with emphasis on the 18th and 19th centuries, the Continental, English, American, and Modern Theatres. 3 class hours. Credit, 3. Mr. Mahnken.

281 (81) (I) (II). Phonetics.

A scientific study of the sounds of English; descriptive analysis of individual vowels and consonants. Study of the International Phonetic Alphabet; training in auditory discrimination. 3 class hours. Credit, 3. Misses Hanifan, Labelle.

282 (85) (I). Introduction to Speech Pathology.

A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy. Observation; field trips. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Miss Hegarty.

283 (82) (I) (II). Introduction to Clinical Practice.

Training in basic diagnostic and therapeutic techniques for various speech handicaps; emphasis on articulation defects, delayed speech and stuttering. Supervised practice required. Prerequisites, Speech 281 (81) and 282 (85). 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Labelle.

284 (83) (I). Anatomy and Physiology of the Speech and Hearing Mechanism.

A study of the anatomy and physiology of the speech and hearing mechanism; consideration of phonation, resonance, articulation and audition. Prerequisites, Zoology 137 (37) and 138 (38). 3 class hours. Credit, 3. Miss Hegarty.

285 (84) (II). Audiology.

A study of the symptoms and causes of hearing loss; special attention to diagnostic test procedures. Supervised practice in audiometric testing. Observation; field trips. Prerequisite, Speech 282 (85). 3 class hours. Credit, 3. Mr. Green.

286 (86) (II). Rehabilitation of the Acoustically Handicapped.

Training in the techniques of speech therapy, auditory training, and speech reading for children and adults with hearing impairments. Laboratory practice under supervision. Prerequisite, Speech 285 (84). 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Green.

288 (88) (II). Advanced Clinical Practice.

Advanced training in clinical practice under supervision; special consideration of organic speech disorders. Opportunity for supervised clinical practice at Lemuel Shattuck Hospital. Prerequisite, Speech 283 (82). 2 class hours, 1 2-hour laboratory period. Credit, 3. Miss Hanifan.

385 (97) (I), 386 (98) (II). Independent Study and Research.

For qualified seniors, independent study and research on selected problems in the various major areas of study. Credit, 1–3.

390 (96) (II). Seminar in Speech Pathology.

Individual student reports on selected topics in the field of speech pathology. Prerequisite, Speech 282 (85). 3 class hours. Credit, 3. Miss Hegarty.

STATISTICS

Professor Gail B. Oakland; Assistant Professors Bagai, Norman.

The curriculum in statistics is designed to teach the student to observe carefully and correctly, to treat his data honestly and dispassionately and to reason objectively from a set of conditions to their logical conclusions. It emphasizes the logical relation of the analytical techniques taught to the main categories of scientific method: observation and classification of data, induction and deduction.

There is no undergraduate major in statistics. The curriculum is intended for those who wish to prepare themselves for graduate work in statistics and for those who require statistics as a basic preparation for their own subject-matter discipline. Cognate courses are needed to supply a basis for mature thinking. The statistical specialist should choose, according to his interests, cognate courses from such fields as: animal and plant breeding, biology, computer science, econometrics, engineering, genetics, mathematics, market research, psychology, and sociology. Such students who expect to specialize in statistics should take Statistics 255 and 256 no later than their senior year.

Statistics leans heavily on mathematics and most of the prerequisites of the advanced statistical courses will come from: calculus, Mathematics 174 (26) and differential equations, Mathematics 241 (92). Statistics 261, 262, 271, 272, 281, 282, and 292 are available for students who have the appropriate prerequisites. Two pairs of the above courses: Statistics 261, 262 (Design of Experiments) and Statistics 281, 282, (Multivariate Analysis) are given as courses complementary to each other. The lower numbers 261 and 281 designate courses on methodology while the higher numbers 262 and 282 designate courses on theory. For those who wish to use statistics primarily as a tool, Statistics 121, 251, 261, 271, 272, and 281 provide basic grounding. For those who have the calculus prerequisites, Statistics 255 and 256 are recommended in place of 121 and 251.

The Statistical Laboratory located in the School of Business Administration Building is open to students and staff wishing to use its facilities. Students wishing to use the calculating machines will be instructed in their proper use. The laboratory is supervised at all times. A wide range of statistical and mathematical tables are available and may be used in the laboratory.

121 (21) (I) (II). Elementary Statistics. (E)

The nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series. 3 class hours. Credit, 3.

251 (51) (I) (II). Elementary Statistics.

The analysis of variance; the design of experiments; sample surveys, multiple regression, non-parametric tests. Prerequisite, Statistics 121. 3 class hours. Credit, 3.

255 (55) (I). Introductory Statistics.

Descriptive statistics; mathematical properties of distribution functions; statistical inference; relationships between variables. Prerequisite, Mathematics 174 (26) or 185 (31). 3 class hours. Credit, 3.

256 (56) (II). Introductory Statistics.

The analysis of variance; the design of experiments; acceptance sampling; non-parametric inference. Prerequisite, Statistics 255. 3 class hours. Credit, 3.

261 (61) (I). Design of Experiments (Methods).

Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields. Prerequisite, Statistics 121 or 255. 3 class hours. Credit, 3.

262 (62) (II). Design of Experiments (Theory).

Conceptual basis of experimental designs, especially randomized blocks, latin squares, factorial and sequential, incomplete blocks, and experiments with attributes. Prerequisite, Statistics 256. 3 class hours. Credit, 3.

271 (71) (I). Survey Sampling.

The theory and practice of sampling; optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, the problem of non-response. Prerequisite, Statistics 121 or 255. 3 class hours. Credit, 3.

272 (72) (I). Sampling Theory and Methods.

Problems and methods of samplings, production and quality control, acceptance sampling, OC and ASN curves, types and properties of estimators. Prerequisite, Statistics 121 or 255. 3 class hours. Credit, 3.

281 (81) (I). Multivariate Analysis (Methods).

Applications of the theory in Statistics 282 to actual problems; it may involve research studies by the students, critiques of published research, or analysis of other bodies of data. Prerequisite, Statistics 251 or 256. 3 class hours. Credit, 3.

282 (82) (II). Multivariate Analysis (Theory).

Correlation and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions. Prerequisites, Statistics 256. 3 class hours. Credit, 3.

292 (92) (II). Frequency Distribution.

Basic probability, frequency functions, transformation of variates, generating functions, normal and related distributions, binomial, multinomial, hypergeometric, poisson, exponential, logarithmic and other distributions including Pearson's system. Prerequisites, Statistics 256 and Mathematics 241 (92) (or concurrently). 3 class hours. Credit, 3.

ZOOLOGY

Head of Department: Professor Donald Fairbairn. Professor Emeritus Traver; Professors Anderson, Bartlett, Honigberg, Nutting, Rauch, Snedecor; Associate Professors Harvey, Moner, J. L. Roberts, Rollason, Swenson; Assistant Professors Andrews, Cooper, Klingener, Mange, L. S. Roberts, Sargent, Snyder; Mrs. White.

Major aims served by courses of instruction in zoology are:

(1) To present biological principles insofar as these contribute to liberal education (Zoology 101 (1), 125 (25), 135 (35), 145 (58)).

(2) To satisfy the need for specialized training of students majoring in other departments or schools (Zoology 135 (35), 137 (37), 138 (38), 200 (54).

(3) To provide the fundamentals of professional training for Zoologists, and also for those who plan to qualify professionally in medicine, dentistry, and veterinary science.

Students electing zoology as their major subject must complete the following courses or their equivalents: Mathematics 123 (9), 124 (10); Physics 103 (3), 104 (4); Botany 100 (1); Zoology 101 (1), 223 (50), 240 (53), 271 (70), 221 (71), 225 (72), 360 (83); Chemistry 113 (3), 114 (4), 210 (32), 261 (51), 262 (52), 263 (53), 264 (54) (or, less preferably, Chemistry 111 (1), 112 (2), 127 (27), 261 (51), 262 (52), 263 (53), 264 (54) and four additional courses in the sciences or mathematics of which at least one must be in zoology.

The following courses are required of zoology majors planning to teach in high schools: Zoology 101 (1), 135 (35), 240 (53), 271 (70), and four electives; Botany 100 (1), 126 (26); Chemistry 111 (1), 112 (2), or 113 (3), 114 (4), 160 (33); Physics 103 (3), 104 (4); Mathematics 121 (7), 123 (9); Education 251 (51) (junior year); concentrated semester block, Education 252 (52), 385 (85), 388 (88) (senior year); Psychology 301 (56); additional science credits, if desired, recommended from: Microbiology 250 (51), Geology 101 (1), Wildlife Management 101 (27), Botany 221 (81), Entomology 126 (26), 279 (79), 290 (90), Chemistry 220 (79).

ZOOLOGY

101 (1) (I) (II). INTRODUCTORY ZOOLOGY. (E)

Principles of biology with special reference to the cell and its metabolism and to the anatomy, physiology and evolution of the major groups of the animal kingdom. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Rollason and staff.

125 (25) (I). SURVEY OF THE ANIMAL KINGDOM. (E)

Emphasis on adaptation, symbiosis, ecology, and evolution, and a consideration of major animal phyla which best illustrate these topics. Several field trips. Prerequisite, Zoology 101 (1). 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Cooper.

135 (35) (I) (II). Introductory Physiology. (E)

Includes circulation, respiration, digestion, metabolism, excretion, chemical and nervous coordination, muscular activity, and reproduction. Prerequisite, Zoology 101 (1). 2 class hours, 1 3-hour laboratory period. Credit, 3. Staff.

137 (37), 138 (38) (I) (II). Anatomy and Physiology. (E)

Designed for students in the School of Nursing. Prerequisites, Zoology 101 (1); Chemistry 111 (1), 112 (2); 137 (37) prerequisite for 138 (38); credit only for full year course. 3 class hours, 1 3-hour laboratory. Credit, 4 per semester. Mrs. White.

145 (58) (II). Human Genetics.

For non-science majors, an introduction to genetics with reference to its implications and applications to man. Not for major credit. Prerequisite, Zoology 101 (1). 3 class hours. Credit, 3. Mr. Mange.

200 (54) (I) (II). Natural History.

Designed to orient the student to features of sky, climate, and terrain, of importance to the teaching naturalist. Methods of identification, collecting data, etc. Prerequisites, Botany 100 (1); Zoology 101 (1). 1 class hour, 1 4-hour laboratory period. Credit, 3. Mr. Nutting, Mr. Cooper.

221 (71) (I) (II). Comparative Vertebrate Anotomy.

Structure and phylogeny of the vertebrates. Laboratory work will illustrate evolutionary trends and specializations and provide experience in dissection. Prerequisite, Zoology 101 (1). 2 class hours, 1 3-hour laboratory. Credit, 3. Mr. Snyder, Mr. Klingener.

223 (50) (I) (II). Histology.

The structure of cells, tissues and organs as related to function, with emphasis on the mammal; introduction to microtechnique. Prerequisite, Zoology 101 (1). 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Rollason.

225 (72) (I) (II). Developmental Biology.

Lectures emphasize physiological and biochemical aspects of development. Laboratories deal with descriptive and comparative phases of ontogeny, especially of amphibian, bird, and mammal. Prerequisite, Zoology 221 (71). 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Harvey.

240 (53) (I) (II). Principles of Genetics.

Mechanism of heredity in plants and animals, emphasizing transmission and action of genes, population genetics and evolution. Prerequisites, Zoology 101 (1), Chemistry 112 (2), or 114 (4). 3 class hours. Credit, 3. Mr. Rauch.

242 (52) (II). Genetics Laboratory.

Laboratory experiments illustrating transmission genetics, including linkage and gene location. Recommended for Zoology majors. Prerequisite, Zoology 240 (53). 1 3-hour laboratory period. Credit, 1. Mr. Rauch.

246 (78) (II). Population Genetics.

Introduction to the principles of population genetics; the population approach to the origin of species and the study of human genetics. Prerequisites, Zoology 240 (53) and permission of instructor. 3 class hours. Credit, 3. Mr. Mange.

271 (70) (II). Invertebrate Zoology.

A survey of invertebrate animals based upon evolutionary and phylogenetic considerations. Prerequisite, 221 (71) or permission of instructor. Lectures, discussion periods, laboratory. Credit, 3. Mr. Nutting.

275 (64) (II). Biology of Protozoa (1966–1967).

Morphology and physiology of Protozoa, with emphasis on the contributions made on the basic problems of biology through the study of these organisms. Prerequisites, Zoology 101 (1), and permission of instructor. 1 class hour, 1 2-hour and 1 3-hour laboratory periods. Credit, 3. Mr. Honigberg.

283 (69) (I). General Parasitology.

Morphology, life cycles, and physiology of protozoan and helminth parasites, with emphasis on broad aspects of parasitism. Prerequisites, Zoology 101 (1), and Chemistry 112 (2) or 114 (4). 2 class hours, 2 2-hour laboratory periods. Credit, 4. Mr. Honigberg.

300 (81) (I). Vertebrate Zoology.

History, relationships, patterns of distribution, classification, and ecology, with major emphasis on the fishes. Prerequisite, Zoology 101 (1). 1 class hour, 2 2-hour laboratories, field trips. Credit, 3, Mr. Andrews.

302 (86) (II). Ichthyology.

The morphology, ecology and relationships of fishes, and their distribution in space and time. Prerequisite, Zoology 221 (71) or 300 (81), or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Andrews.

306 (80) (II). Ornithology.

Avian biology with emphasis on structural and functional adaptations, and particularly behavioral patterns. Laboratory includes field trips. Prerequisite, Zoology 101 (1). 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Bartlett.

308 (82) (II). Mammalogy.

Evolution, distribution, classification and ecology of mammals. Laboratory includes field trips, preparation of study material, and identification of local fauna. Prerequisites, Zoology 221 (71) or 300 (81) and permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Snyder.

335 (74) (II). Limnology (1965–1966).

Study of inland waters, including geological, physical, chemical and biological aspects. Prerequisites, Botany 100 (1); Zoology 101 (1); Chemistry 112 (2) and permission of instructor. 2 class hours, 2 3-hour laboratories or field trips. Credit, 4. Mr. Andrews in cooperation with the departments of Botany, Entomology, Public Health, Geology, and Zoology,

360 (83) (I). General and Cellular Physiology.

Modern trends in physiology with emphasis on the chemical and physical properties of cells, including protoplasmic organization, cellular metabolism, permeability, bioelectric phenomena, muscle contraction, radiation biology, and cellular regulatory mechanisms. Prerequisites, one year biology and organic chemistry. 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Swenson, Mr. Moner.

366 (85) (II). Vertebrate Physiology.

Function of organs and organ systems in vertebrates. Prerequisites, Zoology 360 (83) (or Chemistry 220 (79) or 224 (94)). 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. Snedecor.

370 (84) (II). Comparative Physiology.

Physiological principles involved in adaptations of animals to their environment; emphasis in the laboratory on experimental methods used to study adaptive mechanisms. Prerequisite, Zoology 360 (83). 3 class hours, 1 3-hour laboratory period. Credit, 4. Mr. J. L. Roberts.

385 (97) (I), 387 (98) (II). Special Problems in Zoology.

Qualified students who have met departmental requirements for specialization in the field of zoology may arrange for work on a special problem in zoology. Credit 1–3 per semester. Invertebrate Zoology, Marine Biological Laboratory, Woods Hole, Massachusetts. Credit, 3. Invertebrate Embryology, Marine Biological Laboratory, Woods Hole, Massachusetts. Credit, 3.

INTERDEPARTMENTAL COURSES

Comparative Literature 291 (71) (I). The Enlightenment. (C)

Characteristic themes, ideas and attitudes in 18th Century European Literature. The course will focus on major representatives of the Age of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany. Prerequisites, proficiency in French or German. 3 class hours. Credit, 3.

Comparative Literature 293 (91) (I). Anglo-German Literary Relationships since 1750. (C)

Study of subjects and problems common to English and German literature since the middle of the eighteenth century with some attention to German-American literary relationships. By permission may be counted for major credit in English and German. 3 class hours. Credit, 3. Mr. Heller, Mr. Page.

Linguistics 393 (93) (I). Linguistics. (C)

A basic course combining comprehensive treatment of the field with special attention to recent contributions, particularly in structural linguistics, to the study of language and literature. By permission may be counted for major credit in English, German, and Romance Languages. Prerequisites, English 125, 126. 3 class hours. Credit, 3.

Social Science 260 (60) (II). Africa, South of the Saraha. (D)

An introductory study of recent political, economic, and social developments in the principal countries of Africa, south of the Sahara. By permission may be counted for major credit in government and sociology. Prerequisites, at least two semester courses in one or more of the following fields; economics, government, sociology. 3 class hours. Credit, 3.

Social Science 269 (69) (I). India and South Asia. (D)

An introductory study of recent political, economic, and social developments in India and the countries of South and Southeast Asia. By permission may be counted for major credit in government and sociology. Prerequisites, at least two semester courses in one or more of the following fields; economics, government, sociology. 3 class hours. Credit, 3. Mr. Driver.

History of Science 360 (60) (II). Survey.

A study of the development of a few major scientific concepts. 3 class hours. Credit, 3.

Computer Science 121 (21) (I) (II). Introduction to Automatic Computation.

An introduction to the programming of digital computers. Topics included are basic programming systems, compiler languages, and the logic of programming and compilation. Prerequisite, Mathematics 113 or 123. 1 class hour. Credit, 1. Mr. Rowell.

Computer Science 351 (51) (I) (II). Digital Computer Programming and Applied Numerical Techniques.

Designed primarily for the physical science and engineering majors; includes complete coverage of FORTRAN programming and selected topics in numerical methods. Prerequisite, intermediate algebra; a knowledge of calculus is helpful but not prerequisite. 2 1-hour lectures, 1 3-hour laboratory period. Credit, 3.

ORIENTAL LANGUAGES

Elementary Chinese 1 (I), 2 (II). Modern Chinese.

For those with no previous training in Chinese language. Grammar, reading and writing characters, practice in reading, composition and oral use of the language. 3 class hours. Credit, 3. Miss Kopetsky.

Chinese 107 (7) (I) and 108 (8) (II). Intermediate Chinese.

Continuation through the second year of the study of the Chinese language. Prerequisite, Chinese 102. 3 class hours, 1 laboratory hour. Credit, 3. Miss Kopetsky.

Chinese 311 (51) (I) and 312 (52) (II). Classical Chinese.

Classical language and literature; selections from the early philosophers, historians and poets. Prerequisite, Chinese 108 (may be a co-requisite for seniors). 3 class hours. Credit, 3. Miss Kopetsky.

Chinese 333 (65) (I). Traditional Literature in Translation.

Selections from each of the four classes: classics, philosophy, history, and belles-lettres, as works of art and as sophisticated thought. Prerequisite, permission of instructor. 3 class hours. Credit, 3. Miss Kopetsky.

Chinese 334 (66) (II). Popular Literature in Translation.

Selections, since A.D. 650, as works of art and as illustrations of social conditions at important stages of Chinese history. Prerequisite, permission of instructor. 3 class hours. Credit, 3.

Elementary Hindi 1 (I), 2 (II).

For those who have had no previous training in Hindi. Intensive practice in the language skills. 3 class hours. Credit, 3.

Elementary Japanese 1 (I), 2 (II).

For those who have had no previous training in Japanese. Intensive practice in the language skills. 3 class hours. Credit, 3.

Japanese 107 (I) and 108 (II). Intermediate Japanese.

Continued study of the Japanese language. 3 class hours, 1 laboratory period. Credit, 3.

SCHOOL OF BUSINESS ADMINISTRATION

H. B. KIRSHEN, *Dean*

The Faculty of the School of Business Administration is keenly aware of the dynamic changes taking place in our economy, the extensive shifts in occupations and professions and the consequent need for intelligent and well educated businessmen. The continuing advancement of technology, science and the behavioral sciences has placed upon Schools of Business Administration the necessity, not only to probe into the developments of its own areas of education but also into the relationships that exist among other areas such as Mathematics, Economics, Psychology, Sociology and Government.

The School of Business Administration prepares students to take advantage of important economic opportunities and eventually to assume positions of responsibility in business. The School's educational program is directed toward the broad aspects of business, encouraging high standards of ethical conduct, broad social responsibilities and the development of competence in particular courses of study of the student's own interest, aptitude and choice.

The first two years emphasize general education by providing fundamental courses in the humanities, mathematics, science and social science. In addition, basic courses in accounting and economics prepare the student for further work in the School of Business Administration. The junior and senior years emphasize a greater degree of specialization and provide for this in the programs indicated below. But even in these last two years all students need to view business as a whole in so far as a "core" of courses can do this. This "core" of courses is listed below under the junior-senior curricula and is required of all students. Elective courses, whether in the freshman-sophomore years or in the junior-senior years require the consent of a student's faculty adviser. A total of at least 120 credit hours (122 for Accounting majors) is required for graduation exclusive of credit received in the required physical education courses. Each course of study leads to a degree of Bachelor of Business Administration.

The passing of a comprehensive examination is a requirement for a degree for majors in the department of accounting. Comprehensive examinations may also be required by other departments of the School. Beginning with the class of 1964 all students in the School of Business Administration must attain, as a graduation requirement, a 2.0 average in Accounting 125 (25) and 126 (26), Elementary Economic Statistics 121 (21), and the junior "core" courses: Finance 210 (55), Financial Institutions; Finance 201 (65), Corporation Finance; General Business

260 (71), Business Law I; Management 201 (61), Principles of Management; and Marketing 253 (53), Fundamentals of Marketing. The "core" must be completed by the end of the junior year unless a student, on recommendation of his department chairman, has received permission from the Dean to postpone any such course to the senior year.

Students transferring to the School of Business Administration from any School or College within the University shall receive junior and senior elective credit only for those courses passed with a grade of C or better.

The School of Business Administration is a member of the American Association of Collegiate Schools of Business.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111	2	English 112	2
Speech 101*	2	Speech 101	2
Mathematics 111	3	Mathematics 112	3
History # and/or Government#	3	History# and/or Government#	3
Science***	3	Science***	3
Elective†	3	Elective†	3
(Military or Air Science 111	1)	(Military or Air Science 112	1)
Physical Ed. 001a, 001b**	2	Physical Ed. 002a, 002b**	2

*May be taken either semester.
**Not quality point credit.
***6 Credits: Any sequence or combination of botany, entomology, microbiology, zoology, chemistry, physics, geology, or astronomy.
#Any combination of 6 credits of History 100, 101, 150, 151; Government 100, 150.
†A student may elect 6 hours of a language but he will not receive credit in any elementary language in which he completed two years in high school.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125 Humane Letters	3	English 126, Humane Letters	3
Economics 125, Elements	3	Economics 126, Probl. of Nat'l. Economy	3
Accounting 125, Introduction I	3	Accounting 126, Introduction II	3
Psychology 101 General	3	Sociology 101, Introduction to	3
Statistics 121*	3	Mathematics 113*	3
(Military 125 or Air Science 121	1)	(Military 126 or Air Science 122	1)
Physical Ed. 031a, 031b†	2	Physical Ed. 032a, 032b†	2

*Statistics or Mathematics may be taken either semester.
†Not quality point credit.
Note: A qualified student, with the consent of his advisor, may arrange a schedule so that he may register for one junior "core" course in the second semester of the sophomore year: Finance 210, Finance 201, General Business 260, Management 201, or Marketing 253. The course postponed, but taken later, must be outside the School of Business Administration.

JUNIOR-SENIOR CURRICULA

Courses and major programs are listed under four departments in the School of Business Administration: Accounting, General Business and Finance, Management, and Marketing. Irrespective of any major selected a certain "core" of courses is required of all students.

Required Core Courses	*Credits*
Finance 210 (55), Financial Institutions	3
Finance 201 (65), Corporation Finance	3
General Business 260 (71), Business Law I	3
Management 201 (61), Principles of Management	3
Marketing 253 (53), Fundamentals of Marketing	3

Elective courses shown in major programs are selected with the aid and consent of the student's adviser.

ACCOUNTING

Chairman of Department: Professor John W. Anderson, Professor Singer; Associate Professors Dennler, Lentilhon, Mulling; Assistant Professors Fitzgerald, Krzystofik; Instructors Daglio, Pion.

The accounting program is designed to prepare students for public accounting and for positions as accountants in business, industry and government.

	Credits
Required "core" courses	15
Required courses in the major:	20
Accounting 261, Intermediate Accounting	
Accounting 262, Intermediate Accounting	
Accounting 263, Cost Accounting	
Accounting 265, Advanced Accounting	
Accounting 273, Federal Income tax Procedures	
General Business 261, Business Law 11 or General Business 262, Business Law 111	
One elective course in Accounting	3
Four elective courses	12
Four elective courses outside Business Administration	12

125 (25) (I) and (II). Introduction to Accounting I.

An introduction to the principles underlying the collection, recording, and interpretation of accounting data. 3 class hours. Credit, 3. Staff.

126 (26) (I) and (II). Introduction to Accounting II.

A continuation of Accounting 125 (25) with major emphasis on accounting for corporations, partnerships and manufacturers. Prerequisite, Accounting 125 (25). 3 class hours. Credit, 3. Staff.

127 (27) (I). Introduction To Accounting.

A one semester course to combine the coverage of Accounting 125 (25) and 126 (26). 5 class hours. Credit, 5. (Not offered, 1965–66.) Staff.

261 (61) (I) (II), 262 (62) (I) (II). Intermediate Accounting.

An intensive examination of the fundamental concepts underlying financial reporting. Theoretical bases for practices and procedures in asset accounting and income measurement are studied. Emphasis is placed upon use of information as reported in financial statements. A terminal course for non-accounting majors and a foundation for the accounting major. Prerequisite, Accounting 126 (26). 4 class hours. Credit, 4. Mr. Fitzgerald, Mr. Daglio, Mr. Pion.

263 (63) (I) and (II). Cost Accounting.

Methods of cost determination for job order, process, and standard cost systems, with emphasis on cost control and interpretation. Prerequisite, Accounting 126 (26). 3 class hours. Credit, 3. Mr. Krzystofik, Mr. Dennler.

264 (64) (II). Advanced Cost Accounting.

A continuation of Accounting 263 (63) with emphasis on budgetary control; direct costs; and cost analyses for control and decision-making. Prerequisite, Accounting 263 (63). 3 class hours. Credit, 3. Mr. Krzystofik, Mr. Dennler.

265 (65) (I). Advanced Accounting.

A course designed to give the accounting major a thorough grounding in partnership accounting, installment sales, consignment sales and preparation of consolidated financial statements. Prerequisite, Accounting 262 (62). 3 class hours. Credit, 3. Mr. Fitzgerald, Mr. Daglio, Mr. Pion.

267 (67). Governmental Accounting.

Special features of budgetary and fund accounting as applied to municipalities, other governmental units and institutions, such as hospitals and schools. Prerequisite, Accounting 125 (25). Credit, 3. Mr. Anderson.

272 (72) (I). Administrative Costing and Control.

A case study approach to the significance of quantitative data for decision making. Prerequisite, Accounting 126 (26) or 127 (27). 3 class hours. Credit, 3. Mr. Singer. (not open to students majoring in Accounting).

273 (73) (I) and (II). Federal Income Tax Procedure.

A study of federal income tax laws and regulations as they affect individuals; the preparation of tax returns. Prerequisite, Accounting 125 (25) or 127 (27). 3 class hours. Credit, 3. Mr. Anderson, Mr. Lentilhon.

274 (74) (II). C.P.A. Problems.

Extensive practice in solution of problems from C.P.A. examinations. Topics covered include governmental and institutional accounting, estates, trusts, receiverships, liquidations and consolidations. Prerequisite, Accounting 265 (65). 3 class hours. Credit, 3. Mr. Lentilhon.

277 (77). Auditing and Internal Control.

Basic principles of auditing with emphasis on theory, types of audits, duties and responsibilities of the auditor, audit programs and methods of internal control. A complete audit is developed through the use of an audit case. Prerequisites, Accounting 262 (62) and 263 (63). 3 class hours. Credit, 3. Mr. Krzystofik.

278 (78) (II). Advanced Federal Tax Procedures.

A continuation of Accounting 273 (73) emphasizing corporations, partnerships, estates and trusts, gifts and estate taxes, tax planning and research. Prerequisite, Accounting 273 (73). 3 class hours. Credit, 3. Mr. Anderson.

297 (97) (I) 298 (98) (II). Independent Study and Research.

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1–3. Staff.

GENERAL BUSINESS AND FINANCE

Chairman of Department: Professor James B. Ludtke; Professors Cheng, Kyler; Associate Professors Rivers, Allan; Assistant Professors Burak, Hartzler, Tessier, Theilman.

The Department offers four programs of study and specially designed programs for those students who wish to combine business administration with one or more related fields of study. The program in General Business, emphasizing breadth of knowledge and viewpoint, is designed for those students who are uncertain as to their specific career objectives. The program in Financial Management is designed for those students who wish to prepare for careers in the area of planning and controlling the financial operations of business firms and governmental units. The two other formal programs reflect the large number of requests for programs relating to economics and urban planning. The program in Business Administration and Economics combines these two areas into an integrated program of study. The program in Urban and Regional Studies combines courses from many disciplines, including economics, sociology, government, civil engineering, landscape architecture, and agricultural economics. The specific content of the special program option is mutually determined by the Department Chairman and the interested student at the beginning of the junior year.

Curriculum in Finance	*Credits*
Required "core" courses	15
Other required courses: Finance 230, Principles of Insurance, or Finance 231, Life Insurance Finance 202 and 203, Problems in Business Finance I and II Finance 220, Investments Accounting 272, Administrative Cost and Control Economics 301, Decision Theory	18
Electives in area of concentration, with a minimum of 9 credit hours in Business Administration and Economics	15
Electives outside of Business Administration and Economics	12

Curriculum in General Business

Required "core" courses	15
Other required courses: General Business 261 or 262, Business Law General Business 265, Business and its Environment Finance 202, Problems in Business Finance I, or Finance 203, Problems in Business Finance II, or Management 371, Problems in Management, or Marketing 280, Problems in Marketing, or General Business 250, Administrative Statistics	9
Electives in Business Administration	9
Electives in Economics	6
Electives outside Business Administration and Economics with a minimum of 9 credit hours in Government, Sociology, and/or Psychology	21

Curriculum in Business Administration and Economics

Required "core" courses	15
Other required courses: Economics 301, Decision Theory Economics 214, Business Fluctuations and Forecasting Economics 391, Intermediate Theory	9
Electives in Business Administration and Economics, with a minimum of 12 credit hours in Economics	24
Electives outside of Business Administration and Economics	12

Curriculum in Business Administration with an area of concentration in Urban and Regional Studies

Required "core" courses	15
Other Required courses: General Business 240, Principles of Transportation General Business 270, Real Estate	6
Electives in Business Administration and Economics	15
Electives in Government, Sociology, Agricultural Economics, Civil Engineering, Landscape Architecture	15
Electives outside Business Administration, Economics, and an area of concentration	9

FINANCE

201 (65) (I) and (II). Corporation Finance.

Corporate financial behavior: Appraisal of factors affecting decision-making regarding the sources and application of funds. Introduction to the capital budgeting and cost of capital problem. Prerequisite, Accounting 125 or consent of instructor. 3 class hours. Credit, 3. Staff.

202 (81) (I). Problems in Business Finance I.

Short and intermediate-term financing; decision-making under uncertainty regarding needs and sources of funds. Prerequisite, Finance 201. 3 class hours. Credit, 3. Mr. Tessier.

203 (82) (II). Problems in Business Finance II.

Long term financing, capital budgeting, reserves and dividend policy, pensions, company expansion, merger and consolidation, reorganization. Prerequisite, Finance 201. 3 class hours. Credit, 3. Mr. Tessier.

210 (55) (I) and (II). Financial Institutions.

The American financial system and the functional relationships between financial institutions and the economic activities of households, business firms and governmental units. Prerequisites, Economics 125 and Accounting 125 or consent of Instructor. 3 class hours. Credit, 3. Staff.

220 (83) (I). Investments.

The development of a general theory of investment management and its application to individual and institutional investors including Computer Portfolio Management. Prerequisites, Finance 201, and Finance 210 or consent of instructor. 3 class hours. Credit, 3. Mr. Ludtke.

221 (84) (II). Security Analysis.

Examination of factors affecting investment values of securities and the methods used in their analysis. Prerequisite, Finance 220 or consent of instructor. 3 class hours. Credit, 3. Mr. Tessier.

230 (75) (I). Principles of Insurance.

Risks encountered by individuals and business firms and the methods and institutions which have been established to insure against financial losses. The various forms of insurance are studied primarily from the buyers' point of view. 3 class hours. Credit, 3. Mr. Kyler.

231 (76) (II). Life Insurance.

The application of life insurance to the problems of family security, business security, investments, and estate protection. 3 class hours. Credit, 3. Mr. Kyler.

GENERAL BUSINESS

240 (65) (I). Principles of Transportation.

The development and growth of transportation as a function of production and distribution of goods; rate structures and transportation laws as they affect the relationships between carriers and shippers. 3 class hours. Credit, 3. Mr. Rivers.

241 (66) (II). Traffic Management.

A case and problem approach to the regulation, management, and traffic functions in transportation. Three field trips required. Prerequisites, Gen. Bus. 240 and consent of instructor. 3 class hours. Credit, 3. Mr. Rivers.

242 (67) (I). Public Utilities.

The nature, organization and administration of regulated industries; aspects of Public regulation at Federal, State and Local levels as they affect service operations. 3 class hours. Credit, 3. Mr. Rivers.

250 (78) (II). Administrative Statistics.

Probability and statistical distributions applied to business management problems. Application of Bayes' theorem to sampling for business decision-making under uncertainty. 3 class hours. Credit, 3. Mr. Cheng.

260 (71) (I) and (II). Business Law I.

The nature of law and the judicial process: Fundamental laws of contracts and sales —their economic functions and consequences. 3 class hours. Credit, 3. Mr. Allan, Mr. Burak, Mr. Hartzler.

261 (72) (II). Business Law II.

The fundamental laws of property and negotiable instruments—their economic functions and consequences. Prerequisite, Gen. Bus. 260. 3 class hours. Credit, 3. Mr. Hartzler, Mr. Allan.

262 (73) (I). Business Law III.

The fundamental laws of agency, partnerships and corporations—their economic functions and consequences. Prerequisite, Gen. Bus. 260. 3 class hours. Credit, 3. Mr. Hartzler, Mr. Allan.

GENERAL BUSINESS

265 (I) and (II). Business and Its Environment.

A study of the theories and doctrines relating the firm to its environment. Aggregate social, political, and economic factors are integrated in a rigorous examination of the competing concepts of the role of business in society. Prerequisite, Senior Class standing or permission of the instructor. 3 class hours. Credit, 3. Also listed as Management 330.

270 (68) (II). Real Estate.

A comprehensive survey of real estate principles and practices; the mechanics of the real estate market and the economic and legal factors that influence it. 3 class hours. Credit, 3. Mr. Burak.

385 (97) (98) (I) and (II). Independent Study and Research.

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1–3. Staff.

MANAGEMENT

Chairman of Department: Associate Professor Sidney J. Claunch. Professor O'Donnell; Associate Professors Chen, Conlon; Assistant Professors Elkins, T. F. Johnson, Michael.

Industry and business offer qualified students an opportunity to find careers in General Management, Production Management, and in Personnel Management and Industrial Relations. Curricula are offered in each of these fields and provide the student both a specialized and a comprehensive understanding of the managerial process in business enterprises and other formal organizations.

	Credits
Required School of Business Administration "core"	15
Required Management "core"	12
Management 214, Personnel Management	
Management 231, Administrative Theory	
Management 247, Production Management I	
Management 371, Problems of Management	
Seven elective courses from recommended lists to include typically, but not necessarily, the following courses:	21

Curriculum in General Management

Management 330, Business and Its Environment
Management 341, Management Decision Simulation
Management 342, Integrated Planning and Control Systems
Management 391, Seminar in Administration

Curriculum in Production Management

Management 248, Production Management II
Management 341, Management Decision Simulation
Management 342, Integrated Planning and Control Systems
Management 393, Seminar in Production

Curriculum in Personnel Management and Industrial Relations

Management 234, Wage and Salary Administration
Management 344, Management-Union Relations I
Management 345, Management-Union Relations II
Management 392, Seminar in Personnel Management

Four elective courses from outside Business Administration 12

201 (61) (I) and (II). Principles of Management.

The basic course dealing with the fundamental principles and practices of the managerial process in business enterprises. 3 class hours. Credit, 3. Staff.

214 (64) (I) and (II). Personnel Management.

The principles and policies followed by management in the recruitment, development, direction, and control of personnel. 3 class hours. Credit, 3. Mr. Elkins, Mr. Johnson.

231 (81) (II). Administrative Theory.

Principles of administration, modern organization theories, specialization, functionalization, coordination, planning, and control; authority, status, leadership, decision making, communication, and power-structuring. Prerequisite, Management 201. 3 class hours. Credit, 3. Mr. Elkins, Mr. O'Donnell.

234 (69) (II). Wage and Salary Administration.

A study of the objectives, procedures, and problems involved in the establishment and administration of operative and executive compensation plans. Prerequisite, Management 214. 3 class hours. Credit, 3. Mr. Johnson.

247 (85) (II). Production Management I.

The basic principles of production management. The use of statistical, mathematical, and simulation methods in the production, or operations, aspect of an organization's activities. Prerequisite, Management 201. 3 class hours. Credit, 3. Mr. Chen, Mr. Claunch.

248 (86) (I). Production Management II.

The application of principles and analytical techniques to the design and operation of production systems. Quality control, inventory and production control. Prerequisite, Management 247. 3 class hours. Credit, 3. Mr. Chen, Mr. Claunch.

330 (87) (I) ond (II). Business and Its Environment.

A study of the theories and doctrines relating the firm to its environment. Aggregate social, political, and economic factors are integrated in a rigorous examination of the competing concepts of the role of business in society. Prerequisite, Senior Class standing or permission of the instructor. 3 class hours. Credit, 3. Mr. Elkins. (Also listed as General Business 265)

341 (89) (I). Management Decision Simulation.

A course involving participation in the management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market position. Prerequisite, Senior Class standing and permission of instructor. 2 class hours. Credit, 2. Mr. Chen, Mr. Claunch.

342 (71) (II). Integrated Planning and Control Systems.

A study of systems coordinating sales, production, finance and other business functions and producing the information required for the adjustment and reformulation of plans over time. Both single-use and continuous-use plans are considered. Special attention is given to the design of the organization structure and to the development of control criteria. Prerequisite, Senior Class standing. 3 class hours. Credit, 3. Mr. Chen.

344 (67) (I). Management-Union Relations I.

A comparison of union-management objectives, functions, and structures, including the scope and impact of union penetration into areas of managerial authority. Prerequisite, Management 201 or 214. 3 class hours. Credit, 3. Mr. Conlon.

345 (68) (II). Management-Union Relations II.

The problems involved in the interpretation and administration of collective bargaining agreements are studied by use of the case method of analysis. Prerequisite, Management 344 or consent of instructor. 3 class hours. Credit, 3. Mr. Conlon.

371 (92) (II). Problems of Management.

An integrating course dealing with problems of management that embrace all of the organic management functions. Cases are used as subjects for analysis and systematic decision-making practice. Prerequisites, Management 201 and Senior Class standing. 3 class hours. Credit, 3. Mr. Elkins, Mr. O'Donnell.

385 (97) (I), 386 (98) (II). Independent Study and Research.

For qualified seniors. Independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1–3. Staff.

391 (95) (I). Seminar in Administration.

Advanced study and individual research in the theory and practice of administrative organization and behavior. Prerequisite, Senior Class standing and permission of the instructor. 3 class hours. Credit, 3. Mr. O'Donnell.

392 (94) (II). Seminar in Personnel Management.

Advanced study of current problems in the development and administration of personnel programs. Research methodology and recent research findings are emphasized. Each student is required to complete a major research project. Prerequisite, Senior Class standing and permission of the instructor. 3 class hours. Credit, 3. Mr. Elkins.

393 (96) (II). Seminar in Production Management.

Study of specialized topics and advanced techniques in the field of production management. Prerequisite, Management 247. 3 class hours. Credit, 3. Mr. Chen, Mr. Claunch.

MARKETING

Chairman of Department: Professor Harold E. Hardy, Assistant Professors Drew-Bear, Johnson, Shapiro, Zane; Instructor Dodds.

Students are prepared for a variety of positions in wholesale and retail enterprises and in the marketing activities of manufacturers. The program includes specialized study of basic types of market operations such as advertising, sales management and marketing research.

Curriculum in Marketing	*Credits*
Required "core" courses	15
Required courses in the major:	15
Marketing 254, Salesmanship and Sales Management	
Marketing 262, Marketing Research	
Marketing 271, Retailing Principles	
Marketing 273, Advertising	
Marketing 280, Problems in Marketing	
Three elective courses from a recommended list	9
Two elective courses	6
Five elective courses outside Business Administration	15
Curriculum in Retailing	
Required "core" courses	15
Required courses in the major:	15
Marketing 254, Salesmanship and Sales Management	
Marketing 262, Marketing Research	
Marketing 271, Retailing Principles	
Marketing 273, Advertising	
Marketing 286, Problems in Retailing	
Three elective courses from a recommended list	9
Three elective courses	9
Four elective courses outside Business Administration	12

253 (53) (I) and (II). Fundamentals of Marketing.

The role of marketing in our economic and social structure. The planning, distribution, pricing and promotion of goods, and services to consumer and industrial markets. 3 class hours. Credit, 3. Staff.

254 (54) (I) and (II). Salesmanship and Sales Management.

The principles and practices of selling; the management of sales personnel and the control of sales operations. 3 class hours. Credit, 3. Mr. Johnson, Mr. Dodds.

262 (62) (II). Marketing Research.

The aims, sources and fact-gathering methods of marketing research activities. Individual case study and research projects. 3 class hours. Credit, 3. Mr. Shapiro.

271 (71) (I). Retailing Principles.

Basic concepts of retailing with case studies of retail management problems. 3 class hours. Credit, 3. Mr. Drew-Bear.

273 (73) (I). Advertising.

The techniques and media of advertising, its services to business and the organization and economic functions of the advertising industry. 3 class hours. Credit, 3. Mr. Hardy.

274 (74) (II). New England Markets.

Individual and group study of New England Markets and the marketing problems of New England industrial enterprises. 3 class hours. Credit, 3. Mr. Zane.

275 (75) (II). Credits and Collections.

The principles and practices of mercantile and retail credit management including the sources and analysis of credit information, collections procedures and control and the rights of creditors. 3 class hours. Credit, 3. Mr. Johnson, Mr. Shapiro.

276 (76) (II). Purchasing.

The purchasing organization and practices of industrial enterprises. 3 class hours. Credit, 3. Mr. Zane.

279 (79) (I). Wholesaling.

A study of wholesale marketing with emphasis on the marketing activities of manufacturers and wholesale middlemen in the industrial goods area. 3 class hours. Prerequisite, Marketing 253 (53) or equivalent. Credit, 3. Mr. Zane.

280 (80) (II). Problems in Marketing.

The interrelations between research planning and the execution of sales programs with case studies showing the effects of various marketing policies upon individual firms. Prerequisite, Marketing 253 (53). 3 class hours. Credit, 3. Mr. Hardy, Mr. Zane.

284 (84) (II). Problems in Advertising.

Application of basic marketing knowledge in planning and analyzing advertising campaigns, research appropriations, the determination of the advertising budget and the choice of media and the subsequent measurement of effectiveness. Prerequisite, Marketing 253 (53), 273 (73) or consent of instructor. 3 class hours. Credit, 3. Mr. Hardy.

286 (86) (II). Problems in Retailing.

Case analysis and decision covering pricing; merchandise management; buying and selling policies; store systems; personnel; accounting control; plant operation. Prerequisites, Marketing 253 (53), 271 (71). 3 class hours. Credit, 3. Mr. Drew-Bear.

297 (97) (I), 298 (98) (II). Independent Study and Research.

For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the Chairman of the Department. Credit, 1–3. Staff.

SCHOOL OF EDUCATION

A. W. PURVIS, *Dean*
R. R. PIPPERT, *Assistant Dean*

The School of Education through its undergraduate program seeks to utilize the forces of the University to prepare for elementary and secondary schools and through its graduate offering to prepare administrators and specialists in public education. Its program is based upon the assumption that teachers and other school personnel should have a broad liberal education, considerable mastery of at least one field, and professional courses which should lead to a knowledge of the persons to be taught, familiarity with the problems to be met, and practice in the best techniques of teaching and supervision. In all of this the School of Education takes the position that teacher education is a University function and that success will come only if the School is successful in maintaining the closest possible relationships with other schools and departments that contribute to the program.

All students who contemplate teaching as a career should register early, in their freshman year if possible, with the School of Education although their courses in education do not begin until the junior year. In general, students are admitted without question to the various service courses of the junior and senior years, but admission to the teacher-training program of the concentrated semester block is determined by a composite rating based on scholarship as shown by University grades (a three-year average at least as high as the University median is desired), success in the beginning courses in education, recommendations from University teachers in general education fields, and personality ratings by members of the staff.

Elementary School Teaching

Candidates for this program major in elementary education. (In some few cases such as those in which the student wishes to work in elementary schools in speech therapy or to teach a foreign language in elementary schools, the student may major in speech or the foreign language if he (1) first obtains the approval of the Dean of the School of Education and (2) if he is able to satisfy the special requirements of the School of Education in terms of general education and professional courses). All students who wish to teach in elementary schools should take Education 109 (9), 139 (39) and 259 (59). The core program including Education 251 (51) and 264 (64), Psychology 261 (65) or Home Economics HD270 (70), and the Elementary Education Block, Education 260 (60), 261 (61), 262 (62) and 385 (85), should be taken in the junior and senior years.

The Program:

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111	2	English 112	2
Speech 101*	2	Speech*	2
Math. 111 or 123 or Chem. 111	3	Math. 112 or 124 or Chem. 112	3
Zool. 101 or Bot. 100	3	Bot. 100 or Zool. 101	3
Foreign Lang.**	3	Foreign Lang.**	3
History 100	3	History 101	3
Education 109† (Military or Air Science 111 (men)	1)	Education 109† (Military or Air Science 112 (men)	1)
Physical Ed. 001a, 001b††	2	Physical Ed. 002a, 002b††	2

*May be taken either semester
**Intermediate Proficiency Required
†To be completed in either semester
††Not quality point credit

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125	3	English 126	3
Psychology 101	3	Sociology 101 or Econ. 125	3
Science*	3 or 4	Zool. 200	4
Government 100	3	Music 101 or Art 115	3
History 150	3	History 151	3
Education 139† (Military or Air Science (men)	1)	Education 139† (Military or Air Science (men)	1)
Physical Ed. 031a, 031b††	2	Physical Ed. 0132a, 032b††	2

*To be chosen from sophomore courses in the College of Arts and Sciences
†To be completed in either semester
††Not quality point credit

JUNIOR AND SENIOR YEARS

During the junior year the student takes Education 251 (51), 259 (59), 264 (64), Psychology 261 (65) or Home Economics HD270 (HD70). Music 231 (85) and Geography 135 (35) are required. One semester of senior year is devoted to the concentrated Elementary Education Block (Ed. 260 (60), 261 (61), 262 (62), 385 (85)). The student must utilize his junior and senior electives to take at least 30 credits in the College of Arts and Sciences, of which at least 15 credits should be concentrated in a minor.

Secondary School Teaching

All candidates for secondary school teaching will major in the subject field to be taught and minor in education. A maximum of eighteen hours should be taken in this minor. Education 251 (51) and Psychology 301 (56) are required during the junior year and Education 310 (52), 311 (88), 385 (85) (called the secondary block) in one semester of the senior year. Since the concentrated semester block in secondary school teacher training carries only twelve credits students should consult with their

major adviser regarding means of making up the extra three credits, and of meeting all their major requirements in three semesters of the junior and senior years. Carrying an extra course during the secondary block semester is not permitted.

Special Field Programs for Prospective Teachers

In Vocational Agriculture (Mr. Judge, adviser). This program is based on a cooperative agreement between the University and the Vocational Division of the State Department of Education which provides supervisors and consultants in conducting the program. Students otherwise qualified may prepare to teach vocational agriculture by the satisfactory completion of Education 372 (72), 373 (73), and 375 (75). Education 310 (52) is also recommended. To insure a desirable range of preparation, students who contemplate vocational teaching should consult Professor Judge early in the freshman year if possible. A vocational teacher-training certificate is awarded by the Vocational Division to those who fully qualify.

In Home Economics (Mrs. Sullivan, adviser). These students will major in home economics and minor in education. They should elect Education 251 (51), Psychology 301 (56), Home Economics Education HEED 382 (82) and the concentrated semester block (Education 310 (52), 385 (85)).

In Teacher Coaching (S. W. Kauffman, adviser). These students will major in physical education and minor in education. They should elect Psychology 301 (56) and the concentrated semester block (Education 310 (52), 311 (88), 385 (85)). They should elect a minor teaching field from the College of Arts and Sciences consisting of a minimum of eighteen hours.

In Music (R. DuBois, adviser). These students will major in music and minor in education. They should elect Education 251 (51), Psychology 301 (56), Music 321 (87), and the concentrated semester block (Education 310 (52), 385 (85)).

EDUCATION

Dean: Professor Albert W. Purvis, Professors Anthony, C. V. Jones, Wyman; Assistant Dean: Associate Professor Ralph R. Pippert and Associate Professors Kornegay, O'Leary; Assistant Professors Angus, Benz, Byrne, Clegg, Eddy, Fiorino, Fredrickson, Griffiths, Hall, Hillman, Hulsen, R. C. Jones, Judge, McManamy, Ratcliffe, Rosemier, Thelen, Warner, Wellman, Zimmer; Messrs. Cebula, King, Sleeman.

109 (9) (I) (II). Directed Observation.

Twelve hours in the Laboratory School in the freshman year. Prerequisite to the Elementary Education Block. Credit, 0.

139 (39) (I) (II). Directed Observation.

Fifteen hours in the Laboratory School in the sophomore year. Prerequisite to the Elementary Education Block. Credit, 0.

251 (51) (I) (II). History of Education.

Educational movements are traced from early Greece to the present with the aim of better understanding of modern problems. 3 class hours. Credit, 3. Mr. Angus, Mr. Eddy, Mr. Wellman.

253 (53) (I) (II). Educational Tests and Measurements.

The most serviceable tests for measuring achievement are considered; test construction, administration, scoring, and interpretation of results are studied and applied to the classroom. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Rosemier.

259 (59) (I) (II). Directed Observation.

Twenty hours in the Laboratory School in the junior year. Prerequisite to the Elementary Education Block. Concurrent registration with Education 264 (64). Credit, 0.

260 (60) (I) (II). Elementary School Curriculum.

The elementary school curriculum from the standpoint of content and methodology. Emphasis placed on the unit method and the activity programs. Prerequisites: Education 251 (51), and 264 (64) and Psychology 301 (56) or Home Economics HD270 (70). 3 class hours. Credit, 3. Mr. Clegg.

261 (61) (I) (II). Teaching of Elementary Reading and Language Arts.

Discussions and demonstrations of principles and effective practices in the teaching of all phases of the language arts. Prerequisites: Education 251 (51), and 264 (64) and Psychology 301 (56) or Home Economics HD270 (70). 3 class hours. Credit, 3. Miss O'Leary, Mr. Benz, Mr. Byrne.

262 (62) (I) (II). Teaching of Elementary Arithmetic and Science.

Accepted methods and materials in the teaching of arithmetic and science in the elementary grades will be studied and demonstrated. Prerequisites: Education 251 (51), and 264 (64) and Psychology 301 (56) or Home Economics HD270 (70). 3 class hours. Credit, 3. Mr. Hall, Mr. King.

264 (64) (I) (II). Principles of Elementary Education.

The aim, organization, program, and pupil population of the elementary school and the relationship between elementary and secondary school are the areas of concentration. 3 class hours. Credit, 3. Miss McManamy.

277 (77) (I) (II). Principles of School Guidance

The need for guidance in the schools, the nature of guidance, and an overview of an adequate guidance service for a school system. 3 class hours. Credit, 3. Mr. Fredrickson.

310 (52) (I) (II). Principles and Methods of Teaching.

By means of discussion, case studies, and current educational literature, teaching ideals and procedures are set up and applied to the major teaching fields. Prerequisites: Education 251 (51) and Psychology 301 (56). 3 class hours. Credit, 3. Mr. Anthony, Mr. Thelen, Mr. Warner, Mr. Hillman.

311 (88) (I) (II). Secondary School Curriculum

Learning materials and activities and their organization in various teaching fields. 2 class hours, 1 2-hour laboratory period. Prerequisites: Education 251 (51) and psychology 301 (56). Credit, 3. Mr. Hillman, Mr. Kornegay, Mr. Thelen, Mr. Warner, Mr. Ratcliffe.

366 (66) (I) (II). Preparation and use of Audio-Visual Materials.

Study is made of available machines, materials, and techniques for teaching groups of students. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wyman, Mr. Hulsen.

372 (72) (I). Vocational Education in Agriculture.

A survey of vocational agricultural education and an introduction to teaching of vocational agriculture at the secondary level. Admission by permission of instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Judge.

373 (73) (I) (II). Apprentice Teaching in Agriculture.

A full year in absentia normally following the junior year, teaching agriculture, horticulture, and related subjects under a supervising teacher in selected schools. Prerequisites: Education 372 (72) and 375 (75). Credit, 6. Mr. Judge.

375 (75) (II). Technique of Teaching Vocational Agriculture

The materials, methods, policies, and special requirements of Massachusetts for teaching vocational agriculture and related subjects in high schools and in special county agricultural schools. Prerequisite: Education 372 (72), or permission of the instructor. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Judge.

385 (85) (I) (II). Observation and Student Teaching

In cooperating schools under staff supervision. Given only in the elementary and secondary concentrated blocks. Prerequisites: for secondary block, Education 251 (51) and Psychology 301 (56); for elementary block, Education 109 (9), 139 (39), 251 (51), 259 (59), 264 (64), Psychology 261 (65) or Home Economics HD270 (HD 70). Credit, 6. Mr. Jones and Staff.

SCHOOL OF ENGINEERING

E. E. LINDSEY, *Acting Dean*

The departments of Chemical Engineering, Civil Engineering, Mechanical Engineering and Electrical Engineering comprise the School of Engineering. Each department offers a curriculum leading to a Bachelor of Science degree in that particular branch. A Bachelor of Science curriculum in Industrial Engineering is offered in the Mechanical Engineering department. All curricula are accredited by the Engineers Council for Professional Development.

Engineering can be defined as the combination of science and art by which materials and power are made useful to mankind. An engineer requires intensive technical training but at the same time he should acquire the broad education that distinguishes the professional man from the technician. His education does not end with formal schooling but continues throughout his life as he accumulates experience.

The curricula in engineering have been carefully prepared to offer each student the opportunity to acquire the sound training in mathematics and the basic sciences of chemistry and physics upon which is built the work in the engineering sciences. In the senior year courses are offered which enable the student to use his previous training for engineering analysis, design and engineering systems in his particular field of interest. About twenty per cent of his time is devoted to studies in the social science and humanistic area. Some opportunity is provided to elect courses from both the technical and humanistic-social fields. The curriculum of the freshman year is the same for all. Specialization to a limited extent begins in the sophomore year.

BASIC ENGINEERING

The program in Basic Engineering is administered by the Dean. All new students in Engineering are enrolled in it until qualified to enter into a program in a degree-granting department. This is normally at the conclusion of the uniform freshman year program with satisfactory grades.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111, Composition	2	English 112, Composition	2
Speech 101	2	Physics 105, General	3
Math. 135, Introd. Engr. Mathematics	3	Math. 136, Introd. Calculus for Engineers	3
Chem. 111 or 113*	3 or 4	Chem. 112 or 114*	3 or 4
Engineering 103, Graphics	3	Engineering 104, Problems	3
Social Science Elective#	3	Soc. Sci. or Humanity Elective	3#
(Military or Air Science 111	1)	(Military or Air Science 112	1)
Physical Ed. 001a, b†	2	Physical Ed. 002a, b†	2

*It is recommended that chemical engineering majors take Chemistry 113 and 114.
†Not quality point credit.
#Social science electives are those to be chosen from Group D of the general Graduation Requirements of the Catalog (page). Humanities electives are to be from Group C of the same. All elective requirements must be satisfied.

Faculty: Assistant Dean Edward J. Rising; Associate Professor Weidmann; Assistant Professors Bissey, Kroner; Instructors Fohlin, Umholtz, Departmental Representatives.

Engineering 103 (3). Engineering Graphics I.

Problems involving points, lines, planes and solids in space. Development of orthographic and pictoral theory. Course objectives are met by the solution of assigned problems and original student designs in both freehand and instrumental forms. Three 2-hour periods. Credit, 3.

Engineering 104 (4). Engineering Problems.

A study of computation techniques, utilizing both the slide rule and the computer focusing on problem solutions and equation analysis. The course also includes an examination of the nature of the profession and its various branches.

Engineering 105 (I) (II). Engineering Graphics II.

A second course in Graphics primarily for students in Mechanical and Industrial Engineering. Working drawings and drawing conventions. Limits and tolerances, cams and gears, fastenings and use of standard parts will be introduced. Orthographic and pictorial presentation of laboratory problems and original designs. Prerequisite: Engin. 103. 2 3-hour periods. Credit, 2.

Engineering 293 (ME. 93). Nomography.

The construction of functional scales, alignment charts and proportional charts. The use of determinants in the construction of alignment charts. Prerequisite, Mathematics 2, 6, or 29. 1 class hour, 1 3-hour laboratory period. Credit, 2.

Engineering 385 (I) (II). Special Problems.

Special problems and topics, may be repeated. Admission by permission of the instructor. Credit, 1–3.

ENGINEERING SCIENCE OPTION

Departmental Advisers

Engineering science is concerned with the application of the basic sciences to research and development in engineering. Thus the curriculum contains extensive mathematics, physics, and other courses in the basic sciences designed to develop the student's skill in precise physical reasoning, analysis and synthesis. The student may elect the option from one of the four engineering departments at the end of his sophomore year provided he has completed his freshman and sophomore years with a quality point average of 2.80 or above or has achieved a cumulative average of 3.20 for the two preceding semesters. The freshman year is the same for all students and the sophomore year corresponds to that of the major department in which a student is enrolled. Every student enrolled in the engineering science option must satisfy the following core curriculum:

Course	*Credits*
Chem. Eng. 377, Elements of Unit Operations	3
C. E. 140, Mechanics I	3
C. E. 141, Mechanics II	3
C. E. 257, Fluid Mechanics	3
E. E. 141, Circuit and Field Analysis I	4
E. E. 142, Circuit and Field Analysis II	4
M.E. 263, Engineering Thermodynamics 1	3
M.E. 287, Engineering Thermodynamics III	3
M.E. 288, Science of Engineering Materials	3
Math. 285, Adv. Mathematics for Engineers I	3
Math. 286, Adv. Mathematics for Engineers II	3
Eng. Science Seminar (four semesters)	No credit

In addition to this core curriculum a student must satisfy certain other courses as prescribed by the department in which he is enrolled. In the remainder of his courses required for graduation, exclusive of University and School of Engineering requirements, the student is allowed considerable flexibility, subject only to the approval of his departmental adviser. The degree received is the same as that offered by the department in which the student is enrolled.

CHEMICAL ENGINEERING

Head: Professor John W. Eldridge; Professor Cashin; Associate Professors Duus, Roblee; Assistant Professors McAvoy, Novak; Visiting Lecturer Chappelear.

Chemical engineering is concerned with the application of the principles of the physical sciences and mathematics, together with those of economics and human relations, to any field involving chemical or certain physical changes in matter. Thus this profession is practiced not only in the chemical manufacturing industries, but also in a wide variety of related fields. To list but a few, these include petroleum products and petrochemicals, all plastics, synthetic fibers and textiles, synthetic rubber, pulp and paper, metals of all types, pharmaceuticals, nuclear energy, missile fuels and space age materials. In brief, essentially all man-made materials involve the application of chemical engineering in their development and manufacture. Chemical engineering is also basic to several new interdisciplinary fields such as nuclear engineering, biochemical engineering, biomedical engineering, and space environmental engineering.

The activities of the chemical engineering profession in these many fields are equally broad in scope. They extend all the way from the conception of a new product or material through its ultimate utilization or sale, and chemical engineers are in demand in each of the functional areas of research, development, design, construction, production, technical sales and service, and management. The tools of the chemical engineer range from his slide rule through a great variety of scientific instruments for measuring properties of materials, and for automatically controlling processes and operations, to the modern electronic computers which are widely used in both design computations and process control.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 125, Fundamentals I	3	Ch. E. 126, Fundamentals II	3
Chem. 165, Organic	3	Chem. 166, Organic	3
Chem. 167, Organic Lab.	1	Chem. 168, Organic Lab.	1
Physics 106, Gen.	3	Physics 107, General	4
Math. 185, Calculus	4	Math. 186, Diff. Eqs.	4
Engl. 125, Humane Letters	3	English 126, Humane Letters	3
	17		18
*Phys. Ed. 031a, b	2	Phys. Ed. 032a, b	2

*Not quality point credit.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 255, Unit Ops. I	5	Ch. E. 256, Unit Ops. II	4
Ch. E. 375, Instrumentation	3	Ch. E. 376, Automatic Control	3
Chem. 285, Physical	3	Chem. 286, Physical	3
C. E. 140, Mechanics I	3	Chem. 288, Physical Lab.	2
Engl. 331, Tech. Writing	2	C. E. 141, Mechanics II	3
		**Elective (econ. 125 if not already taken)	3
	16		18

SUMMER (4 wks)

Ch. E. 288, Chem. Engrg. Lab. 3 credits (See pg. 72)

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ch. E. 381, Heat-Energy Relations	3	Ch. E. 380, Kinetics	3
Ch. E. 383, Comprehensive Probs.	3	Ch. E. 382, Thermo. Equil.	3
Ch. E. 391, Seminar	1	Ch. E. 384, Plant Design	3
E. E. 261, Fundamentals	4	Ch. E. 392, Seminar	1
**Electives	5 or 6	**Electives	5 or 6
	16 or 17		15 or 16

**Six credits must be taken in the social sciences and three in the humanities. (See page 00). The remainder may be in technical or scientific courses or in advanced military. All elective requirements listed must be satisfied.

125, 126 (25,26) (I) (II). Fundamentals.

An introduction to the nature and scope of chemical engineering through the study of selected chemical processes and of material and energy balances. Prerequisites, Chemistry 112 or 114 (2 or 4); Physics 103 or 105 (3 or 5) for Course 126 (26). 3 class hours. Credit, 3.

255 (55) (I). Unit Operations I.

Consideration of the thermodynamic properties of matter. Ideal and non-ideal systems. The Unit Operations of fluid flow, heat transfer, evaporation, and equilibrium and steam distillation. Prerequisites, Chemical Engineering 126 (26); Mathematics 185 (31). 4 class hours, 1 2-hour computation period. Credit, 5.

256 (56) (II). Unit Operations II.

A continuation of Course 255 (55); including the additional unit operations of distillation, gas absorption, liquid extraction, crystallization, filtration, mixing, crushing and grinding. Prerequisite, Chemical Engineering 255 (55). 3 class hours, 1 3-hour computation period. Credit, 4.

258 (58). Organic Chemical Technology.

Some of the unit processes involved in the manufacture of organic chemicals. Includes nitration, amination, halogenation, oxidation and esterfication. Prerequisite, Chemistry 165 (51). 2 class hours, 1 3-hour laboratory period. Credit, 3.

288 (88) (Summer). Chemical Engineering Laboratory.

Study and operation of pilot plant size equipment illustrating unit operations. Emphasis is on the securing of accurate data, correct operating techniques and on report writing. Prerequisite, Chemical Engineering 256 (56). 4 40-hr. weeks. Credit, 3.

361 (61) (I). Chemical Engineering Analysis.

A study of mathematical techniques with application to chemical engineering problems. Emphasis is on setting up ordinary differential equations corresponding to specific problems and on methods for their solution. Prerequisite, Chemical Engineering 256 (56). 3 class hours. Credit, 3.

363 (83) (I). Survey of Nuclear Engineering I.

An introduction to the principles of reactor physics and a survey of problems involved in the design and operation of nuclear reactors. Also problems in heat transfer, shielding, instrumentation and waste disposal. Prerequisites, Chemistry 112 or 114 (2 or 4); Physics 104 or 106 (4 or 6); Mathematics 186 (32), or equivalent; and permission of the instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3.

364 (84) (II). Survey of Nuclear Engineering II.

A continuation of Chemical Engineering 363 (83) with emphasis on reactor physics. Prerequisite, Chemical Engineering 363 (83). 2 class hours, 1 3-hour laboratory period. Credit, 3.

367 (87). Process Equipment Design.

The design of process equipment for the chemical industries; riveted pressure vessels, welded pressure vessels, piping, attachments and closures, etc. Prerequisites, Chemical Engineering 256 (56); Civil Engineering 141 (36). 1 class hour, 1 3-hour laboratory period. Credit, 2.

375 (75) (I). Instrumentation.

A detailed study of the underlying principles and practices in indicating and recording instruments used on industrial process equipment. Prerequisite, Physics 103 or 105 (3 or 5). 2 class hours, 1 3-hour laboratory period. Credit, 3.

376 (76) (II). Automatic Process Control.

A study of the theoretical and practical factors governing automatic control of industrial processes. Topics include: control systems, review of measurement devices, control modes, mathematical relationships and analysis of control systems. Prerequisites, Chemical Engineering 375 (75); Mathematics 186 (32). 2 class hours, 1 3-hour laboratory period. Credit, 3.

377 (77) (I). Elements of Unit Operations.

Primarily for engineering science students. Emphasis is on the scientific principles of the Unit Operations. Molecular and turbulent transport of heat, mass and momentum are considered in detail. Prerequisite, Engineering Science option, or permission of instructor. 3 class hours. Credit, 3.

378 (78). Advanced Unit Operations.

A more detailed study of certain unit operations with emphasis on heat transfer. Prerequisite, Chemical Engineering 256 (56). 2 class hours. Credit, 2.

380 (80) (II). Kinetics.

Principles underlying the rates of transformations of matter and energy. Review of the pertinent differential equations; effect of temperature and catalysis on chemical reaction rates; application to design of chemical reactors. Prerequisite, Chemistry 286 (66). 3 class hours. Credit, 3.

381 (81) (I). Heat-energy Relations.

Types of energy, energy balances, second law, thermodynamic functions, P-V-T relations of fluids, compression and expansion processes. Prerequisites, Chemistry 286 (66); Chemical Engineering 256 (56). 3 class hours. Credit, 3.

382 (82) (II). Industrial Equilibria.

Phase and chemical equilibria and rates of reaction in chemical processes from the industrial point of view. Prerequisite, Chemical Engineering 381 (81). 3 class hours. Credit, 3.

383 (93) (I). Comprehensive Problems.

The solution of problems which require the use and integration of principles studies in previous courses. Final results will be determined by the application of economic considerations. Prerequisites, Chemical Engineering 256 (56); Chemistry 286 (66). 2 class hours, 1 3-hour computation period. Credit, 3.

384 (94) (II). Plant Design.

The optimum design of selected chemical plants involving production rates, site location, process flow diagrams, equipment design and sizing, total plant costs and other factors. Prerequisite, Chemical Engineering 383 (93). 2 class hours, 1 3-hour computation period. Credit, 3.

385 (97) (I). Laboratory Projects.

Investigation and report on an elementary chemical engineering problem. Prerequisites, Chemical Engineering 288 (88). 1 3-hour laboratory period. Credit, 1.

386 (98) (II). Laboratory Projects.

Investigation and report on an elementary chemical engineering problem. Prerequisites, Chemical Engineering 288 (88). 2 3-hour laboratory periods. Credit, 2.

391, 392 (95, 96) (I) (II). Seminar.

Preparation and discussion of professional topics of interest to chemical engineers. Prerequisite, Chemical Engineering 256 (56). 1 class hour. Credit, 1.

CIVIL ENGINEERING

Head of Department: Professor Merit P. White. Professors Carver, Feng, Hendrickson, Marcus, Osgood; Associate Professors Boyer, Grow, Higgins, Stockton; Assistant Professors Bemben, Chajes, Dzialo, Harris, Miller.

Civil Engineering is concerned with structures, transportation, movement of fluids, use and storage of water, sanitation, and surveying and mapping. A civil engineer may be engaged in research, in planning and designing, in construction, or in maintenance and operation.

The curriculum gives a thorough training in the fundamental physical sciences and at the same time prepares a student for work in any branch of civil engineering, allowing him to specialize to some extent in whatever branch is most interesting to him—sanitation, mechanics and structures, hydraulics, foundation engineering, highway engineering.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125, Masterpieces of Western Literature	3	English 126, Masterpieces of Western Literature	3
Math. 185, Applied Calculus for Engineers	4	Physics 107, General	4
Physics 106, General	3	Math. 186, Applied Calculus for Engineers	4
C. E. 101, Surveying I	3	C. E. 102, Surveying II	3
C. E. 140, Mechanics I	3	C. E. 141, Mechanics II	3
(Military or Air Science 125	1)	(Military or Air Science 126	1)
Physical Ed. 031*		Physical Ed. 032*	2

*Not quality point credit.

SUMMER

Either C. E. 103 and 104, Surveying Practice, or approved engineering employment.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
C. E. 242, Mechanics III	3	C. E. 230, Theory of Struct. I	3
C. E. 210, Transport. Engr. I	3	C. E. 260, Sanitary Engr. I	3
C. E. 257, Fluid Mechanics	3	C. E. 220, Soil Mechanics I	3
M. E. 263, Engr. Thermo I	3	Humanities Elective	3
Geol. 280, Engr. Geol.	3	English 332, Tech. Writing†	2
Soc. Sci. Elective	3	Soc. Sci. Elective	3
C. E. 258, Fluid Mechanics Lab	1		

†May be replaced by M. E. 264

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
C. E. 331, Structural Design	3	C. E. 280, Engr. Materials	3
C. E. 270, Sanitary Engr. II	3	C. E. 333, Reinforced Concrete	3
E. E. 261, Fundamentals of E.E.	4	C. E. 285, Contracts and Spec.*	3
Technical Electives **	6	C. E. 390, Professional Seminar	1
Non-Technical Elective	3	Technical Electives**	6
		Elective	3

*May be replaced by E.E. 262
**Technical electives must be approved by the adviser.
All elective courses listed must be satisfied. Students taking advanced ROTC and AFROTC courses follow a somewhat different program.

100 (27) (I). Plane Surveying.

Elements of plane surveying: taping, transit, level, stadia, topographic, surveying and mapping, care and adjustment of instruments. Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

101 (31) (I). Surveying I.

Theory of surveying. Use, care, and adjustment of tape, transit, and level; traverse computation; topographic surveying and mapping; property surveying. Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

102 (32) (II). Surveying II.

Route surveys; centerline layout; simple, compound, reverse, parabolic, and spiral curves; construction surveys; earthwork computation; chainage equations; astronomical observations. Prerequisite, Civil Engineering 101 (31). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

103 (28) (Summer). Surveying Practice I.

Property surveys, topographic surveys by stadia and plane table, triangulation. Prerequisite, Civil Engineering 100 (27) or 101 (31). 3 40-hour weeks. Credit 3, Mr. Boyer.

104 (30) (Summer). Surveying Practice II.

Preliminary route survey with plan, profile, cross sections, slope stakes, earthwork quantities. Prerequisite, Civil Engineering 102 (32). 3 40-hour weeks. Credit 3, Mr. Boyer.

140 (35) (I) (II). Mechanics I.

Elements of statics and strength of materials. Prerequisite, integral calculus concurrently. 3 class hours. Credit 3.

141 (36) (I) (II). Mechanics II.

A continuation of strength of materials; elementary kinematics of mechanisms and dynamics of particles and rigid bodies. Prerequisite, Civil Engineering 140 (35). 3 class hours. Credit 3.

210 (55) (I). Transportation Engineering I.

Major transportation systems with emphasis on geometric design of highways, transportation and traffic studies, and design and operation of railroads. Prerequisite, Civil Engineering 102 (32). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

220 (80). Soil Mechanics I.

An elementary course in the engineering uses and properties of soils, including embankment stability, and consolidation. Prerequisite, Geology 280 (50). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Hendrickson.

222 (82). Soil Testing.

Sampling and testing of soils for engineering purposes. 1 class hour, 2 3-hour laboratory periods. Credit 3, Mr. Hendrickson.

230 (70) (II). Theory of Structures I.

An elementary treatment of statically determinate structures, especially buildings and bridges. Prerequisite, Civil Engineering 242 (37). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Osgood.

232 (72) (I). Theory of Structures II.

The analysis of statically indeterminate structures by several appropriate methods. Prerequisite, Civil Engineering 230 (70). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Osgood.

234 (74) (II). Theory of Structures III.

The analysis and design of complex or special structures in metal, concrete or wood. Prerequisites, Civil Engineering 331 (71); 232 (72); 333 (73) concurrently. 3 class hours. Credit 3, Mr. Osgood.

240 (88) (II). Strength of Materials II.

Determination of stresses and strains in elements of machines and structures. Prerequisite, Civil Engineering 242 (37). 3 class hours. Credit 3, Mr. White.

241 (54) (I) (II). Mechanics IV.

Applications of vector analysis to advanced topics in statics, dynamics and strength of materials. Prerequisite, Civil Engineering 141 (36). 3 class hours. Credit 3.

242 (37) (I) (II). Mechanics III.

Advanced topics in dynamics and strength of materials. Prerequisite, Civil Engineering 141 (36). 3 class hours. Credit 3.

256 (93) (II). Introduction to Hydrodynamics.

A mathematical treatment of the basic theorems of classical hydrodynamics including potential flow, conformal mapping, wave and vortex motion, Navier-Stokes equation and boundary layer theory. Prerequisite, Mathematics 186 (32). 3 class hours. Credit 3, Mr. Carver.

257 (75) (I) and (II). Fluid Mechanics.

A study of the properties and behavior of fluids, involving laws of hydrostatics, kinetics and dynamics. Flow measurement, hydraulic machinery, flow in pipes and open channels. Prerequisite, Civil Engineering 141 (36). 3 class hours. Credit 3, Mr. Carver, Mr. Higgins.

258 (76) (I) and (II). Fluid Mechanics Laboratory.

Applications of fluid mechanics theory. Flow measurement and behavior of fluids in pipes and open channels. Prerequisite, Civil Engineering 257 (75) concurrently. 13-hour laboratory period. Credit 1, Mr. Carver, Mr. Higgins.

259 (89) (II). Fluid Mechanics of the Oceans.

An introduction to physical oceanography including tides and waves, characteristics of sea water, advective and convective processes in the ocean and atmosphere, oceanographic measurements, planetary models of the oceans. Prerequisites, Physics 105 (5) or equivalent and Mathematics 173 (25). Credit 3, Mr. Carver and Mr. Higgins.

260 (77) (II). Sanitary Engineering I.

Water demand and quantity of sewage, water collection and distribution, sewer systems, and pumping stations. Prerequisite, Civil Engineering 257 (75) concurrently. 3 class hours. Credit 3, Mr. Feng.

261 (87) (I). Open Channel Flow.

A study of steady flow in open channels including natural and artificial sections and elementary design of related hydraulic structures. Prerequisite, Civil Engineering 257 (75). 3 class hours. Credit 3, Mr. Higgins.

270 (78) (I). Sanitary Engineering II.

Water and sewage laboratory analysis, stream pollution, water and sewage treatment, industrial waste problems. Prerequisite, Civil Engineering 257 (75) concurrently. 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Feng.

271 (79) (I). Principles of Sanitary Engineering.

Designed for students in the Department of Public Health, covering phases of Civil Engineering 260 (77) and 270 (78) with consideration of the non-engineering background of the student. Admission by permission of the instructor. 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Feng.

280 (62) (II). Engineering Materials.

A study of engineering materials with particular emphasis on physical behavior and the correlation between experimental observations and theory. Prerequisite, Civil Engineering 242 (37). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Harris.

285 (90) (II). Contracts and Specifications.

Current practice and the legal aspects of preparing construction contracts, specifications, and cost estimates. 3 class hours. Credit 3, Mr. Grow.

305 (91) (I). Surveying III.

Elements of astronomical geodetic and photogrammetric surveying; coordinate systems and map projections. Prerequisite, Civil Engineering 102 (32). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

311 (94) (II). Transportation Engineering II.

The engineering aspects of traffic problems, geometric design of urban and rural highways including intersections, traffic signs and signals, and planning studies. Prerequisite, Civil Engineering 210 (55). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Boyer.

321 (81). Soil Mechanics II.

Foundations and earth structures. Interpretation of borings. Analysis and design of piles, footings, piers, abutments, and retaining walls. Prerequisite, Civil Engineering 220 (80). 3 class hours. Credit 3, Mr. Hendrickson.

331 (71) (I). Structural Design.

The choosing and proportioning of the elements and connections of metal structural frames of buildings and bridges. Designs are made. Prerequisite, Civil Engineering 230 (70). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Osgood.

333 (73) (II). Reinforced Concrete.

The analysis and design of reinforced concrete structures. Prerequisite, Civil Engineering 242 (37). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Grow.

362 (92) (I). Hydraulic Engineering.

Hydrologic and structural considerations for hydraulic projects including studies of dams and appurtenances, hydraulic machinery, engineering economy, and the design of a typical hydroelectric development. Prerequisite, Civil Engineering 257 (75). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Higgins.

372 (85) (I). Water and Wastewater Analysis.

Analysis of water relative to its quality for various domestic and industrial uses, and analysis of wastewater relative to its potentiality of pollution. Prerequisites, Chemistry 111 (1); 112 (2); Civil Engineering 270 (78). 2 class hours, 1 3-hour laboratory period. Credit 3, Mr. Feng.

373 (86) (II). Sanitary Engineering III.

The hydraulics and chemistry relating to water and sewage treatment plants, design criteria of treatment units. Prerequisites, Civil Engineering 260 (77) and 270 (78). 3 class hours. Credit 3, Mr. Feng.

385 (97) (I), 386 (98) (II). Civil Engineering Project.

Investigation of a problem or completion of a project significant in civil engineering. Prerequisite, permission of department. Credit 3.

390 (96) (II). Professional Seminar.

For senior civil engineering students. Student reports on current engineering projects and the professional aspects of civil engineering. 1 class hour. Credit 1.

ELECTRICAL ENGINEERING

Head of Department: Professor G. Dale Sheckels. Professors Langford, Roys; Associate Professors Bett, Edwards, Fitzgerald, Laestadius, Mohn; Assistant Professors Herchenreder, Lovell, Scott; Visiting Professors Longley, Maunder.

Electrical engineering deals with the engineering applications of electricity. Because of its unusual amount of diversity, it is usually convenient to separate it into such main divisions as power, communications, electronics and control, and others. The undergraduate curriculum is designed to prepare the student for work in any of these fields and to serve as a basis for further specialization. Courses in liberal arts and in engineering courses outside of the department give the student an understanding of the broader aspects of engineering and other fields.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Math 185, Integral Calculus	4	Math 186, Differential Equations	4
Physics 106, General Physics	3	EE 142, Linear Circuit Anal. II	4
EE 141, Linear Circuit Anal. I	4	Physics 107, General Physics	4
Engl 125, Humane Letters	3	Engl 126, Humane Letters	3
Humanity Elective	3	Social Science Elec.	3
(MS 125, Air or Armor	1)	(MS 126, Air or Armor	1)
PE 031a, 031b, Physical Education*	0	PE 032a, 032b, Physical Education*	0

*Not quality point credit

SUMMER (Following Sophomore Year)

EE 285, Electrical Measurements, 3 credit hours.
ME 123, Materials Processing Laboratory, 3 credit hours.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
EE 251, Linear Circuit Anal. III	4	EE 252, Linear Circuit Anal. IV	3
EE 255, Electronics I	4	EE 253, Energy Conversion Systems I	4
EE 257, Electromagnetic Fields	3	EE 256, Electronics II	4
ME 263, Heat Engineering I	3	ME 264, Heat Engineering II	3
CE 140, Mechanics	3	CE 141, Mechanics	3
Engl 331, Technical Writing	2	Econ 125, Elements of Economics	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
EE 254, Energy Conv. Syst. II	4	EE 394, Professional Seminar	1
CE 257, Fluid Mechanics		ME 288, Elec. Engrg. Materials	3
or		Major Technical Elec.	4
ME 282, Heat Transfer	3	Major Technical Elec.	4
Major Technical Elec.	4	Humanity or Soc. Sc. Elec.	3
Social Science Elec.	3	General Elective	3
General Elective	2 or 3		
General Elective	3		

All elective courses listed must be satisfied. All electives to be approved by adviser For humanities and social science electives, see page 60. Six credits of advanced military or air science may be substituted for six credits of electives.

141 (41) (I), 142 (42) (II). Linear Cicuit Analysis I and II.

Analysis using differential relationships, free and forced responses, complex frequency, steps and impulses, poles and zeros and network theorems. Prerequisites, Mathematics 136 (6), Physics 105 (5), and Engrg. 104 (4) or Comp. Sc. 121 (21) concurrently. 3 class hours, 1 3-hour computation and laboratory period. Credit, 4.

251 (51) (I). Linear Circuit Analysis III.

Polyphase circuits, coupled circuits, harmonics, Fourier series, and magnetic circuits. Prerequisite, EE 142 (42). 3 class hours, 1 3-hour laboratory period. Credit, 4.

252 (52) (II). Linear Circuit Analysis IV.

The use of operational and transform methods for the solution of fundamental equations of electrical, mechanical and thermal systems, with a correlated study of functions of a complex variable. Prerequisite, EE 251 (51). 3 class hours. Credit, 3.

253 (53) (II), 254 (54) (I). Energy Conversion Systems I and II

Principles of operation and physical aspects of energy conversion systems with a detailed analysis of performance and control of transformers and rotating electrical machinery. Prerequisite, EE 251 (51). 3 class hours, 1 3-hour laboratory period. Credit, 4.

255 (55) (I), 256 (56) (II). Electronics I and II.

Physical phenomena of electronic conduction in solids, vacua, and gases. Applications include amplifiers, rectifiers, oscillators, inverse feedback systems, computers, and other basic circuits. Prerequisite, EE 142 (42), or consent of instructor. 3 class hours, 1 3-hour laboratory period. Credit, 4.

257 (57) (I). Electromagnetic Fields.

Static and time varying electromagnetic fields using vector notation. Maxwell's equations, relations between field and circuit theory. Plane waves in dielectric and conducting media. Prerequisites, Physics 106 (6) with Mathematics 186 (32) concurrently. 3 class hours. Credit, 3.

261 (61) (I). Fundamentals of Electrical Engineering.

A study of basic laws of electrical science as they pertain to electric and magnetic circuits. Not open to electrical engineers. Prerequisites, Physics 106 (6), Mathematics 185 (31) or equal. 3 class hours, 1 3-hour laboratory period. Credit, 4.

262 (62) (II). Basic Application of Electrical Engineering.

A study of the general applications of the basic laws of electrical engineering in the fields of stationary and rotating electromechanical machinery and basic electronics. Not open to electrical engineers. Prerequisite, EE 261 (61). 3 class hours, 1 3-hour laboratory period. Credit, 4.

265 (65) (I), 266 (66) (II). Electronics I and II.

These courses are identical to the lecture portions of EE 255 (55) and 256 (56). They are not open to electrical engineers. Prerequisites, Physics 106 (6) and Mathematics 185 (31), or equivalents. 3 class hours. Credit, 3.

277 (77) (I). Principles of Switching Circuits I.

Logical design of switching circuits with emphasis on the scientific methods available: the analysis and synthesis of switching systems using electromagnetic, electronic and solid state devices. Prerequisite, EE 256 (56). 3 class hours, 1 3-hour laboratory period. Credit, 4.

278 (78) (II). Principles of Switching Circuits II.

Multiterminal and iterative circuits; circuit reliability; switching codes; alternative methods of sequential circuit design with emphasis on synchronous pulse circuits; trends in switching. Prerequisite, EE 277 (77). 3 class hours, 1 3-hour laboratory period. Credit, 4.

279 (79) (I). Communication Circuits.

Theory of lumped circuits and lines including matrices, positive real functions, and synthesis methods of Foster and Cauer. Prerequisite, EE 252 (52). 3 class hours, 1 3-hour laboratory period. Credit, 4.

280 (80) (II). Electronics III.

Active circuits and communication theory covering tube and semi-conductor circuitry with emphasis on aspects pertaining to information transmission. Prerequisite, EE 256 (56). 3 class hours, 1 3-hour laboratory period. Credit, 4.

281 (81) (II). Advanced Electromechanical Energy Conversion.

Modern methods of analysis: Hamilton's Principle and Lagrange's Equations; matrices, dyadics and tensors; two reaction theory and symmetrical components; the generalized and special machines. 3 class hours, 1 3-hour laboratory period. Prerequisite, EE 254 (54). Credit, 4.

284 (84) (II). Industrial Electronics and Control.

Industrial electronic devices and their characteristics; basic circuits and their application to commercial equipment. Prerequisites, EE 255 (55), or 262 (62). 3 class hours, 1 3-hour laboratory period. Credit, 4.

285 (85) (Summer) Electrical Measurements.

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices. Prerequisite, EE 142 (42). 3 40-hour weeks. Credit, 3.

286 (86) (II). Power System Networks.

Power transfer diagrams, voltage studies, system stability criteria, short-circuit calculations, and protective methods. Prerequisite, EE 252 (52). 3 class hours, 1 3-hour laboratory period. Credit, 4.

288 (88) (II). Pulse Circuits.

Generation, transmission and processing of information by means of pulses, with applications to computers, communications, radar and televisions. Prerequisite, EE 256 (56). 3 class hours, 1 3-hour laboratory period. Credit, 4.

290 (90 (II). Feedback Control Systems I.

Analysis and design of error-sensitive control systems. Analytical and graphical determination of steady state and transient performance; applications to electrical, mechanical, and hydraulic systems. Prerequisite, EE 256 (56). 3 class hours, 1 3-hour laboratory period. Credit, 4.

292 (92) (II). Principles of Electrical Design.

The fundamentals of electric, dielectric, magnetic and heat-flow systems applied to the design, performance, rating life of coils, transformers, machinery and other equipment. Prerequisite, EE 254 (54). 2 class hours, 1 3-hour laboratory period. Credit, 3.

294 (94) (II). Microwave Engineering.

Fundamental principles of communications and electromagnetism and their application to the special problems of the generation, transmission, propagation and reception of microwaves. Prerequisite, EE 257 (57). 3 class hours, 1 3-hour laboratory period. Credit, 4.

385 (97) (I), 386 (98) (II). Special Problems.

An individual investigation carried out under the supervision of an interested staff member, or a class study of recent advances and current problems in a specialized field of electrical engineering. Prerequisite, consent of instructor. Credit, 1–4.

394 (96) (II). Professional Seminar.

Current engineering developments are discussed through student reports. Instruction is given in the preparation of papers for publication and their presentation before technical audiences. Prerequisite, senior standing. 1 class hour. Credit, 1.

MECHANICAL ENGINEERING

Head of Department: Professor William H. Weaver. Professors Bates, Dittfach, Keyser, Swenson; Associate Professors Costa, Day, O'Bryne, Patterson, Rising, Sobala, Trueswell; Assistant Professor, Cromack.

Two curricula are offered by the Department of Mechanical Engineering: (1) Mechanical Engineering and (2) Industrial Engineering.

MECHANICAL ENGINEERING

Mechanical engineering is that branch of the engineering profession which, broadly speaking, covers the fields of heat, power, and the design of machinery.

Building upon a foundation of mathematics, physics, and chemistry, the department of mechanical engineering undertakes to show the student how fundamental physical laws apply to this field and to give him thorough training in the basic principles so that particular application can be mastered in professional practice. Therefore, no attempt is made to give highly specialized instruction.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125, Mastp. West. Lit.	3	English 126, Mastp. Lit.	3
Math. 185, Applied Calculus for Engineers	4	Math. 186, Applied Calculus for Engineers	4
C. E. 140, Statics	3	C. E. 242, Strength of Matls.	3
M. E. 135, Engin. Mat'l. & Proc.	4	M. E. 146, Metallurgy	3
Physics 106, General Physics	3	Engr. 105, Engr. Graphics	3
(Mil. 125, Mil. or Air Sci.*	1)	(Mil. 126, Mil. or Air Sci.*	1)
P. E. 031, Physical Education**	0	P. E. 032, Physical Education**	0
	17 or 18		16 or 17

*Elective

**Not quality point credit

SUMMER (Following Sophomore Year)

M. E. 125, Materials Processing Laboratory II, 2 credits
M. E. 126, Materials Processing Laboratory III, 2 credits

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. E. 263, Engr. Thermo. I	3	M. E. 264, Engr. Thermo II	3
M. E. 267, Mech. Instr. Lab.	1	M. E. 268, Kinematics	3
E. E. 261, Fundamentals	4	E. E. 262, Applications	4
C. E. 141, Dynamics	3	C. E. 257, Fluid Mech.	3
Physics 107, General Physics	4	C. E. 258, Fl. Mech. Lab.	1
Econ. 125, Elements	3	Humanities or Soc. Sci. Elec.	3
	18		17

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
M. E. 279, Mech. Engr. Lab.	1	M. E. 280, Mech. Engr. Lab.	2
M. E. 283, Mach. Design	3	M. E. 282, Heat Transfer or M. E. 284, Basic Engr. Analysis	3
M. E. 285, Dynamics of Mach.	4		
M. E. 287, Engr. Thermo III	3	M. E. 286, Adv. Mach. Design	3
M. E. 393, Seminar	1	Non-technical Elective	6
Engl 331, Tech. Writing	2	Technical Elective	3
Technical Elective	3		
	17		17

Technical Electives: M. E. 274, 275, 276, 277, 282, 284, 290, 385, 386; I. E. 254; 286; C. E. 240. Humanities and social science electives are specified in the undergraduate catalog. Non-technical electives may be selected with the approval of the adviser. All electives must be satisfied. Advanced military students will be allowed a maximum of six credits substitution according to Department requirements. Total credits, 139–143.

123 (23). Materials Processing Laboratory I.

A lecture and laboratory course to develop a basic understanding of metal working using cutting and joining processes. Not for Industrial or Mechanical engineers. Offered immediately previous to the fall semester. Prerequisite, Engineering 103. 3 40-hour weeks. Credit, 3.

125 (25). Materials Processing Laboratory II.

An understanding of the weldability of metals using manual and automatic processes applicable to machine design and industrial processes. Prerequisite, Engineering 103. 2½ 30-hour weeks. Credit, 2.

126 (26). Materials Processing Laboratory III.

An understanding of the machining of metals using standard machine tools applicable to machine design and industrial processes. Prerequisite, Engineering 103. 2½ 30-hour weeks. Credit, 2.

135 (35) (I). Engineering Materials and Processes.

Properties, production, fabrication, and uses of engineering materials. Laboratory work includes mechanical testing, motion pictures, and inspection trips. Prerequisites, Chemistry 112 or 114; Physics 103 or 105, previously or concurrently. 3 class hours, 1 3-hour laboratory period. Credit, 4.

146 (46) (II). Fundamentals of Metallurgy.

Physical metallurgy involving crystal structure, solid solutions, diffusion in the solid state, freezing of metals, metal hardening, annealing, equilibrium diagrams. Heat treating processes. Prerequisite, Mechanical Engineering 135 or Chemistry 286. 2 class hours, 1 3-hour laboratory period. Credit, 3.

263 (63) (I). Engineering Thermodynamics I.

The application of the laws of thermodynamics to various energy-transforming devices, including ideal and actual cycles of steam, internal combustion engines and air compressors. Prerequisites, Physics 105 and 106; Mathematics 185 or 186. 3 class hours. Credit, 3.

264 (64) (II). Engineering Thermodynamics II.

A study of liquids and vapors, thermodynamic cycles, energy transformations, the transfer of heat plus appropriate problems. Prerequisite, Mechanical Engineering 163. 3 class hours. Credit, 3.

267 (67) (II). Mechanical Instrumentation Laboratory.

The calibration and application of instruments used in the testing of mechanical engineering apparatus. Prerequisite, Mechanical Engineering 163, taken previously or concurrently. 1 3-hour laboratory period. Credit, 1.

268 (68) (II). Kinematics.

Principles of mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions. Prerequisites, Mechanical Engineering I; Civil Engineering 141. 2 class hours, 1 3-hour laboratory period. Credit, 3.

274 (74) (I) and (II). Basic Aerodynamics.

The basic concepts of applied aerodynamics, including properties of air, ideal fluid flow, airfoils and their properties, aircraft performance and stability. Prerequisite, Civil Engineering 258. 3 class hours. Credit, 3.

275 (75) (I). Steam Power Plants.

The steam power plant, including boilers, stokers, fuels, combustion, steam generation, prime movers, and auxiliary equipment, and engineering problems involved in design and operation. Prerequisite, Mechanical Engineering 264. 3 class hours. Credit, 3.

276 (76) (II). Refrigeration and Air Conditioning.

Fundamental principles of thermodynamics as applied to refrigeration in industrial processes and the control of temperature, humidity and motion of air in buildings. Prerequisite, Mechanical Engineering 264. 3 class hours. Credit, 3.

277 (77) (I). Internal Combustion Engines.

The thermodynamic and performance aspects of reciprocating gasoline and Diesel engines, steady flow gas turbines, turbo-jet engines and rockets. Prerequisite, Mechanical Engineering 287 concurrently. 3 class hours. Credit, 3.

279 (79) (I). Mechanical Engineering Laboratory I.

Standard performance tests of steam, gasoline and Diesel engines, fans, turbines, compressors, and refrigeration systems. Process control instrumentation including digital and analog computer techniques. Prerequisite, Mechanical Engineering 267. 1 3-hour laboratory period. Credit, 1.

280 (80) (II). Mechanical Engineering Laboratory II.

Advanced project experimental work in all phases of Heat Power equipment. Prerequisite, Mechanical Engineering 279. 2 3-hour laboratory periods. Credit, 2.

282 (82) (I) (II). Heat Transfer.

A study of the mechanisms of heat transfer: conduction, convection and radiation, with engineering applications. Prerequisites, Mechanical Engineering 263; Mathematics 186 or 241. 3 class hours. Credit, 3.

283 (83) (I). Machine Design.

Principles involved in the design of various machine parts. Related topics such as economy of manufacture, safety, styling, invention and creativity. Prerequisites, Civil Engineering 242; Engineering 103, 104, 105; Mechanical Engineering 125, 126, 268. 2 class hours, 1 3-hour laboratory period. Credit, 3.

284 (84) (II). Basic Engineering Analysis.

The application of mathematical solutions to problems in vibrations, elasticity, fluid mechanics and dynamics. The analysis of the problems and the derivation of the governing equations. Prerequisite, Mathematics 186 or 241. 3 class hours. Credit, 3.

285 (85) (I). Dynamics of Machinery.

Elements of vibration theory, vibration isolation, absorbers, instrumentation, analysis of equivalent masses and shaft systems. Dynamic balancing. Prerequisites, Mathematics 186; Civil Engineering 141; Mechanical Engineering 268. 3 class hours, 1 3-hour laboratory period. Credit, 4.

286 (86) (II). Advanced Machine Design.

Continuation of Course 283. Additional elementary parts are analyzed and some complete machines studied. Emphasis on invention and creativity. Prerequisite, Mechanical Engineering 283. 2 class hours, 1 3-hour laboratory period. Credit, 3.

287 (87) (I). Engineering Thermodynamics III.

Topics investigated include steam turbines, steam power plants, refrigeration, high-velocity flow, and shock phenomena. Prerequisite, Mechanical Engineering 264. 3 class hours. Credit, 3.

288 (88) (II). Science of Engineering Materials.

The mechanical, electrical, magnetic and thermal properties of engineering materials. Prerequisites, Chemistry 112 or 114, Physics 105 and 106 or 125 and 126 or their equivalents. 3 class hours. Credit, 3.

289 (89) (I). Instrumentation.

A study of mechanical instrumentation with mechanical-electrical transducers emphasized. A few heat power experiments included. For electrical engineering majors or permission of instructor. Prerequisite, Mechanical Engineering 264. 1 class hour, 1 3-hour laboratory period. Credit, 2.

290 (90) (II). Advanced Metallurgy.

Advanced topics in engineering metallurgy, including X-ray diffraction and X-ray fluorescent analysis. Prerequisite, Mechanical Engineering 146. 2 class hours, 1 3-hour laboratory period. Credit, 3.

293 (93) (I). Nomography.

The construction of functional scales, alignment charts and proportional charts. The use of determinants in the construction of alignment charts. Prerequisite, Mathematics 2, 112 or 136. 1 class hour, 1 3-hour laboratory period. Credit, 2.

393 (95) (I). Professional Seminar.

Presentation of papers on important subjects and recent development in the field of mechanical engineering. Prerequisite, Senior standing. 1 class hour. Credit, 1.

385 (97) (I), 386 (98) II. Experimental Mechanical Engineering.

Special work in mechanical engineering for a senior thesis. Admission by permission of instructor. Credit, 3.

INDUSTRIAL ENGINEERING

Industrial engineering is concerned with the engineering aspects of the organization, operation and management of manufacturing plants. Consequently, the industrial engineering curriculum is built on a foundation of mechanical engineering. To the technical knowledge and scientific attitude developed through the study of engineering is added the study of certain courses in the humanities, in economics, and in management.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125, Mastp. West. Lit.	3	English 126, Mastp. West. Lit.	3
Math 185, Applied Calculus for Engineers	4	Math 186, Applied Calculus for Engineers	4
I. E. 251, Basic. Industrial Engineering	3	I. E. 256 Data Processing	3
M. E. 135, Engr. Materials & Processes	4	M. E. 146, Metallurgy	3
Physics 106, General Physics	3	C. E. 140, Statics	3
(Mil. 125, Mil. or Air Sci.*	1)	(Mil. 126. Mil. or Air Sci.*	1)
P. E. 031, Physical Education**	0	P. E. 032, Physical Education**	0
	17 or 18		16 or 17

*Elective

**Not quality point credit

SUMMER (Following Sophomore Year)

M.E. 125, Materials Processing Laboratory II, 2 credits
M.E. 126, Materials Processing Laboratory III, 2 credits

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
I. E. 253, Methods & Standards Engineering	4	Econ. 25, Elements of Econ.	3
I. E. 271, Basic Probability for Engineers	3	I. E. 272, Prin. of Engr. Statistics	3
Engr. 105, Engr. Drawing	2	Humanities or Soc. Sci. Elec.	3
C. E. 141, Dynamics	3	C. E. 242, Strength of Materials	3
Physics 107, General Physics	4	M. E. 263, Engr. Thermo I	3
English 331, Tech. Writing	2	M. E. 268, Kinematics	3
	18		18

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
E. E. 261, Fundamentals	4	E. E. 262, Applications	4
M. E. 283, Machine Design	3	I. E. 254, Engr. Economy	3
C. E. 257, Fluid Mechanics	3	I. E. 278, Manufacturing Control	3
I. E. 277, Ind. Engr. Design	2	I. E. 280, Cost Control Engr.	3
I. E. 279 Ind. Engr. Problems	3	I. E. 394, Seminar	1
Non-technical Elective	3	Non-technical elective	3
	18		17

Humanities and social science electives are specified in the undergraduate catalog. Non-technical electives may be selected with the approval of the advisor. All electives must be satisfied. Advanced military students will be allowed a maximum of six credits substitution according to Department requirements. Total credits 141–145.

251 (51) (I). Basic Industrial Engineering.

The principles of organization and management and their application to the problems of the industrial plant. For industrial engineering majors. 3 class hours. Credit, 3.

253 (53) (I). Methods and Standards Engineering.

The principles involved in the simplification of the work pattern, the design of the work place, and in the establishment of production standards. Prerequisite, Industrial Engineering 271, previously or concurrently. 3 class hours, 1 3-hour laboratory period. Credit, 4.

254 (54) (II). Engineering Economy.

A study of the basis for comparison of alternatives in engineering projects, break-even and minimun cost points, evaluation of proposals, the economic selection and replacement of structures and machines. Prerequisites, Economics 125; Mathematics 136. 3 class hours. Credit, 3.

256 (56) (II). Data Processing and Information Handling Systems.

Principles and applications of data processing and electronic computer systems for use by industrial engineers in management for control and decision making. Prerequisite, Industrial Engineering 251, Engineering 103, 104 or approval of instructor. 3 class hours. Credit, 3.

271 (71). Basic Probability for Engineers.

A study of probability and its applications to engineering which utilizes calculus to examine frequency, density and cumulative distribution functions. Distributions such as chi square, normal, binomial, etc. are treated. Hypothesis testing will be included. Prerequisite Math 136. 3 class hours. Credit, 3.

272 (72) (I). Principles of Engineering Statistics.

A study of statistical principles as applied to engineering problems including: analysis of variance, design of experiments, sampling plans, statistical quality control, industrial problem solutions. Prerequisite, Industrial Engineering 271. 3 class hours. Credit, 3.

277 (77) (I). Layout and Design of Organizational Facilities.

The principles applying to the determination and development of the physical relationship between plant, equipment and operators considering the economy and effectiveness of operation. Prerequisites, Mechanical Engineering 2; Industrial Engineering 279 previously or concurrently. 1 class hour, 1 3-hour laboratory period. Credit, 2.

278 (78) (II). Production Planning and Control.

A study of the principles and methods used to regulate production activities in keeping with the manufacturing plan. Prerequisites, Industrial Engineering 251; Industrial Engineering 279. 3 class hours. Credit, 3.

279 (79) (I). Industrial Engineering Problems.

The principles and methods of operations research and optimization of methods applied to problems encountered in industrial engineering. Prerequisites, Industrial Engineering 253, 256, 271, 272.

280 (80) (II). Cost Control Engineering.

The principles for pre-determining expenses for the factors of production, the comparison of results with estimates to determine and deal with the causes of expense variations. Prerequisites, Industrial Engineering 251 and 279. 3 class hours. Credit, 3.

286 (86) (II). Industrial Engineering Principles.

Industrial engineering principles as applied to organization, plant location, plant layout, industrial costs, production control, production standards incentives. For engineering students other than industrial engineering majors. Prerequisite, Junior standing. 3 class hours. Credit, 3.

288 (88) (II). Motion and Time Study.

The combined fields of motion study and time study. For junior and senior students outside the industrial engineering field. Prerequisite, Junior standing. 2 class hours, 1 3-hour laboratory period. Credit, 3.

385 (97) (I), 386 (98) (II). Industrial Engineering Projects.

Special work in industrial engineering for a senior thesis or an honors program. Admission by permission of the instructor. Credit, 1–3.

394 (96) (II). Professional Seminar.

Presentation of papers on important subjects and recent development in the field of industrial engineering. Prerequisite, Senior standing. 1 class hour. Credit, 1.

SCHOOL OF HOME ECONOMICS

MARION A. NIEDERPRUEM, *Dean*

Home Economics encompasses areas of study which apply the principles and concepts of fundamental arts and sciences to the physiological, psychological, social and economic environmental needs of man.

The School of Home Economics has five subject matter areas: Food and Nutrition (FN); Textiles, Clothing and Environmental Arts (TCEA); Management and Family Economics (MFE); Human Development (HD); and Home Economics Education (HEEd.). The letters in parentheses are area codes. Within these five areas the following undergraduate majors are offered:

DIETETICS AND INSTITUTIONAL ADMINISTRATION
FOODS IN BUSINESS
FASHION MERCHANDISING
CHILD DEVELOPMENT
SECONDARY EDUCATION AND EXTENSION

The undergraduate program of the School, leading to a Bachelor of Science degree, emphasizes a liberal education in the sciences, arts and humanities with specialized instruction as preparation for professional careers. The transitional continuing relationships between liberal and professional education seek to develop in the student a disciplined mind, mental curiosity and professional competence.

Professional home economists are college and university graduates with bachelor's degrees in Home Economics. They serve individuals, families, and communities through schools and colleges, extension programs, business organizations of many kinds all over the world, community and government organizations and agencies, newspapers, magazines, radio and television. Representative types of activities that Home Economists participate in include teaching, research, writing, dietetics, extension work, interior decoration, fashion merchandising, food consulting, food service management and product development. Experience and advanced study in areas of specialization lead to positions of great responsibility.

FOOD AND NUTRITION

Food and Nutrition curricula provide courses in Food and Nutrition combined with a strong foundation in the Arts and Sciences with two majors:

DIETETICS AND INSTITUTIONAL ADMINISTRATION; AND FOODS IN BUSINESS.

Dietetics and Institutional Administration

This curriculum prepares the student for positions as therapeutic and administrative dietitians; teaching and research dietitians and nutritionists with public and private agencies. An increasing number of new opportunities continually challenges graduates in this major.

The sequence offers opportunities for further work at the graduate level. This program is planned to meet the basic requirements of the American Dietetic Association for admission to approved dietetic internships.

MAJOR IN DIETETICS AND INSTITUTIONAL ADMINISTRATION

	Credits		*Credits*
General Education	60	Professional	25
Home Economics Core	10	Electives	15
Pre-Professional	15	Physical Education	8
		Credits 125	

I. *General Education*	*Credits*
English 111 and 112, Composition	4
English 125 and 126, Masterpieces of Western Literature	6
Speech 101, Oral Communication	2
Economics 125, Elements of	3
Sociology 101, Introductory	3
Psychology 101, General	3
History 100, 101, 150 or 151	3
Government 100, 303, or Math 111	3
Chemistry 111 and 112, General	6
Chemistry 160, Organic	4
Chemistry 220, Elementary Biochemistry	4
Zoology 101, Introductory	3
Zoology 135, Vertebrate Physiology	3
Microbiology 150, Introductory	4
Accounting 125, Introduction	3
Electives from the following Humanities: Music, Art, Philosophy, Speech 201, or Language	6

II. *Home Economics Core*	
HEEd. 120, Introduction to Home Economics	1
FN 127, Man and Nutrition	3
Select two from the following core: TCEA 141, Man and Clothing; TCEA 123, Art for Living; MFE 250, Family Management and Decision Making; HD 380, Human Development in the Family	6

III. *Pre-Professional*

Management 214, Personnel Management	3
HEEd. 381, Adult Education in Home Economics	3
Limited Electives from the following:	
MFE 274, Consumer Attitudes and Demand	
MFE 277, Theory and Application of Management	
Public Health 261 or 262, General and Community Sanitation	
AFE 110, Food and Natural Resources	
AFE 261, Food Marketing	9

IV. *Professional*

FN 130, Food Science and Preparation	3
FN 251, Meal Management	3
FN 352, Advanced Nutrition	3
FN 389, Nutrition in Disease	3
FN 350, Quantity Food Preparation	4
FN 351, Institutional Administration	4
FN 360, Experimental Foods or FN 372, Quantity Food Purchasing	3
FN 391, Seminar in Nutrition	1
FN 392, Seminar in Institutional Administration	1

V. *Electives* 15

Foods in Business

This curriculum is based on professional training in Food and Nutrition combined with other selected courses in Home Economics, the humanities, Western cultures, social sciences and business. The program is designed for the student who is oriented to the business world, and leads directly into development and promotion with food, equipment and utility industries. Positions are open in the field of communications for the student who combines her knowledge of Food, Nutrition and Equipment with Journalism, English, Speech, Television and Radio. Graduates with a major in this sequence are also placed in advertising and public relations agencies or with a consulting firm. This curriculum allows students to pursue graduate study.

MAJOR IN FOODS IN BUSINESS

	Credits		Credits
General Education	56	Professional	30
Home Economics Core	16	Electives	12
Pre-Professional	12 or 13	Physical Education	8
		Credits 126–128	

		Credits
I.	*General Education*	
	English 111 and 112, Composition	4
	English 125 and 126, Masterpieces of Western Literature	6
	Speech 101, Oral Communication	2
	Speech 201, Public Speaking	3
	Philosophy 105, 125, 110, 243, Art 120, or Music 101	3
	Journalism 201 and 339, or Speech 222, 223, English 337, or 341	6
	Psychology 101, General	3
	Economics 125, Elements of	3
	Sociology 101, Introductory	3
	Government 100, 303, History 100, 150, 221 or 200	3
	Chemistry 111 and 112, General	6
	Chemistry 160, Organic	4
	Zoology 101, Introductory	3
	Zoology 135, Vertebrate Physiology	3
	Microbiology 150, Introductory	4
II.	*Home Economics Core*	
	HHEd. 120, Introduction to Home Economics	1
	FN 127, Man and Nutrition	3
	TCEA 141, Man and Clothing	3
	TCEA 123, Art for Living	3
	MFE 250, Family Management and Decision Making	3
	HD 380, Human Development in the Family	3
III.	*Pre-Professional*	
	MFE 275, Personal and Family Economics	3
	AFE 265, Food Merchandising	3
	Chemistry 220, Elementary Biochemistry*	4
	Marketing 254, 273, AFE 261, 368, or MFE 260	3
	*Not required for those interested in Utility work; substitute any one of the option courses above.	
IV.	*Professional*	
	FN 130, Food Science and Preparation	3
	FN 251, Meal Management	3
	FN 352, Advanced Nutrition* *or* FN 373, Nutrition During Growth & Development	3
	HEEd. 261, Communication by Demonstration Methods	3
	FS&T. 684, Sensory Evaluation	2
	FN 360, Experimental Foods	3
	MFE 274, Consumer Attitudes and Demand	3
	FN 390, Seminar in Food	1
	Professional Electives. These may include option courses listed under Pre-Professional, or additional Home Economics courses in other areas.	9
	*For students interested in Utility	
V.	*Electives*	12 or 13

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS

A field of specialization in this area is entitled FASHION MERCHANDISING. The retailing and professional opportunities associated with clothing, textiles, home furnishings and related merchandise are limitless. They include positions with manufacturers, producers, retailers, buying organizations, newspapers and magazines, radio, TV and consumer groups, as well as educational institutions and social and government agencies. The student who is interested in the business field pursues, by specializing in this area, a curriculum with a strong program of liberal arts emphasizing the social sciences. Courses which build on this foundation providing professional business competency include fundamentals of clothing, textiles, fashion and environmental arts as well as courses in business, retailing and related subjects. Those students who are particularly interested in Interior Design may follow a sequence of courses as indicated below.

MAJOR IN FASHION MERCHANDISING

	Credits		*Credits*
General Education	60	Professional	19
Home Economics Core	16	Electives	12
Pre-Professional	18	Physical Education	8
		Credits 125	

I. *General Education*	*Credits*
English 111 and 112, Composition	4
English 125 and 126, Masterpieces of Western Literature	6
Speech 101, Oral Communication	2
Art 120, Basic Design	3
Foreign Language or Proficiency	12
Physical or Biological Sciences— 3 Sciences or 2 Sciences and Math 112	9
Sociology 101, Introductory	3
Psychology 101, General	3
Economics 125, Elements of	3
Electives from the Humanities and Social Sciences	12
Mathematics 111, Introductory	3

Fashion Merchandising

II. *Home Economics Core*	*Credits*
HEEd. 120, Introduction to Home Economics	1
TCEA 123, Art for Living	3
TCEA 141, Man and Clothing	3
FN 127, Man and Nutrition	3
MFE 250, Family Management and Decision Making	3
HD 380, Human Development in the Family	3

III. *Pre-Professional*

TCEA 124, Textiles I	3
TCEA 128, Fundamentals of Clothing Construction, *or* TCEA 253, Advanced Clothing Construction*	3
TCEA 265, Apparel Design and Selection*	3
TCEA 266, Apparel and Home Furnishing Accessories	3
TCEA 374, Fashion Industries*	3
MFE 274, Consumer Attitudes and Demand, *or* Economics 248, Consumption and Personal Finance	3

IV. *Professional*

TCEA 142, Fashion in Retailing and Business	3
TCEA 380, Retailing Field Experience*	6
TCEA 390 or 391, Seminar in Textiles, Clothing and Environmental Arts	1
TCEA 387 or 388, Problems in Textiles, Clothing and Environmental Arts	3
Marketing 253, Marketing Principles	3
Marketing 271, Retailing Principles*	3

V. *Electives* *Credits* 12

*For those interested in an Interior Design sequence, the following courses could be substituted for those Fashion Merchandising courses identified by an asterisk.

Art 200, Water Color
Ag. Eng. 261, House Planning
TCEA 276, History of Decorative Arts
TCEA 279, Interior Design
TCEA 378, Advanced Interior Design

HOME ECONOMICS EDUCATION

Home Economics Education offers a curriculum which provides a broad cultural education and preparation for teaching in secondary schools and the Cooperative Extension Service. The School of Home Economics, in cooperation with the School of Education, prepares students for teaching home economics in junior and senior high schools. This curriculum serves also as a base for graduate study in subject matter areas in home economics and home economics education. Students interested in the Cooperative Extension Service will, with the assistance of an extension adviser, select courses in preparation for continuing education positions in adult and 4-H programs.

MAJOR IN SECONDARY EDUCATION AND EXTENSION

	Credits		*Credits*
General Education	55	Professional	32
Home Economics Core	13	Electives	9
Pre-Professional	18	Physical Education	8

Credits 127

I. *General Education*	*Credits*
English 111 and 112, Composition	4
English 125 and 126, Masterpieces of Western Literature	6
Speech 101, Oral Communication	2
Speech 200, Voice and Diction and Oral Interpretation *or* English 331, Advanced Expository Writing	3
Sociology 101, Introductory	3
Sociology 257, The Family	3
Psychology 101, General	3
Psychology 301, Educational	3
Psychology 263, Adolescent	3
History 150 and 151, American	6
Government 100, 219, 218, 303, or 202	3
Economics 125, Elements of	3
Chemistry 111 and 112, General	6
Chemistry 160, Organic	4
Mathematics 111, Introductory	3

II. *Home Economics Core*	*Credits*
HEEd. 120, Introduction to Home Economics	1
FN 127, Man and Nutrition	3
TCEA 123, Art for Living	3
MFE 250, Family Management and Decision Making	3
TCEA 141, Man and Clothing	3

III. *Pre-Professional*	
Education 251, History of Education	3
Education 388, Secondary School Curriculum	3
FN 130, Food Science and Preparation	3
TCEA 124, Textiles I	3
TCEA 128, Fundamentals of Clothing Construction *or* TCEA 253, Advanced Clothing Construction	3
HD 270, Child Development	3

IV. *Professional*	
HEEd. 382, Curriculum and Methods in Home Economics	4
Education 385, Observation and Student Teaching	6
FN 251, Meal Management	3
FN 373, Nutrition During Growth and Development	3
TCEA 265, Apparel Design and Selection	3
TCEA 279, Interior Design	3
MFE 275, Personal and Family Economics	3
Education 366, Preparation and Use of Audio-Visual Materials	3
MFE 377, Theory and Application of Management	3
HEEd. 390 or 391, Seminar in Home Economics Education	1

Secondary Education and Extension

	Credits
V. *Electives*	9

HUMAN DEVELOPMENT

The area of Human Development is of necessity interdisciplinary in nature. The program brings together knowledge from Psychology, Sociology, Anatomy, Physiology, Nutrition, Education, the Arts, Anthropology, and relates it to Human Development and early childhood education. It is concerned with all maturational and environmental effects upon developing individuals, and with all theoretical and empirical descriptions of how this development occurs.

The undergraduate field of specialization in this area is entitled CHILD DEVELOPMENT. The child development program prepares the student for work in various types of group programs serving preschool-aged children, such as laboratory, public, and private nursery schools, clinics for exceptional children, hospital recreation programs, and community and welfare agencies. In addition, the child development curriculum provides a good background for graduate work in various other child serving professions.

Directed experience with the children of the laboratory nursery school and their families provides the necessary opportunity for students to develop a sound personal philosophy of early childhood education, and to achieve competence in implementing it. More intensive specialization for qualified students may be obtained by the election of a one-semester affiliation with: (1) Merrill-Palmer Institute in Detroit, Michigan, which specializes in the study of human development and family life; (2) the Eliot-Pearson School in Boston, Massachusetts, which specializes in the education of the three- to six-year-old child.

MAJOR IN CHILD DEVELOPMENT

	Credits		*Credits*
General Education	60	Professional	28
Home Economics Core	13	Electives	9–12
Pre-Professional	12	Physical Education	8
		Credits 122–125	

I. *General Education*	*Credits*
English 111 and 112, Composition	4
English 125 and 126, Masterpieces of Western Literature	6
Speech 101, Oral Communication	2
Zoology 101, Introductory	3
Zoology 135, Vertebrate Physiology	3
Sociology 101, Introductory	3
Psychology 101, General	3
Mathematics 111, Introductory	3
One 3-hour course from any of the following areas: Mathematics, Biological Sciences or Physical Sciences	3
English 337 or Speech 200, 201, 202, 203	3
Philosophy 105, 125, 110, 161, 230, or 243	3
Foreign Language or Proficiency	12

(if proficiency in language is accomplished before the completion of 12 credits, electives taken in place of the language are to be chosen from a selected list of courses from the following areas: Zoology, Psychology, Speech, Sociology and Anthropology, Recreation and Physical Education, Education and Public Health)

Limited Electives to be chosen from the following areas: Anthropology, Art, Biological Sciences, Economics, Education, English or American Literature, History, Home Economics, Music, Physical Sciences 12

II. *Home Economics Core*

HEEd. 120, Introduction to Home Economics	1
FN 127, Man and Nutrition	3
TCEA 141, Man and Clothing	3
TCEA 123, Art for Living	3
MFE 250, Family Management and Decision Making	3

III. *Pre-Professional*

HEEd. 263, Art Activity in Recreation	3
Statistics 251 or 121	3
Sociology 292, Introduction to Social Welfare	3
Psychology 275, Exceptional Child *or* Psychology 325, Abnormal	3

Child Development

IV. *Professional*	*Credits*
HD 270, Child Development	3
Sociology 257, The Family *or* HD 380, Human Development in the Family	3
HD 383, 384, Nursery School Management	6
FN 373, Nutrition During Growth and Development	3
HD 272, Directed Nursery School Observation	2
HD 385, Student Teaching in the Nursery School	6
HD 390 or 391, Seminar in Human Development	1
HD 387 or 388, Problems in Human Development	3

V. *Electives* 9–12

SCHOOL OF HOME ECONOMICS

Dean: Professor Marion A. Niederpruem. Professor Reber; Associate Professors Cook, D. Davis, V. Davis, Hawes, Merchant, Nichols, Rust, Vaznaian; Assistant Professors Arnold, Knapp, Lojkin, McCullough, Myers, Sullivan, Troxell; Miss Banks, Mesdames Frazier, Jarvesoo, MacNeil.

FOOD AND NUTRITION (FN)

127 (27). Man and Nutrition.

Fundamentals of the science of nutrition and its role in contemporary life. Development of man's food habits encompassing psychological, social, racial, economic and geographical factors. 3 class hours. Credit, 3.

130 (30). Food Science and Preparation.

Chemical and physical properties of food related to preparation and preservation. Prerequisite, Chemistry 160 (33). 2 class hours, 1 3-hour laboratory. Credit, 3.

141 (41). Nutrition and Food Preparation.

Combines the fundamentals of nutrition with food preparation and meal planning to meet nutritional recommendations. Open only to students of Nursing. Prerequisite, Chemistry 112 (2). 2 class hours, 1 3-hour laboratory. Credit, 3.

156 (56). Food Preparation and Meal Planning.

Study of basic food principles, purchasing, preparation and meal planning. A survey course for non-major men and women. 2 class hours, 1 3-hour laboratory. Credit, 3.

251 (51). Meal Management.

Selecting foods, planning, preparing and serving meals; emphasis on management of time, money and energy. Open to Home Economics majors only. Prerequisite, FN 127 (27). 2 class hours, 1 3-hour laboratory. Credit, 3.

350 (92). Quantity Food Preparation.

Management of food production in institutions, quality control, recipe standardization, portion and cost control, menu planning and work simplification. Prerequisites, FN 251 (51) or Food Management 100 (33). 2 class hours, 1 4-hour laboratory. Credit, 4.

351 (91). Institutional Administration.

Principles of organization, management, sanitation, food service planning and equipment selection. 3 field trips. Prerequisite, FN 251 (51) or 156 (56). 2 class hours, 1 4-hour laboratory. Credit, 4.

352 (52). Advanced Nutrition.

Absorption, utilization and interrelationship of food nutrients. Factors and critique of methods for determining nutrient requirements. Prerequisites, FN 127 (27), 251 (51), Chemistry 220 (79), Zoology 135 (35). 2 class hours, 1 2-hour laboratory. Credit, 3.

360 (94). Experimental Foods.

Fundamental principles of food quality evaluation; development of independent research problem. Prerequisites FN 130 (30), Chemistry 160 (33) or permission of instructor. 1 class hour, 2 3-hour laboratories. Credit, 3.

372 (72). Quantity Food Purchasing.

Food distribution and merchandising processes as they influence the purchasing of food for food services. Prerequisites, Accounting 125 (25), Economics 125 (25). 3 class hours. Credit, 3.

373 (73). Nutrition During Growth and Development.

Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children. Prerequisite, FN 127 (27) or 352 (52). 3 class hours. Credit, 3.

375 (89). Nutrition in Disease.

Physiological basis for therapeutic diets in certain diseases. Current medical and nutrition literature used. Prerequisites, FN 130 (30), 352 (52), Chemistry 220 (79), Zoology 135 (35), or permission of instructor. 3 class hours. Credit, 3.

387 (97). Problems in Food.

Intensive study in some phase of Food. Prerequisite, permission of instructor. Credit, 1–3.

388 (98). Problems in Nutrition.

Intensive study in some phase of Food. Prerequisite, permission of instructor. Credit, 1–3.

389 (98). Problems in Institutional Administration.

Intensive study in some phase of Institutional Administration. Prerequisite, permission of instructor. Credit, 1–3.

390 (95). Seminar in Food.

Reports and discussion of current research studies in Food. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

391 (95). Seminar in Nutrition.

Reports and discussion of current research studies in Nutrition. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

392 (96). Seminar in Institutional Administration.

Reports and discussion of current research studies in Institutional Administration. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS (TCEA).

123 (23). Art for Living.

Exploration of the basic concepts of art in relation to the development of individual values. Illustrated lectures, field trips. 3 class hours. Credit, 3.

124 (24). Textiles I.

Introductory study of fibers, fabrics, finishes of textiles products related to their care and performance. 2 class hours, 1 2-hour laboratory. Credit, 3.

128 (28). Fundamentals of Clothing Construction.

Fundamental principles of clothing construction as a form of artistic expression. 1 class hour, 2 2-hour laboratories. Credit, 3.

141 (21). Man and Clothing.

The impact of clothing and textiles on the individual and society; the sociological, psychological and economic implications as seen in historical and contemporary perspective. Prerequisite, Sociology 101 (1) or Psychology 101 (1). 3 class hours. Credit, 3.

142 (42). Fashion in Retailing and Business.

Analysis of socio-economic factors underlying the distribution of fashion oriented commodities from producer to ultimate consumer. Prerequisite, Economics 125 (25). 3 class hours. Credit, 3.

253 (53). Advanced Clothing Construction.

Study of patterns and problems of fitting with opportunities for students to create original designs. Prerequisite, TCEA 128 (28), or permission of instructor. 1 class hour, 2 2-hour laboratories. Credit, 3.

265 (65). Apparel Design and Selection.

Basic criteria for selection and design of clothing for men, women and children. Prerequisites, TCEA 123 (23) or permission of instructor, Psychology 101 (1) or Sociology 101 (1). 3 class hours. Credit, 3.

266 (66). Apparel and Home Furnishing Accessories.

Factors involved in production, distribution, selection and evaluation of accessories: leather goods and furs, jewelry, ceramics, glassware, silverware, plastics and furniture. Study tours. 2 class hours, 1 2-hour laboratory. Credit, 3.

276 (76). History of Decorative Arts.

Style periods in their historic contexts, with emphasis on developments in furniture and furnishings. Illustrated lectures. Study tours. Prerequisite, TCEA 123 (23), or permission of instructor. 3 class hours. Credit, 3.

278 (78) Applied Textile Design.

A creative approach to textile art. Original designing which emphasizes principles of organization. Application to heighten the understanding in techniques and media. Prerequisites, TCEA 123 (23), or Art 120 (31), or by permission of instructor. 1 class hour, 1 4-hour laboratory. Credit, 3.

279 (79). Interior Design.

Principles of interior design as applied to coordinating furnishing, backgrounds, accessories, color and lighting. Prerequisite, TCEA 123 (23). 1 class hour, 4 studio hours. Credit, 3.

370 (86). Textiles II.

Analysis and evaluation of recent scientific and technical developments in fibers and finishes. Prerequisite, TCEA 124 (24). 3 class hours. Credit, 3.

374 (85). Fashion Industries.

Study of the development of foreign and domestic fashion industries with special emphasis on primary and secondary markets; evaluation of their importance to the economy. Prerequisite, Marketing 271 (71). 3 class hours. Credit, 3.

378 (88). Advanced Interior Design.

Creative approach to architectural space; rendering of interiors with emphasis on interpreting textures, light and form in perspective. Prerequisites, TCEA 123 (23), 279 (79), Art 200 (51), Ag. Eng. 261 (51) or equivalent. 1 class hour, 4 studio hours. Credit, 3.

380 (93). Retailing Field Experience.

Supervised work-study program including 7–8 weeks off-campus experience in cooperating stores; evaluation of student's training, experience and development. Prerequisites, Marketing 271 (71), TCEA 124 (24), 142 (42), 266 (66), 6–8 weeks prior selling experience and permission of the department. Credit, 6.

387 (97) or 388 (98). Problems in Textiles, Clothing and Environmental Arts.

Intensive study of some phase of Textiles, Clothing and Environmental Arts. Prerequisite, permission of instructor. Credit, 1–3.

390 (95) or 391 (96). Seminar in Textiles, Clothing and Environmental Arts.

Reports and discussion of current research studies in Textiles, Clothing and Environmental Arts. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

HOME ECONOMICS EDUCATION (HEEd.)

120 (20). Introduction to Home Economics.

Development, scope and character of home economics as a general and professional field of study; breadth and depth of professional opportunities. 1 class hour. Credit, 1.

261 (61). Communication by Demonstration Methods.

Adaptation of the learning process in the demonstration method of communicating. Prerequisites, Speech 101 (3), 6 credits in major area, or permission of instructor. 1 class hour, 2 2-hour laboratory periods. Credit, 3.

263 (63). Art Activity in Recreation.

Stresses creative growth of the individual. Adapted for those working in schools, playgrounds, camps, in recreational leadership and occupational therapy. Prerequisite, Psychology 101 (1). 2 class hours, 1 2-hour laboratory. Credit, 3.

381 (81). Adult Education in Home Economics.

Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement. Prerequisite, minimum 6 credits in major area. 2 class hours, 1 2-hour laboratory. Credit, 3.

382 (82). Curriculum and Methods in Home Economics.

Organization, scope and sequence of learning experiences in home economics education. Philosophy and content of curriculum, development of resource units, and methods of teaching. Prerequisites, Psychology 301 (56), 263 (66), and Education 251 (51). 4 class hours. Credit, 4.

387 (97) or 388 (98). Problems in Home Economics Education.

An intensive study of some phase of Home Economics Education. Prerequisite, permission of instructor. Credit, 1–3.

390 (95) or 391 (96). Seminar in Home Economics Education.

Reports and discussion of current research studies in Home Economics Education. Prerequisite, Junior standing. 1 class hour. Credit, 1.

HUMAN RELATIONS (HD)

270 (70). Child Development.

The study of the child from the development point of view. Emphasis is on interaction of heredity and environment on development. Prerequisites, Sociology 101 (1), Psychology 101 (1), or permission of instructor. 3 class hours. Credit, 3.

380 (80). Human Development in the Family.

The family as the dynamic setting for the development of the human being from conception to senescence, with consideration of roles and relationships at the various developmental stages. Prerequisites, Psychology 101 (1) and Sociology 101 (1). 3 class hours. Credit, 3.

383 (83). Nursery School Management.

Principles and methods of Nursery School Education. Directed experience in teaching and curriculum planning for three- and four-year-old children. Field trips. Prerequisites, HD 270 (70) or equivalent. 2 class hours, 2 2-hour laboratories. Credit, 3.

384 (84). Nursery School Management.

Continuation of 383 (83). Prerequisite, HD 383 (83) or permission of instructor. 2 class hours, 2 2-hour laboratories. Credit, 3.

387 (97) or 388 (98). Problems in Human Development.

Intensive study of some phase of Human Development. Prerequisite, permission of instructor. Credit, 1–3.

390 (95) or 391 (96). Seminar in Human Development.

Reports and discussion of current research studies in Human Development. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

MANAGEMENT AND FAMILY ECONOMICS (MFE)

250 (50). Family Management and Decision Making.

A presentation of the integrated nature of management in the family; concerns values and goals as reflected in decision making about family resources. 3 class hours. Credit, 3.

260 (60). Household Equipment.

Physical principles, construction, materials, and economic considerations underlying the selection, use and care of household equipment. 2 class hours, 1 2-hour laboratory period. Credit, 3.

274 (74). Consumer Attitudes and Demand.

Study of the motives, attitudes and expectations of consumer behavior as influencing variables operating within and on the market. Prerequisite, Economics 125 (25), Psychology 101 (1), Sociology 101 (1), or permission of instructor. 3 class hours. Credit, 3.

275 (75). Personal and Family Economics.

Analyzing financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society. Prerequisite, Economics 125 (25), or permission of instructor. 3 class hours. Credit, 3.

377 (77). Theory and Application of Management.

Theory and application of principles of effective home management: problem-solving applied to theoretical and practical situations. Prerequisite, MFE 250 (50). 2 class hours, 1 2-hour laboratory period. Credit, 3.

387 (97) or 388 (98). Problems in Management and Family Economics.

An intensive study of some phase of management or Family Economics. Prerequisite, permission of instructor. Credit, 1–3.

390 (95) or 391 (96). Seminar in Management and Family Economics.

Reports and discussion of current research studies in Management and Family Economics. Prerequisite, permission of instructor. 1 class hour. Credit, 1.

SCHOOL OF NURSING

MARY A. MAHER, *Dean*

MARY E. MACDONALD, *Associate Dean*

The basic nursing program is designed to prepare the qualified high school graduate for a career in professional nursing, as well as for the responsibilities of family and community life.

The program aims to equip the graduate with those understandings and skills which are needed to function effectively in beginning positions in a variety of nursing situations. These include the ability to provide competent nursing care to patients and families in the hospital, home and community; to participate with allied professional and citizen groups for the improvement of total health services to individuals and communities; to participate in organizing, planning and directing the work of nursing auxiliary workers. A foundation is laid for advanced study, through which the nurse may prepare for positions in a clinical specialty, teaching, supervision, administration, consultation and research.

During the first two years, the student builds an educational foundation upon which to base the more specialized portion of the program. Courses in the humanities and in the sciences—biological, physical and behavioral—are taken with other students on the campus.

The clinical aspects of the program are developed in the next two years, when instruction and correlated clinical practice are given in selected cooperating agencies by the nursing faculty of the University and the allied professional staffs of the cooperating agencies. These agencies include: the Springfield Hospital; the Wesson Maternity Hospital, Springfield; the Wesson Memorial Hospital, Springfield; the Northampton State Hospital; Springfield Adult Mental Health Center; the Visiting Nurse Association of Springfield, the Springfield Health Department; and other community health, educational and welfare resources.

The Bachelor of Science degree, awarded upon successful completion of this program, qualifies the graduate for State Board Examinations in Nursing. If achievement in these examinations is satisfactory, the candidate receives legal status as a registered nurse within the state.

The program is fully accredited by the Accrediting Service of the National League for Nursing.

PROGRAM SEQUENCE

FIRST YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111, English Composition	2	English 112, English Composition	2
Chemistry 111, General	3	Chemistry 112, General	3
Psychology 101, General	3	Zoology 101, Introductory	3
Sociology 101, Introduction	3	Elective*	3
Elective*	3	Speech 101, Oral Communication	2
Speech 101, Oral Communication	2	Nursing 100, Introduction	3
Physical Education 001a, 001b†	2	Physical Education 002a, 002b†	2

*Elective chosen from: History, Government, or Economics. Students wishing to elect a foreign language may do so providing the basic requirement of the six elective credits indicated above is fulfilled, prior to graduation. If a language is elected, intermediate proficiency is required.

**May be taken either semester.
†Not quality point credit.

SECOND YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125, Masterpieces of Western Literature	3	English 126, Masterpieces of Western Literature	3
Microbiology 150, Introductory	4	Chemistry 120, Introduction to Biochemistry	4
Zoology 137, Human Anatomy and Physiology	4	Zoology 138, Human Anatomy and Physiology	4
Human Development 380, Human Development in the Family	3	Food & Nutrition 141, Nutrition	3
Nursing 110, Fundamentals of Nursing I	3	Nursing III, Fundamentals of Nursing II	3
Physical Education 031a, 031b†	2	Physical Education 032a, 032b†	2

†Not quality point credit.

THIRD YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Nursing 200, Nursing of Child & Adult in the Hospital and Community I	7	Nursing 210, Nursing of Child & Adult in the Hospital I	7
Nursing 201, Nursing of Child & Adult in the Hospital & Community II	7	Nursing 211, Nursing of Child & Adult in the Hospital II	7
Electives*	3	Elective*	3

*Elective chosen from Behavioral Sciences.

FOURTH YEAR*

1st Semester	Credits	2nd Semester	Credits
Nursing 300, Maternal & Infant Nursing	7	Nursing 302, Nursing of the Adult in the Hospital I	7
Nursing 301, Nursing in the Community	7	Nursing 303, Nursing of the Adult in the Hospital II	7
Nursing 390, Professional Foundations of Nursing	2	Nursing 391, Senior Seminar	2
Electives**	3	Elective***	3

*Clinical nursing courses listed will be taken during first *or* second semester, depending on clinical rotation of individual student.

**Humanities Elective: Art, Music, English Literature, Foreign Language Literature, History, Philosophy.

***Elective: Student will be guided in her selection by her major advisor.

SCHOOL OF NURSING

Dean: Professor Mary A. Maher; Associate Dean: Professor Mary E. Macdonald; Professors DiMaggio, Gilmore; Assistant Professors Clarke, Condron, Kurkul, Smith, Walker; Miss Cahill, Miss Mather, Miss Nicholson, Miss Sexton, Miss Shepard.

100 (I) (II). Introduction to Nursing.

Designed to assist the individual student in her personal and professional adjustment to nursing. Enrollment limited to students of nursing. Credit, 3. Staff.

110 (25 (I). Fundamentals of Nursing I.

Aims at the acquisition of beginning knowledge and skills considered basic to an effective nurse-patient relationship. Selected experiences in the nursing care of the hospitalized adult are provided. Prerequisite, Nursing 100. Credit, 3. The Clinical Nursing Faculty.

111 (26) (II). Fundamentals of Nursing II.

A continuation of Nursing 110. Prerequisite, Nursing 110. Credit, 3. The Clinical Nursing Faculty.

200 (51) (I). Nursing of the Child and Adult in the Hospital and Community I.

Through concurrent study of the components of community health and selected health problems of children and adults, the student acquires the beginning competence and judgment necessary to administer comprehensive nursing care. Ex-non-hospitalized patients. Prerequisite, Nursing 111. Credit, 7. The Clinical Nursing Faculty, Medical, Pediatric and Allied Professional Staffs of the Springfield Hospital and other Community Health Agencies.

201 (52) (I). Nursing of the Child and Adult in the Hospital and Community II.

A continuation of Nursing 200. Prerequisite, Nursing 200. Credit, 7. The Clinical Nursing Faculty, Medical, Pediatric and Allied Professional Staffs of the Springfield Hospital and other Community Health Agencies.

210 (53) (II). Nursing of the Child and Adult in the Hospital I.

Selected health problems of hospitalized children and adults are emphasized. Includes an introduction to the role of the nurse in the treatment and prevention of mental illness. Clinical experience in the nursing care of patients with medical, surgical and psychiatric problems is provided. Prerequisite, Nursing 201. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital and the Northampton State Hospital.

211 (54) (II). Nursing of the Child and Adult in the Hospital II.

A continuation of Nursing 210. Prerequisite, Nursing 210. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital and the Northampton State Hospital.

300 (55) (I) (II). Maternal and Infant Nursing.

A study of the health needs of the mother and newborn infant throughout the maternity cycle. Clinical experience includes participation in the nursing care of mothers and infants in the home, out-patient department, hospital, and child health conference. Prerequisite, Nursing 211. Credit, 7. Maternal-Child Nursing, Public Health Nursing and Mental Health Nursing Faculty; Obstetrical, Pediatric and Allied Professional Staffs of the Wesson Maternity Hospital and other Community Health Agencies.

301 (57) (I) (II). Nursing in the Community.

The philosophy, purpose and scope of public health and public health nursing. The needs and problems of individuals and families in the area of health promotion and maintenance and the related responsibilities of the nurse are emphasized. Nursing practice includes experiences with selected individuals, families and groups served by an official and non-official public health nursing service. Prerequisite, Nursing 300. Credit, 7. Miss Kurkul, Mr. Wisnieski, Mental Health Nursing Faculty; the Professional Staffs of the Visiting Nurse Association of Springfield, the Springfield Health Department, and other Community Health Agencies.

302 (58) (I) (II). Nursing of the Adult in the Hospital I.

The nursing care of the adult with medical, surgical and psychiatric problems is included. Prerequisite, Nursing 211. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital, the Springfield Adult Mental Health Center, and other Community Health Agencies.

303 (60) (I) (II). Nursing of the Adult in the Hospital II.

The nursing care of hospitalized adults with multiple health problems is stressed. The principles of management, as related to the nursing care of patients in a hospital nursing unit, are taught. Clinical experience includes participation as a member and co-leader of the nursing team. Prerequisite, Nursing 211. Credit, 7. The Clinical Nursing Faculty, Medical and Allied Professional Staffs of the Springfield Hospital.

385 (97) (I), 386 (98) (II). Special Problems.

A study of special problems in selected areas of nursing specialization. For qualified Juniors. Credit, 1–2. Staff.

390 (95) (I). Proffessional Foundations of Nursing.

An exploration of the professional responsibilities and relationships of the nursing practitioner. Enrollment limited to senior students of nursing. 2 class hours. Credit, 2. Miss Macdonald.

391 (96) (II). Senior Seminar.

A seminar on the historical and social foundations and trends in nursing. Enrollment limited to senior students of nursing. 2 class hours. Credit, 2. Miss Macdonald.

387 (97) (I), 388 (98) (II). Special Problems.

A continuation of the junior seminar. For qualified Seniors. Credit, 1–2. Staff.

SCHOOL OF PHYSICAL EDUCATION

W. P. McGUIRK, *Dean* D. C. BISCHOFF, *Assistant Dean*

The School of Physical Education includes the Departments of Physical Education for Men, Physical Education for Women, Recreation, and Athletics. It offers a major in Physical Education and in Recreation.

PHYSICAL EDUCATION FOR MEN

Head of Department: Professor S. W. Kauffman. Professors Briggs, Zunic; Associate Professors Garber, Ricci; Assistant Professors Berquist, Cobb, James; Messrs. Barber, Beal, Brosky, Douglas, Gundersheim, Kjeldsen.

General Program

Each male freshman and sophomore student, unless exempted under certain conditions, must successfully complete four semesters of physical education and demonstrate his ability to swim as a requirement for his degree. The physical education requirement does not apply to those students excused by the University physician, veterans of at least 2 years of military service, and certain transfer students. Students may receive credit for physical education, during the sport in season, by becoming squad members of any freshman or varsity team. Freshmen who elect an athletic team sport for physical education credit must rejoin their class sections at the termination of the seasonal sport. Students may not participate in a given sport for credit for more than two semesters. All equipment except footwear is provided by the department. All general program students must provide their own tennis shoes.

Major Program

The major program leading to the degree of Bachelor of Science in physical education is designed to train the student for a career as a teacher of physical education. The curriculum combines both general and professional education and provides for full teacher certification for the student who has met the prescribed requirements of preparation. The program also provides for adequate training in a minor area of teaching, elected by the student, including the coaching of inter-school athletics.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111	2	English 112	2
Humanities, Elective	3	Speech 101	2
PE 121 Intro. to Phys. Ed.	3	Social Science Elective	3
PE 123 Princ. of Health Ed.	3	PE 122 First Aid & Safety	3
PE 105 Skills & Techniques (Lacrosse—Gymnastics)	1	PE 106 Skills & Techniques (Gym—Badminton—Volleyball)	1
Elect One		*Elect One*	
Chemistry 111	3	Chemistry 112	3
Botany 100	3	Botany 100	3
Zoology 101	3	Zoology 101	3
	15		14

SOPHOMORE YEAR

English 125	3	English 126	3
Zoology 135, Physiology	3	PE 142 Kinesiology	3
PE 141 Anatomy	3	Psych. 301 Educ. Psychology	3
Psych. 101 Gen. Psychology	3	PE 136 Skills & Techniques (Aquatics)	1
PE 135 Skills & Techniques (Soccer—Wrestling)	1	Electives	6
Elective	3		
	16		16

JUNIOR YEAR

Statistics 121	3	Psych. 261 Child Psych.	3
PE 253 Phys. Ed. Elem. & Second. Schools	3	PH 88 Epidemiology	3
PE 257 Coaching: Baseball	1	PE 254 Methods of Phys. Ed.	1
PE 261 Coaching: Basketball	1	PE 258 Coaching; Track	1
PE 259 Adapted Phys. Ed.	3	PE 260 Coaching: Football	1
PE 263 Skills & Techniques (Baseball—Basketball)	1	PE 274 Tests and Msmts. in Phys. Ed.	3
Electives	3–6	PE 264 Skills & Techniques (Games—Track)	1
		Electives	3–6
	15–18		16–19

SENIOR YEAR

*PRACTICE TEACHING BLOCK		Speech 201 Public Speaking	3
Ed. 252 Princ. and Methods of Teaching	3	PE 255 Org. & Adm. of PE	3
Ed. 388 Sec. Sch. Curriculum	3	PE 276 Philos. and Princ. Phys. Ed.	3
Ed. 385 Practice Teaching	6	PE 278 Physiology of Exercise	3
PE 281 Adm. Intramural Programs	1	PE 282 Coaching: Soccer	1
PE 283 Skills & Techniques (Golf—Tennis—Rhythms)	1	PE 284 Skills & Techniques (Elem.–Sec. Rhythms)	1
	14	Rec. 352 Org. & Adm.	3
			17

*Offered both semesters.

PHYSICAL EDUCATION FOR MEN

The following courses with the exceptions of 001a., 001b., 002a., 002b., 031a., 031b., 032a., 032b., are offered for majors in Physical Education. Non-major admission is only by permission of the Department.

001a (1a) 001b (1b) (I), 002a (2a) 002b (2b) (II). Physical Education.

105 (5) (I). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) lacrosse. (Unit 2) apparatus gymnastics. 60 clock hours per semester. Credit, 1.

106 (6) (II). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) tumbling and trampoling. (Unit 2) badminton. 60 clock hours per semester. Credit, 1.

121 (21) (I). Introduction to Physical Education.

Origins of physical education, fundamental concepts, current status in education, qualifications and professional opportunities in the field 3 class hours. Credit, 3.

122 (22) (II). First Aid and Safety.

Materials applicable to the immediate care of the injured, causes of accidents and procedures designed to develop desirable safety practices. 3 class hours. Credit, 3.

123 (23) (I). Principles and Practices in Health Education.

Principles of personal and community health, teaching techniques, materials and resources. 3 class hours. Credit, 3.

031a (31a) 031b (31b) (I), 032a (32a) 032b (32b) (II). Physical Education.

A continuation of 001a., 002a., 001b., 002b., 3 class hours.

135 (35) (I). Skills and Techniques.

Fundamental skills and techniques to teaching. (Unit 1) soccer. (Unit 2) wrestling. 60 clock hours per semester. Credit, 1.

136 (36) (II). Skills and Techniques.

Fundamental skills in life saving and water safety. Certification as American Red Cross Water Safety Instructor. 60 clock hours per semester. Credit, 1.

141 (41) (I). Human Anatomy.

A study of the gross structure and function of the human body. 2 class hours, 1 2-hour laboratory period. Credit, 3.

142 (42) (II). Kinesiology.

A study of the anatomical application basis to a thorough understanding of the mechanical problems in motor skills. Prerequisite, Physical Education 141. 2 class hours, 1 2-hour laboratory period. Credit, 3.

143 (43) (I). Officiating.

Techniques and practice in officiating major sports. 2 class hours. Credit, 2.

253 (53) (I). Physical Education in Elementary and Secondary Schools.

Modern materials and methods of teaching physical education in elementary and secondary schools. Prerequisite, Psychology 301 or 261. 3 class hours. Credit, 3.

254 (54) (II). Methods of Physical Education.

Laboratory experience in teaching individual, dual and team activities. Credit, 1.

255 (55) (I) (II). Organization and Administration of Physical Education.

A study of the basic problems in the organization and administration of physical education. 3 class hours. Credit, 3.

257 (57) (I). Methods and Materials; Coaching Baseball.

Development of individual skills and techniques of teaching and coaching baseball. 2 class hours. Credit, 1.

258 (58) (II). Methods and Materials; Coaching Track.

Development of individual skills and techniques of teaching and coaching track. 2 class hours. Credit, 1.

259 (59) (I). Adapted Physical Education.

Programs of developmental activities, suited to the interests and capacities of students with disabilities restricted from participation in activities of the general physical education program. Prerequisite, Physical Education 142. 3 class hours. Credit, 3.

260 (60) (II). Methods and Materials; Coaching Football.

Development of individual skills and techniques of teaching and coaching football. 2 class hours. Credit, 1.

261 (61) (I). Methods and Materials; Coaching Basketball.

Development of individual skills and techniques of teaching and coaching basketball. 2 class hours. Credit, 1.

263 (63) (I). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) baseball. (Unit 2) basketball. 60 clock hours per semester. Credit, 1.

264 (64) (II). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) high and low organization games. (Unit 2) track and field. 60 clock hours per semester. Credit, 1.

274 (74) (II). Tests and Measurements.

The statistical interpretation of data and the practical application of measurement to physical education. 3 class hours. Credit, 3.

275 (75) (I). Athletic Injuries; Prevention and Care.

The medical examination, techniques in support methods, therapeutic aids, clinical use of physiotherapy equipment. Prerequisite, Physical Education 142. 2 class hours, 1 2-hour laboratory period. Credit, 3.

276 (76) (I) (II). Philosophy and Principles of Physical Education.

Contemporary interpretations and critical analysis for the foundation of policies and program construction. 3 class hours. Credit, 3.

278 (78) (I) (II). Physiology of Exercise.

Application of the basic physiological concepts of the program of physical education, emphasizing the physiological effects and adjustments accruing from participation in physical activity. Prerequisite, Physical Education 142. 2 class hours, 1 2-hour laboratory period. Credit, 3.

280 (80) (I) (II). Driver Education.

Driver education and driver training at the instructor's level. Leads to certification as instructor in driver education and driver training. 2 class hours, 1 2-hour laboratory period. Credit, 3.

281 (81) (I) (II). Administration of Intramural Programs.

Objectives, tourney design, organization and administration of intramural programs. 2 class hours. Credit, 1.

282 (82) (I) (II). Methods and Materials; Coaching Soccer.

Development of individual skills and techniques of teaching and coaching soccer. 2 class hours. Credit, 1.

283 (83) (I). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) tennis. (Unit 2) golf. 60 clock hours per semester. Credit, 1.

284 (84) (II). Skills and Techniques.

Fundamental skills and techniques of teaching. (Unit 1) dance. (Unit 2) rhythms. 60 clock hours per semester. Credit, 1.

297 (97) (I), 298 (98) (II). Special Problems.

Presentation and discussion of research work in physical education, health, or athletics. 3 class hours. Credit, 3.

PHYSICAL EDUCATION FOR WOMEN

Head of Department: Professor Margaret A. Coffey. Associate Professors Hubbard, Ogilvie, Riggs, Wallace; Assistant Professors Reid, Rupp, Vendien; Misses Irvine, Staton, Struzinsky, Upton; Mrs. Kjeldsen, Mrs. Purnell.

General Program

Physical Education is required of all women students during their freshman and sophomore years. The courses are planned to provide recreative activity, to improve skills, to develop grace and efficiency and to increase health and vigor. The first and second year women students are required to take three class hours a week for a total of eight credits, one for each quarter of satisfactory work, and to pass a swimming test.

Major Program

The major course in physical education is planned to prepare women students for professional careers. Attention is given to preparing teachers for elementary and secondary schools in both physical and health education. Other areas for which the graduate will qualify are teaching sports and dance in social agencies, industrial plants, civic centers and camps. A foundation will be laid for specialization in graduate study. The curriculum gives a broad general background as well as the professional preparation. There is opportunity for concentration in both academic and activity of the student's choice.

Curriculum For Women's Physical Education

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111	2	English 112	2
History 100	3	Speech 101	2
Psych. 101, General	3	History 101	3
WPE 110, Health for Adults	2	Zoology 101	3
WPE 105, Introduction to Physical Education	2	WPE 106, Introduction to the Child through Physical Education	2
WPE 111, Skills	1	WPE 112, Skills	1
Select one	3	Select one	3

Chemistry 111 and 112 are required if students have not had chemistry in high school. Others may select from chemistry, physics, microbiology or foreign language.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125	3	English 126	3
PE 141, Anatomy	3	Sociology 101	3
PE 122, First Aid & Safety	3	REC 131, Camp Counseling	3
WPE 135, Skills	1	PE 142, Kinesiology	3
Music 101 or Art 115	3	WPE 130, Aquatics	2
Elective	3	WPE 130, Aquatics	2
		WPE 136, Skills	1
		Elective	3

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
WPE 273, History & Principles of Physical Education	3	PE 274, Tests & Measurements	3
Zoology 135	3	WPE 270, Organization & Administration of Physical Education	3
WPE 263, Analysis of Rhythm	3	Psych. 301, Educational	3
WPE 253, Physical Education in Elementary Schools	3	WPE 256, Methods & Principles of Health Education	3
WPE 251, Skill & Teaching Methods	2	WPE 252, Skills & Teaching Methods	2
Statistics 121	3	Elective	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Ed. 252, Principles & Methods	3	WPE 283, Adaptive Physical Education	3
Ed. 288, Secondard Schools	3	WPE 296, Seminar	3
Ed. 285, Practice Teaching	6	PE 278, Physiology of Exercise	3
WPE 261, Skills & Teaching Methods	2	WPE 262, Skills & Teaching Methods	2
		Elective	6

PHYSICAL EDUCATION FOR WOMEN

001a (1a) (I). Physical Education.

Students are required to pass a safety test in swimming. Except for this requirement all unrestricted students may select any activity which is offered. Fall season: archery, field hockey, folk dance, golf, gymnastics, lacrosse, life-saving, modern dance, swimming, tennis, volleyball. 3 class hours. Credit, 1.

001b (1b) (I). Physical Education.

Winter I season: badminton, ballroom dance, basketball, body mechanics, bowling, diving, fencing, folk dance, gymnastics, life-saving, modern dance, ski conditioning, swimming, synchronized swimming, tap dance, trampoline, volleyball. 3 class hours. Credit, 1.

002a (2a) (II). Physical Education.

Winter II season: same as course 001b together with skiing. 3 class hours. Credit, 1.

002b (2b) (II). Physical Education.

Spring season: archery, folk dance, golf, gymnastics, lacrosse, life-saving, modern dance, softball, swimming, synchronized swimming, tennis, volleyball. 3 class hours. Credit, 1.

105 (5) (I). Introduction to Physical Education for Women.

A brief survey of the various areas of physical education for all ages; the trends and opportunities in today's program. 2 class hours, one two-hour laboratory period. Credit, 2.

106 (6) (II). Introduction to the Child Through Physical Education.

A study of children as they take part in physical activities. 2 class hours, one two-hour laboratory period. Credit, 2.

110 (10) (II). Health for Adults.

Practical personal and community health problems for the consideration of young adults. 2 class hours. Credit, 2.

111 (11) (I). Skills.

Body mechanics, field hockey, tennis, gymnastics. 6 class hours. Credit, 1.

112 (12) (II). Skills.

Tap dance, gymnastics, softball, gymnastics. 6 class hours. Credit, 1.

130 (30) (II). Aquatics.

Techniques unique in the teaching of aquatics including the American Red Cross courses. 2 class hours, one two-hour laboratory period. Credit, 2.

031a, 031b (31a, 31b) (I), 032a, 032b (32a, 32b) (II). Physical Education.

The seasonal activities for sophomores are the same as in Courses 001a and 001b, 002a and 002b, with emphasis on perfecting techniques rather than learning the elementary skills. 3 class hours. Credit, 1.

135 (35) (I). Skills.

Soccer-Speedball, volleyball, modern dance, life-saving. 6 class hours. Credit, 1.

136 (36) (II). Skills.

Dance, basketball, lacrosse, child rhythms. 6 class hours. Credit, 1.

251 (51) (I). Skills and Teaching Techniques.

Field hockey, golf, gymnastics, basketball. The chief emphasis will be on teaching techniques; however, improvement in skill will be stressed. 6 class hours. Credit, 2.

252 (52) (II). Skills and Teaching Techniques.

Gymnastics, modern dance, folk dance, track and field. 6 class hours. Credit, 2.

253 (53). Physical Education for Elementary Schools.

Modern methods and material for teaching physical education in elementary grades. 2 class hours, one two-hour laboratory period. Credit, 3.

256 (56) (II). Methods and Principles of Health Education for Elementary and Secondary Schools.

To prepare students to teach health and hygiene in elementary and secondary schools. 3 class hours. Credit, 3.

261 (61) (I). Skills and Teaching Techniques.

Tennis, lacrosse, ballroom dance, bowling. 6 class hours. Credit, 2.

262 (62) (II). Skills and Teaching Techniques.

Gymnastics, badminton, gymnastics, archery. 6 class hours. Credit, 2.

263 (63) (I). Analysis of Rhythm.

The analysis of the rhythmic structure of music and its application to motor activity. 2 class hours, one two-hour laboratory period. Credit, 3.

270 (70) (II). Organization and Administration.

The organization of the school system, the role of the teacher, the necessary facilities and the program in physical education. 3 class hours. Credit, 3.

273 (73) (I). History and Principles of Physical Education.

A study of the principal methods of physical education throughout the western world and of the philosophical and scientific bases of learning and teaching as applied to physical education. 3 class hours. Credit, 3.

283 (83) (I) (II). Adapted Physical Education for Women.

The problems of exercise for girls who are restricted physically. 3 class hours. Credit, 3.

296 (96) (I) (II). Seminar.

The opportunity for specialized study in a chosen area of physical education with emphasis on practical application. 3 class hours. Credit, 3.

RECREATION

Head of Department: Professor William E. Randall. Assistant Professor Miss Frank, Mr. Willmann.*

Major Program

The department seeks to prepare men and women for positions involving administrative, supervisory and program leadership responsibilities in municipal recreation agencies, voluntary and youth-serving agencies, hospitals, and industrial and institutional organizations. The program is designed to provide opportunities for a general education, a knowledge and understanding of people and society, activity skills and resource knowledge, professional competency, and practical experience in various leadership situations.

In addition to completing the curriculum as described below, the student is required to:

1. attend a professional conference approved by the department;
2. participate in programming activities at the Student Union, with a scout troop, or in a similar setting approved by the department;
3. devote one summer (minimum of six weeks) to a recreation position, preferably with pay, in a camp, playground, or similar setting approved by the department.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 111, Composition	2	English 112, Composition	2
Speech 101	2	Statistics 121	3
Botany 100, Intro. Botany	3	Zool. 101, Intro. Zool.	3
Govt. 100, American Govt.	3	Soc. 101, Intro. to Soc.	3
Humanities Elective	3	M. P. E. 122, First Aid & Safety	3
Rec. 101, Intro. to Rec.	3	Rec. 111, Soc. Rec.	2
Gen. Phys. Ed.†	2	Gen. Phys. Ed.†	2
(Military or Air Science 111 (men)	1)	(Military or Air Science 112 (men)	1)

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125, Humane Letters	3	English 126, Humane Letters	3
Art 115, Intro. to Art or Music 101, Intro. to Music	3	Zool. 200, Natural History	3
Rec. 130, Group Leadership	3	Speech 246, Stage Direction	3
H. E. Ed. 263, Art Activity in Rec.	3	Soc. 101, Intro. to Soc.	3
Gen. Phys. Ed.†	2	Rec. 131, Camp Counseling	3
(Military or Air Science 125 (men)	1)	M. P. E. 136, Aquatics or W.P.E. 130, Aquatics	2
Elective	3	(Military or Air Science 126 (men)	1)

†Not quality point credit.
*On leave of absence.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
P. Health 261, Gen. & Com. San.	3	Rec. 351, Op. of Rec. Facil.	3
Soc. 251, Urban Soc. or Soc. 252, Rural Soc.	3	Psych. 286, Social Psych. Ed. 366, Audio visual Aids in Ed.	3
Soc. 275, Social Problems	3	English 337, Advanced Expository Writing	3
Electives	6	Electives	3

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Rec. 380, Practice Lead	6	Rec. 390, Concepts in Rec.	3
Rec. 352, Comm. Rec.	3	Speech 201, Extempore Speech	3
Rec. 351, Nature Rec.	3	Electives	9
Music 111, Elem. Music Theory	3		

101 (1) (I). Introduction to Recreation.

Fundamental concepts, current status, and established principles of recreation as a social force. Field trip. 3 class hours. Credit, 3.

111 (2) (II). Social Recreation.

Organization, leadership, and activity skills for the planning and conducting of social recreation programs. Field experiences. 1 class hour, 1 2-hour laboratory period. Credit, 2.

130 (25) (I). Group Leadership.

Foundations and tools for leadership. Successful leadership techniques for large and small groups such as clubs and committees. Field trips. 2 class hours, 1 2-hour laboratory period. Credit, 3.

131 (26) (II). Camp Counseling.

Operating procedures of organized camps. Camper guidance, program skills, and practical leadership experience. Two-night camping trip, plus one-day trip. 2 class hours, 1 2-hour laboratory period. Credit, 3.

251 (56) (II). Operation of Recreation Facilities.

Functions and methods for directors of community recreation and park facilities and of organized camps. Field trip. 3 class hours. Credit, 3.

351 (53) (I). Nature Recreation.

Contemporary programs, activity skills, and leadership techniques for recreation programs based upon the natural sciences. Prerequisite, Zoology 200, or consent of instructor. Field trips. 2 class hours, 1 2-hour period. Credit, 3.

352 (77) (I). Organization and Administration of Community Recreation.

Functions and methods for supervisors and assistant superintendents of various types of park and recreational agencies. Field trip. 3 class hours. Credit, 3.

380 (85) (I). Practice Leadership.

Professional field experience with an approved cooperating recreation agency appropriate to the student's career choice. Open only to majors in the concentrated senior block. Credit, 6.

385 (97) (I). Special Problems.

386 (98) (II). Special Problems.

Individual intensive study of an aspect of recreation and the presentation of results in written form. Credit, 2–3.

390 (96) (II). Concepts in Recreation.

Critical consideration of basic concepts and of current controversies and problems. 2 class hours. Credit, 2.

DEPARTMENT OF ATHLETICS

The following men coach intercollegiate athletics and intramurals: R. E. Bergquist, freshman coach of baseball; R. Bresciani, assistant director sports information; L. E. Briggs, coach of varsity soccer; J. L. Cobb, assistant coach of track; J. J. Delaney, assistant coach of football; C. B. Demers, head athletic trainer; J. C. Douglas, coach of wrestling; W. Footrick, coach of track and cross country; V. H. Fusia, coach of football; R. F. Garber, coach of lacrosse; C. S. Gladchcuk, Director of Intramurals and coach of golf; F. J. Glatz, assistant coach of football; J. Gundersheim, freshman gymnastic coach; E. Kjeldsen, varsity coach of gymnastics; S. R. Kosakowski, director of Stockbridge athletics and coach of hockey and tennis; J. A. Leaman, Jr., freshman coach of basketball and soccer; E. E. Lorden, coach of baseball; R. W. O'Connell, financial manager of athletics; J. Orr, coach of basketball; R. H. Page, director of sports information; J. R. Rogers, Jr., coach of swimming; T. S. Schmitt, assistant football coach; F. J. Shields, coach of freshman football and freshman lacrosse.

DEPARTMENT OF PUBLIC HEALTH

Chairman: Robert W. Gage, M. D. Professor Jerome Peterson, M.D.; Associate Professor Perriello; Assistant Professors Peters and Wisnieski; Mrs. Reinisch; also Mr. Iantosca and Mr. Snow, Division of Sanitary Engineering, Massachusetts Department of Public Health.

Students majoring in Public Health may select divisional classification in accordance with their special interests. The Department of Public Health offers programs leading to the Bachelor of Science degree in Environmental Health and the Bachelor of Science degree in Medical Technology. The Master of Science degree in Environmental Health is also offered.

PUBLIC HEALTH

The curriculum in public health is designed to prepare a student for a health career. Career opportunities are open in: (1) administration of health services; (2) basic sciences related to health; (3) environmental health services; (4) food and drug protective services; (5) health education; and (6) health information and communications. Students electing this major should complete the following courses during their sophomore year: Chemistry 127, Physics 103 and 104, Zoology 135 and Microbiology 150 or 250.

During junior and senior years the following courses should be completed: Chemistry 133, Public Health 381 and 390; Public Health 261, 262, 263, 384, and 388. Students planning graduate work in sanitary engineering must take Mathematics 109 and 110 before the end of their junior year. Supporting courses in other departments will be selected with the guidance of an adviser.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 101	2	English 102	2
Speech 103	2	Speech 103	2
Mathematics 101 or 102	3	Mathematics 107	3
Chemistry 101	3	Chemistry 102	3
Foreign language*	3	Foreign language*	3
Botany 101 or Zoology 101	3	Zoology 101 or 135	3
Phys. Ed. 001a, b†	2	Phys. Ed. 002a, b†	2

†Not quality point credit.
*If foreign language is elected, intermediate proficiency is required.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125	3	English 126	3
Chemistry 125	3	Microbiology 150 or Chem. 133	4
Physics 103	4	Physics 104	4
Zoology 135 or 137	3	Humanities* or Zoo. 138	3
Social Science*	3	Social Science*	3
Phys. Ed. 031a, b†	2	Phys. Ed. 032a, b†	2

†Not quality point credit.
*Minimum of 9 credits in social sciences and minimum of 6 credits in humanities.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Public Health 261	3	Public Health 262	3
Chemistry 133 or Micro. 250	4	Public Health 284	3
3 Electives*	9	Public Health 286	2
		2 Electives*	6

*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Public Health 263	3	Public Health 398	3
Public Health 381	3	Public Health 390	3
Public Health 397	3	Public Health 388	3
2 Electives*	6	2 Electives*	6

*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

JUNIOR AND SENIOR YEARS

Other Electives

Food Science and Technology	Dairy Sciences
Public Administration	Planktology
Engineering Drawing	Industrial Mycology
Engineering Geology	Entomology
Calculus	Food Analysis
Animal Hygiene	Veterinary Science
Elements of Meat Packing	Food Processing Engineering
Sanitary Engineering	Radio Chemistry

MEDICAL TECHNOLOGY

The curriculum in medical technology is recommended for young men and women who want to prepare for a profession offering a wide opportunity in occupational outlets. Medical technology graduates may be prepared for positions in medical laboratories, in federal, state and local health departments, and in commercial and research laboratories. The following programs are offered:

Option I. This curriculum will consist of a three-year academic program followed by a 12-month internship in an approved School of Medical Technology. After successful completion of the 12-month internship and after satisfying the requirements of the Department of Public Health, a student will receive a Bachelor of Science degree in Medical Technology. A total of 130 academic credits is necessary for graduation with this option.

FRESHMAN YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 101	2		English 102	2
Speech 103	2	or	Speech 103	2
Mathematics 101	3		Mathematics 102	3
Botany 101	3		Zoology 101	3
Chemistry 101	3		Chemistry 102	3
Foreign Language*	3		Foreign Language*	3
Phys. Ed. 001a, b†	2		Phys. Ed. 002a, b†	2
			Med. Tech. 101	1

†Not quality point credit.
*If foreign language is elected, intermediate proficiency is required.

SOPHOMORE YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 125	3		English 126	3
Chemistry 127	4		Chemistry 133	4
Elective (humanities)*	3	or	Elective (humanities)*	3
Elective (social science)*	3		Elective (social science)*	3
Zoology 137	4		Zoology 138	4
Phys. Ed. 031a, b†	2		Phys. Ed. 032a, b†	2

†Not quality point credit.
*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Chemistry 379	4	Public Health 388	3
Microbiology 250	4	Microbiology 280	4
Elective (social science)*	3	Elective	4
Elective	3	Elective	3

*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

SENIOR YEAR

During the fourth year students will serve a twelve-month internship in a hospital laboratory approved by the American Society of Clinical Pathologists and one with which the University of Massachusetts has reciprocal affiliation. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for Registry of Medical Technology. The student who begins hospital internship for credit toward a degree must complete the full year of hospital training in order to be granted any credit. The course of training must be consistent at all times with the curriculum formulated by the Board of Schools of Medical Technology as approved by the American Society of Clinical Pathologists, the College of American Pathologists, the American Society of Medical Technologists, and the Council on Medical Education and Hospitals of the American Medical Association.

Only those students who have a cumulative quality point average of 2.0 or above will be considered eligible for this option. If placement opportunities are limited, preference will be given to those students with superior over-all records.

The curriculum offered by the hospital staff of the approved, affiliated hospital shall have the following schedule:

Subject:	*Weeks*	*Lecture Hours*
Microbiology (Bacteriology, Parasitology, Mycology)	12	24
Chemistry	12	24
Clinical Microscopy (Urine, Spinal Fluid, Feces, etc.)	4	8
Hematology	10	20
Blood Bank and Serology	8	16
Histologic Technique	4	8
	50	100
Offered by University Staff:		
Seminar in Medical Technology 1	15	30
Seminar in Medical Technology 2	15	30

Total of Lecture Hours 165, equivalent academic credits 11.

Total of Clinical Hours 1,835, equivalent academic credits 30.

Performance in examinations and final grades will be processed by the University faculty. College credit will be based on the following conversion factors:

(1) The hospital internship consists of 50 weeks at 40 hours per week. An accumulation of 2,000 hours will be realized. (Two weeks of the 52 weeks are allowed for vacation or sick leave.)

(2) Fifteen lecture hours equal one credit.

(3) Sixty clinical hours equal one credit.
150 lecture hours 10 credits
1,850 clinical hours 30 credits

*Total Credits Senior Year = 40

1st Semester	*Credits*	*2nd Semester*	*Credits*
*Medical Tech. 300	15	*Medical Tech. 301	15
*Medical Tech. 302 (summer)	5	*Medical Tech. 303	5

Opinion II. This is a four-year academic program leading to a Bachelor of Science Degree. Following graduation the student will be assisted in arranging for a 12-month internship in an approved hospital laboratory school. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology. A total of 120 academic credits is necessary for graduation with this option.

FRESHMAN YEAR

1st Semester	*Credits*		*2nd Semester*	*Credits*
English 101	2		English 102	2
Speech 103	2	or	Speech 103	2
Chemistry 101	3		Chemistry 102	3
Botany 101 or Zoology 101	3	or	Botany 101 or Zoology 101	3
Foreign language	3	or	Foreign language	3
Mathematics 101	3		Mathematics 107	3
Phys. Ed. 001a, b†	2		Phys. Ed. 002a, b†	2

†Not quality point credit.

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
English 125	3	English 125	3
Chemistry 125	4	Zoology 250	3
Physics 103[1]	4	Physics 104[1]	4
Elective*	3	Elective*	3
Elective*	3	Elective*	3
Phys. Ed. 031a, b†	2	Phys. Ed. 032a, b†	2

†Not quality point credit.

[1]Strongly recommended.

*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Microbiology 250	4	Microbiology 280	4
Zoology[1] 137	3	Zoology[1] 138	3
Chemistry[2] 105	4	Chemistry[2] 252	4
Elective*	3	Elective*	3
Elective*	3	Elective*	3

[1]Zoology 135 may be substituted.
[2]Chemistry 133 may be substituted.
*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Microbiology 310	4	Public Health 394[1]	3
Zoology 269	3	Public Health 388	3
Chemistry 379	3	Public Health 390	3
Elective[1]	3	Elective[1]	3
Elective*	3	Elective*	3

[1]Microbiology 260 and Public Health 381 recommended as alternate courses.
*Minimum of 9 credits in social science and minimum of 6 credits in humanities.

261 (61) (I), 262 (62) (II). Environmental Health.

The influence of health measures on community welfare with emphasis on all phases of environmental health. 3 class hours. Credit, 3. Mr. Wisnieski.

263 (63) (I). Industrial Hygiene and Sanitation.

The practices and principles of industrial processes involved in industrial health and quality control. 3 class hours. Credit, 3. Mr. Perriello.

264 (64) (II). Microscopy of Water.

Microscopic forms of life exclusive of the bacteria. Counting and control of plankton in potable waters. Elements of limnology. Prerequisite, Microbiology 150. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Snow.

381 (81) (I). Applied Public Health Bacteriology.

Standard methods used in present day applied bacteriology. Subjects studied include: soils, dairy products, water and shellfish and air analysis. Prerequisite, Microbiology 150 or 250, permission of the instructor. 2 class hours, 2 2-hour laboratory periods. Credit, 3. Mr. Perriello.

384 (84) (II). Public Health Administration.

The organization, function, and administration of governmental health agencies; including public health laws, regulations, and sanitary codes, their origin and enforcement. 3 class hours. Credit, 3. Mr. Perriello.

386 (86) (II). Public Health Statistics.

Evaluation of environmental health practices using graphical summaries and biostatistical methods. Prerequisites, Public Health 261 and 262. 1 class hour, 1 4-hour laboratory period. Credit, 2. Mr. Wisnieski.

388 (88) (I) (II). Epidemiology and Communicable Disease Control.

The general principles of the spread of infections, supported through the study of the communicable diseases, grouped according to their mode of transmission. Prerequisite, Microbiology 150 or 250, or permission of instructor. 3 class hours. Credit, 3. Mr. Wisnieski.

390 (90) (II). Sanitary Bacteriology.

Public Health laboratory procedures including field collection of samples, stream pollution studies, food poisoning and infection, standard methods of food analysis. Prerequisite, Applied Public Health Bacteriology 281, or permission of instructor. 1 4-hour and 1 2-hour laboratory periods. Credit, 3. Mr. Perriello.

392 (92) (Summer). Supervised Field Training.

A thirteen-week field training program with an official agency under the supervision of the Staff. This is a prerequisite for professional placement. 13 weeks. Credit, 3–6.

394 (94) (II). Clinical Bacteriology.

A study of procedures used in clinical laboratory work. Prerequisites, Microbiology 310, Zoology 135 or 137, 138. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Staff.

397 (I), 398 (II). Problems.

Qualified seniors who have obtained permission from the department may arrange for independent work on special problems in Public Health. Credit, 3. Staff.

MEDICAL TECHNOLOGY

101 (II). Introduction to Medical Technology.

This course is designed to acquaint the student with the field of medical technology. Discussions, field trips, visiting lecturers and selected readings. Credit, 1. Mrs. Reinisch.

300 (I). Clinical Laboratory Practice.

Supervised training in affiliated, accredited hospital Schools of Medical Technology. Credit, 15.

301 (II). Clinical Laboratory Practice.

Supervised training in affiliated, accredited hospital Schools of Medical Technology. Credit, 15.

302 (Summer). Clinical Laboratory Practice.

Supervised training in affiliated, accredited hospital Schools of Medical Technology. Credit, 5.

303 (Summer). Clinical Laboratory Practice.

Supervised training in affiliated, accredited hospital Schools of Medical Technology. Credit, 5.

DIVISION OF MILITARY AND AIR SCIENCE

The Division of Military and Air Science includes the Department of Military Science and the Department of Air Science. No major is offered in either Department. However, participation in either the Army or Air Force ROTC program for four years will qualify an individual for a Reserve officer's commission. In addition participants who qualify for and desire a military career may be offered a Regular officer's commission in the Army or Air Force depending upon the program he pursues.

Representatives of both services are available on campus during each summer orientation period to answer questions. Freshmen entering an ROTC program do not obligate themselves during the first two years beyond the semester in which they are enrolled. However, credits earned will apply toward graduation. The time to make a decision concerning ROTC is before coming to the summer orientation so registration can be completed.

DEPARTMENT OF MILITARY SCIENCE (GMS)

Army Military Science courses prepare students for commissioning in the grade of Second Lieutenant in the Regular Army or in the U. S. Army Reserve. The program of general military subjects taught in the University of Massachusetts qualifies graduates for a commission in any of the branches or services of the Army. Thus, regardless of the academic major study program an entering Freshman plans, he will find appropriate leadership opportunities open to him in the modern Army upon his graduation and attainment of a commission. Cadets designated as Distinguished Military Students by reason of their achievement in academic and military studies, may apply for commissions in the Regular Army. Students who intend to continue their education in a graduate field may be deferred, upon application, from active service for periods up to three years after graduation. Army ROTC students are furnished items of uniform and military textbooks without cost.

The first two years of ROTC training are elective, the third and fourth years are both elective and selective in nature. The U. S. Army provides this latter group with a subsistence allowance and additional emoluments that amount to approximately $1000.00. All cadets are required to attend a six-weeks summer camp between their junior and senior years. For University of Massachusetts' cadets, this camp is usually held at Fort Devens, Mass.

In addition, qualified students may apply for Army Flight Training which can, in turn, qualify them for a private pilot's license. Extra curricular activities encompass Special Forces' training, a drill team, rifle and pistol marksmanship teams for those interested students.

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
MS 111 Fundamentals of Leadership National Defense Organization Familiarization with Military Weapons System	1	MS 112 Fundamentals of Leadership United States and National Security	1

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
MS 125 Military History of the U.S. Fundamentals of Leadership	1	MS 126 Fundamentals of Land Navigation Introduction to Tactical Concepts Fundamentals of Leadership	1

***JUNIOR YEAR**

1st Semester	*Credits*	*2nd Semester*	*Credits*
MS 251 Principles of Leadership Military Teaching Techniques	2	MS 252 Principles of Offensive and Defensive Combat Counterinsurgency Operations and Concepts Communications and Control Measures	2

SUMMER SESSION (6 WEEKS)

A period of training which permits the practical application of the academic subjects presented at the university. Included also are subjects which are not practical to teach at the institution. Normally cadets from the University of Massachusetts complete this training at Fort Devens, Massachusetts.

***SENIOR YEAR**

1st Semester	*Credits*	*2nd Semester*	*Credits*
MS 375 Military Logistics Tactical Concepts U.S. Role in World Affairs	2	MS 376 Military Law Army Administration	2

*Two academic subjects, selected from the following areas, must be completed by each students, one in his junior and one in his senior year.

a. Effective Communication
b. Science
c. General Psychology
d. Government

1st Semester	*Credits*	*2nd Semester*	*Credits*
MS 385 Special Problems	1 or 2	MS 386 Special Problems	1 or 2

MILITARY SCIENCE

Head of Department: Professor (Colonel) Albert W. Aykroyd, Assistant Professors (Major) Fowler, (Captain) McGinnis, (Captain) Nilsson, (Captain) Parker.

111 (11) (I). Introductory Military Science.

An introduction to National Defense, organization and officer procurement; a study of the research and development of military weapons and a familiarization of weapons fundamentals; fundamentals of leadership. 2 class hours, 1 laboratory period. Credit, 1.

112 (12) (II). Introductory Military Science.

A study of the evolution of U.S. military policy and the part the Army plays in the support of national policies; a continuation of the fundamentals of leadership. 2 class hours, 1 laboratory period. Credit, 1.

125 (25) (I). Basic Military Science.

A survey of American military history from the Revolutionary War to the Vietnamese War of 1962–1965, with emphasis on the principles of war, Civil War lessons in mobility, and the effect of guerilla tactics on present day warfare; leadership fundamentals. Prerequisites, Military Science 111 and 112, or equivalent credit as arranged by this department. 3 class hours, 1 laboratory period. Credit, 1.

126 (26) (II). Basic Military Science.

An introduction to the principles and fundamentals of contemporary military tactical concepts; a study of military land navigation and the application of the aerial photograph. Principles learned are applied in a series of practical exercises and classroom discussions; a continuation of leadership fundamentals. Prerequisite, MS 125. 3 class hours, 1 laboratory period. Credit, 1.

251 (51) (I). Advanced Military Science.

A study of the techniques of military instruction and the application of these techniques in classroom discussions and demonstrations; a study of the principles of military leadership and their application in the weekly laboratory period. Prerequisite, MS 126 or equivalent credit for previous military service or training. 3 class hours, 1 laboratory period. Credit, 2.

252 (52) (II). Advanced Military Science.

The principles of offensive and defensive combat are studied and an understanding is developed of the application of these to units of the infantry division brigade in a series of map exercises; a portion of this period is devoted to military communications and control measures. In addition the current techniques and concepts surrounding counterinsurgency operations are studied and applied to situation type problems. Prerequisite, MS 251. 3 class hours, 1 laboratory period. Credit, 2.

375 (75) (I). Advanced Military Science.

A continuation of the study of military tactical concepts and its application through classroom discussion and demonstrations. An examination of the U.S. role in world affairs as considered in light of U.S. national power and policies. The geographic-industrial bases of Western Europe, the Far East and the Red Bloc are considered. Prerequisite, MS 252. 3 class hours, 1 laboratory period. Credit, 2.

376 (76) (II). Advanced Military Science.

A study of the fundamentals of military law, their application by the unit commander and their relationship to Civil Law; a survey of Army administrative procedures. Prerequisite, MS 375. 3 class hours, 1 laboratory period. Credit, 2.

377 (77) (I or II). Army Flight Training.

An aeronautics course offered to eligible senior-year Army ROTC students who elect to serve as pilots in the U.S. Army. Students receive thirty-five hours of classroom instruction in meteorology, navigation, and Civil Air regulations and thirty-six and a half hours of flight instruction under supervision of the Federal Aviation Agency. Upon completion of this course and passing a FAA examination, cadets may receive a private pilot's license. Enrollment by arrangement with the Professor of Military Science. 2 class hours and 2 laboratory periods. Credit, 3.

385 (97) (I), 386 (98) (II). Special Problems.

Problems in military science for qualified advanced ROTC students. Independent work on special problems or pertinent intensive studies in military science. Enrollment by arrangement with the Professor of Military Science. Total credit may not exceed 2. Credit, 1 or 2.

DEPARTMENT OF AIR SCIENCE

Head of Department: Roy D. Simmons, Jr., Lt. Colonel, USAF, Head; Assistant Professors (Major) Perry, (Major) Bamber, (Captain) Close, (Captain) Gailey.

The mission of the Department of Air Science is to develop in select students those qualities of leadership and other attributes essential to their progressive advancement to positions of increasing responsibility as professional officers in the United States Air Force. The program provides excellent preparation for such a career and qualifies an individual for a Reserve Commission, or a Regular Commission if selected. Credits earned in the Department of Air Science are applied toward graduation requirements; and in addition thereto, Advanced cadets receive a retainer fee of $40.00 per month.

The first two years of the program, the Basic Course, are not obligatory and are designed to acquaint the student with the fundamentals of aerospace power. This background of knowledge will assist the student in his decision to continue the complete program, and become a commissioned officer.

The last two years of the program, the Advanced Course, and four weeks of summer training at an Air Force Base at the end of the Junior year, are designed primarily to enhance the professional knowledge and leadership capabilities of those individuals selected for officer training.

In the Basic Course, University core curriculum subjects are substituted for all Air Force ROTC subjects, except one. Contact with the student is maintained through one hour of class room activity and one hour of leadership laboratory per week. The Basic AFROTC Course is designed to build a foundation for leadership and aerospace age citizenship.

During the Junior and Senior years qualified cadets may participate in the AFROTC Flight Instruction Program, a course in aeronautics

offered those cadets eligible for and electing to serve as pilots or navigators in the United States Air Force. The course of instruction entails 30 hours of class room instruction and 36½ hours of flight instruction at no expense to the student. Cadets completing this course can apply for a private pilot's license.

The commissioned graduate serves on active duty for a period of not less than four years with one additional year required of those officers who complete Air Force flight training. If desired, the graduate may elect to serve for 20 years with retirement after that period at 50% of pay. Those cadets who are designated as Distinguished Air Force ROTC Graduates are awarded a Regular Air Force Commission, entitling them to a thirty year career with retirement after that period at 75% of pay.

At the time of bulletin publication, subject to approval, the following changes in the program were planned.

1. The four-year program as currently in effect would be continued, but with the implementation of scholarships. Those individuals qualified and selected for scholarships, in lieu of retainer fee, would receive financial assistance granting $50.00 per month. In addition, scholarships would defray tuition, laboratory fee and textbook expenses.

2. A two-year program would be established for those individuals unable, or not electing, to enroll in the four-year course. Cadets enrolled in the two-year program, normally completed during the Junior and Senior years, would not be eligible to receive scholarships. A Field Training Course in lieu of the Freshman and Sophomore Air Science curriculums would be established. Completion of this course would be required prior to enrollment in the two-year program.

3. The Freshman and Senior year curriculums would be revised.

The following courses, and at least one field trip per year, are required for completion of the Air Force ROTC program:

FRESHMAN YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
AS 111, Foundations of Aerospace Power I	1	AS 112, Foundations of Aerospace Power II	1

AND

*One of the following which may be completed in either semester:

English 111 or 113
Speech 101
Psychology 101 or 105

SOPHOMORE YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
AS 121, World Military Systems I	1	AS 122, World Military Systems II	1

AND

*One of the following which may be taken in either semester:
Economics 125 or 126
English 125 or 126
Sociology 101

JUNIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
AS 231, Growth and Development of Aerospace Power I	3	AS 232, Growth and Development of Aerospace Power II	3
		And in addition thereto for Category I-P, I-N Cadets	
		AS 233, Flight Instruction Program—Academic Phase	2

SUMMER (4 WEEKS)
Summer Training Unit

SENIOR YEAR

1st Semester	*Credits*	*2nd Semester*	*Credits*
Category I-N, II, III, IV Cadets		AS 342, The Air Force Officer	1
AS 341, Principles & Problems of Military Leadership	1	AND	
		*Geography 181	
*AND EITHER			
Government 254			
OR			
History 227			
Category I-P Cadets			
AS 343, Flight Instruction Program—Flight Phase	1		

And either Government or History as indicated above.
*Substitutions may be authorized by the Department of Air Science.

DEPARTMENT OF AIR SCIENCE

AS 111 (Air Science 11). Foundations of Aerospace Power I.

A survey of the mission and role of the United States Air Force and its component commands, an evaluation of the professional officer in the United States Air Force, and a study of the principles of leadership. One class hour, 1 laboratory period. Credit, 1.

AS 112 (Air Science 12). Foundations of Aerospace Power II.

An introduction to the fundamentals of aerospace power, the organization and operation of the military arm of the federal government, conflict in the Aerospace Age, and a continuation of the study of the principles of leadership. One class hour, 1 laboratory period. Credit, 1.

AS 121 (Air Science 25). World Military Systems I.

A comparative study of world military forces to include Free World land and naval forces and Free World air forces, and a study of the principles of leadership. One class hour, 1 laboratory period. Credit, 1.

AS 122 (Air Science 26). World Military Systems II.

A continuation of the study of world military forces to include Communist military systems, and trends in the development and employment of military power, and the principles of leadership. One class hour, 1 laboratory period. Credit, 1.

AS 231 (Air Science 51). Growth and Development of Aerospace Power I.

A survey course concerning the nature of war; development of airpower in the United States; mission and organization of the Defense Department; Air Force concepts, doctrine, and employment. Two 2-hour class room periods, on hour of which will be supervised research; and one hour of leadership laboratory. Credit, 3.

AS 232 (Air Science 52). Growth and Development of Aerospace Power II.

A survey course concerning astronautics and space operations; and the future development of aerospace power. Includes the United States space programs, vehicles, systems and problems in space exploration. Two 2-hour class room periods, one hour of which will be supervised research; and one hour of leadership laboratory. Credit, 3.

AS 233 (Air Science 74). Flight Instruction Program—Academic Phase.

An academic course in aeronautics offered those cadets eligible for and electing to serve as pilots or navigators in the United States Air Force. This course of instruction entails 30 hours of class room instruction. Completion of this course is adequate preparation for the Federal Aviation Agency written examination. 2 class hours and one hour of leadership laboratory. Credit, 2.

Summer Training Unit

An encampment of four weeks' duration designed to increase cadet proficiency in essential areas of junior officer training. Two encampments per summer are scheduled at a United States Air Force Base. Either the first or second encampment may be designated.

AS 341 (Air Science 77). Principles and Problems of Military Leadership.

Principles and techniques of leadership and management in the armed forces, with emphasis on the USAF. 1 class hour and one hour of leadership laboratory. Credit, 1.

AS 342 (Air Science 76). The Air Force Officer.

A study of Air Force administrative procedures; the responsibilities and obligations of the Air Force Officer; and rules of conduct of the armed services. 1 class hour and one hour of leadership laboratory. Credit, 1.

AS 343 (Air Science 75). Flight Instruction Program—Flight Phase.

An aeronautics course offered those cadets eligible for and electing to serve as pilots in the United States Air Force. This course of instruction provides a total of 36½ hours of flight instruction. Cadets completing this course can apply for a private pilot's license. Prerequisite: AS 233 or simultaneous enrollment. 3 laboratory periods and one hour of leadership laboratory. Credit, 1.

RELIGION

CHAPLAINS POWER, RUCHAMES, and SCOTT, *Advisors*

Although there is no department of religion at the University of Massachusetts, students interested in pursuing religion as an academic discipline have certain opportunities, both in curricular and co-curricular ways.

In the formal curriculum, courses are offered by several departments in the College of Arts and Sciences. Credit courses in history, such as those covering the ages of medieval civilization and of the Reformation, for example, afford systematic study into the religious institutions and movements of those periods. Similarly, those offered by the philosophy department in the Philosophy of Religion and in Oriental Philosophies provide a critical and constructive study of basic issues, in both the contemporary western world and Asia. Also, certain courses in other departments deal with matters of religion.

In addition to curricular work, students may learn from co-curricular programs of an academic nature offered by the Chaplains and the campus religious organizations. Each year classes (non-credit) are taught by the Chaplains and invited lecturers on topics such as Basic Beliefs and Practices of Judaism, Catholic Faith and Practices, Essentials of Protestant Christianity. Classes in Hebrew and Yiddish, study groups on various problems in campus living, and workshops on personal relations are also open to students.

The B'nai B'rith Hillel Foundation, the Protestant Christian Council, and the Newman Club frequently bring to the campus lecturers and scholars of national and international repute to speak at open meetings. Distinguished scientists, journalists, and government officials, as well as theologians and religious leaders, have come as guests of the religious organizations, and some provide leadership for large-scale events such as retreats, the Religious Embassy, and holy day observances. Lectures on religion are occasionally offered in a series of three or more under the leadership of well-known scholars and teachers. The educational and cultural programs of the campus religious organizations are open to all who are interested.

Scholarships

GENERAL SCHOLARSHIPS

Applicants for scholarships may be awarded University scholarships, undergraduate assistantships, or specific scholarships as follows:

University Scholarships. The Commonwealth of Massachusetts annually provides scholarships in varying amounts for members of each of the four undergraduate classes of the University. Upperclass students may obtain application forms from the Office of Placement and Financial Aid Services. Entering freshmen may obtain application forms from this office or from the Office of Admissions and Records. Recipients must be residents of Massachusetts.

Undergraduate Assistantships. The Commonwealth of Massachusetts provides money to be awarded to members of the sophomore, junior and senior classes of the University for a combination work-scholarship program. Students receiving such awards are required to work a minimum number of hours per week under faculty and staff members in research, statistics and other areas of academic professional activities. Recipients must be residents of Massachusetts.

Albert Pierpont Madeira Scholarship Fund. Established in 1964 to honor the memory of Albert Pierpont Madeira (1911-1964), Assistant Professor of English, a distinguished teacher and devoted friend of generations of students. The fund was established from an initial grant by the General Electric Company in the amount of $9,000, the sum won by a team of University scholars who successfully competed in the General Electric College Bowl over national television. Retiring as undefeated national champions, one of only 13 collegiate teams to do so out of more than 200 competing to that date, the four scholars — Susan Tracy '65, Michael Berrini '65, William Landis '65, and David Mathieson '64 — were coached for many months by Professor Madeira. Because Professor Madeira had expressed great faith in the team's ability to compete with opponents from institutions throughout the country, the team decided to appear on the program despite Professor Madeira's sudden death shortly before the date set for the first contest. After five successful appearances, the team was presented with the General Electric scholarship grant and an additional $1,500 from Gimbel's Department Store, New York. The total grant of $10,500, plus any other funds to be added thereto, is held as an endowed fund, the annual interest therefrom to be awarded in the form of scholarships to sophomores, juniors and seniors at the University who have been recommended by the Faculty on the basis of good scholastic performance and demonstrated services to the University and to their fellow students. Final selection of individual recipients is made by the Upperclass Sub-Committee of the University Committee on Financial Aid and Scholarships.

Alpha Sigma Phi Scholarship for needy students.

Danforth Keyes Bangs Scholarship for the aid of industrious and deserving students.

Lucius Clapp Fund to provide scholarships and loans to deserving students.

Foreign Student Scholarships. A limited number of scholarships, involving waiver of tuition fees only, awarded on basis of merit and need. Applications should be addressed to the Adviser to Foreign Students.

Henry Gassett Scholarship for a worthy undergraduate student.

Charles A. Gleason Scholarships. General Scholarship for worthy students.

Whiting Street Scholarship. Scholarships of $50 each for deserving students.

University Associate Alumni Scholarships. A limited number of scholarships awarded on the basis of leadership, need, scholarship and participation in extracurricular activities.

University Foundation Scholarships. A limited number awarded to needy scholars.

RESTRICTED SCHOLARSHIPS

George H. Barber Scholarship and Grant-in-Aid Awards. A limited number of scholarships or grants-in-aid based on evidence of outstanding athletic performance and good citizenship, need or high scholarship.

Class of 1882 Scholarship for the aid of a worthy student of the junior or senior class.

Frederick G. Crane Scholarships for the aid of worthy undergraduate students, preference given to residents of Berkshire County.

Stephen Davis Scholarship. Established by gift of Mr. and Mrs. Benjamin Davis of New York City in memory of their son, Stephen Davis, class of 1954, who lost his life while serving as an officer with the United States Air Force. For a male undergraduate majoring in Liberal Arts or Social Sciences who has participated in the athletic program. The selection of the recipient is made jointly by the Dean of the College of Arts and Sciences and by the Dean of the School of Physical Education. The student selected receives each year, not to exceed four years, the full income from the fund so long as he remains in good standing in the University and continues to major in Liberal Arts or the Social Sciences. Annual income is approximately $800.

Philip B. Hasbrouck Scholarship Fund. Established as an endowment fund through the generosity of the Class of 1910. Income from the fund is used for scholarships for certain deserving juniors and seniors studying a science essential to the national welfare, particularly physics. Students may obtain further information about the scholarship by inquiring at the Office of Placement and Financial Aid Services.

Interfraternity Council Scholarship. A $100 scholarship awarded annually to a member of one of the social fraternities. The recipient must show evidence of need. In addition, he must have a record of participation in extracurricular activities and have at least a 2.5 quality point average.

Betsey C. Pinkerton Scholarships. Two general scholarships for graduates of the schools in the city of Worcester.

Sigma Xi Scholarship Award. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of $100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

Wilbur H. H. Ward Scholarships. Twenty-five scholarships of approximately $100, known as the Wilbur H. H. Ward Scholarships. The Ward Fund is administered by a Board of Trustees independent of the University. Applicants for these scholarships write to Mrs. Marian R. Erush, Stockbridge Hall, University of Massachusetts, Amherst. They are available to Hampshire County men.

College of Agriculture

Alvord. For students specializing in the study of Dairy Husbandry or Dairy Manufacturing with the intention of becoming an investigator, teacher, or special practitioner in the dairy industry. Restricted to students who do not use tobacco or fermented beverages.

O. G. Anderson Memorial Fund. For needy and worthy students majoring in pomology. To be used for the purchase of books and supplies. Granted only on the recommendation of the Department of Plant and Soil Sciences.

Ascension Farm. For men students in the College of Agriculture. Residents of Berkshire County have preference, but awards may be made to students from Hampshire, Hampden, and Franklin Counties.

Berkshire County Farm Bureau Scholarship. The Berkshire County Farm Bureau is sponsor of a scholarship awarded yearly to a Berkshire County boy or girl as a means of assisting him or her to obtain a college education.

Boston Market Gardeners' Association. A $100 scholarship for a Sophomore in agriculture. Applications should be made to the Secretary of the Boston Market Gardeners' Association, 240 Beaver Street, Waltham 54, Massachusetts.

Boston Stewards' Club. Several scholarships for students majoring in Restaurant and Hotel Management. Awards are made on the basis of financial need and merit.

Buttrick. For junior, senior, or graduate students majoring in Dairy Industry or Food Science and Technology. Scholarships will range from $100 to $500 per year depending upon scholarship achievement and need.

H. B. Cantor Foundation. A $500 scholarship for a student who plans to make hotel management his career, awarded on the basis of financial need and merit.

Charles M. Cox Trust Fund Scholarship of $300 is awarded to a student or students in the College of Agriculture on the basis of need, character and scholarship ability. Preferably the scholarships will be awarded to undergraduate majors in dairy husbandry or poultry husbandry.

Lotta M. Crabtree. For students in the College of Agriculture. Based on scholarship and need.

The Arthur E. Dorr Scholarship. A $100 scholarship made available by the New England Association of Hotel and Restaurant Purveyors, awarded on the basis of financial need and merit.

J. W. D. French Fund. For students in dairy and forestry, and allied subjects.

Hampshire County Farm Bureau Scholarship. The Hampshire County Farm Bureau is sponsor of a scholarship awarded yearly to a Hampshire County boy or girl as a means of assisting him or her to obtain a college education.

Charles H. Hood Foundation. Awarded to two students in the College of Agriculture, with preference given to those studying the production of milk. Based on scholastic standing, character, industry, and personality.

Howard Johnson's. Two $500 scholarships for Stockbridge students and one $500 scholarship for a University student majoring in Restaurant and Hotel Management. Preference is given to children of Howard Johnson's employees and to those who have worked for the company.

Massachusetts Flower Growers' Association Scholarships. Two $200 scholarships awarded to qualified juniors or seniors majoring in Floriculture.

Margaret Motley. For a woman student majoring in Floriculture or Landscape Gardening. Need, scholarship, and promise of success form the basis of the award which is provided by the Garden Club Federation of Massachusetts, Inc.

New England Wholesale Food Distributors' Association. A $500 annual scholarship for agricultural students preparing for a career in the food distribution industry with preference given to students majoring in Agricultural and Food Economics. Award based on scholastic achievement, character and personality.

Porter L. Newton. For students majoring in Agriculture who are residents of Middlesex County.

Frank H. Plumb. For students majoring in the College of Agriculture.

Ralston Purina. A $500 Scholarship for a student majoring in Animal Science or Poultry Science.

V. A. Rice Scholarship Fund. A $100 scholarship for a worthy student majoring in Animal Husbandry.

Saga Food Service. Five $200 scholarships for students majoring in Restaurant and Hotel Management, awarded on the basis of need and merit.

Sears, Roebuck Foundation. Four scholarships for outstanding freshmen in the College of Agriculture, based on scholarship, leadership, personality, business ability, or special achievement. The outstanding freshman recipient is eligible for a special sophomore scholarship.

Springfield Garden Club. For students living in the vicinity of Springfield, Mass., and majoring in some phase of Horticulture.

Stouffer Foundation. Three $200 scholarships for students majoring in Restaurant and Hotel Management, awarded on the basis of financial need and merit.

Superior Motels. A $200 scholarship for a student majoring in Restaurant and Hotel Management who expects to make motel management his career.

Ellsworth Milton Statler Foundation Scholarships. Two $500 scholarships for students majoring in Hotel and Food Management. Students must be recommended by the University Scholarship Committee and approved by a Committee of the Statler Foundation. These scholarships may be awarded to either four-year or Stockbridge students.

George Treadwell. A $100 scholarship given by Worcester County Poultry Association to a needy and worthy student from Massachusetts who is majoring in Poultry Husbandry at the Stockbridge School of Agriculture.

School of Business Administration

National Food Brokers Association Scholarship. Four hundred dollars to be awarded to either an undergraduate or graduate student in the Department of Marketing who is interested in making a career in the food industry.

School of Engineering Scholarships

Alumni Scholarships. Provided by annual contributions from graduates and friends of the School of Engineering to provide scholarships to deserving and well qualified students pursuing work in a major field of engineering. They are available to freshmen and upperclassmen.

Kollmorgen Optical Corporation Tuition Scholarship. Awarded annually to a junior or senior student majoring in mechanical engineering. Awarded on the basis of need and superior scholastic attainment.

Western Massachusetts Section, American Society of Mechanical Engineers. Awarded annually to a junior or senior mechanical engineering student who is a legal resident of the area represented by the section. Awarded on the basis of need and scholastic attainment.

Military Scholarships

United States Air Force ROTC Scholarship. The Armed Forces Communications and Electronics Association will award one $500 scholarship annually to a Sophomore AFROTC cadet for undergraduate university study in Electrical, Electronics, or Communications Engineering, and/or Technical Photography.

College of Arts and Sciences

Richard W. Fessenden Memorial Scholarship. An award made to undergraduate students majoring in chemistry upon the recommendation of the department of chemistry. This award is made possible by donations from friends and former students of Dr. Fessenden, former professor of chemistry at the University.

Massachusetts City Manager's Association Scholarship. Tuition scholarship awarded by committee composed of the President of the City Managers' Association, the head of the department of government and the Director of the Bureau of Government Research, to an undergraduate or graduate student majoring in government.

Public Health Scholarships

Massachusetts Department of Public Health Scholarship. A scholarship in the amount of $300 made to an outstanding student in the field of bacteriology and public health.

Massachusetts Association of Sanitarians Scholarship. A scholarship in the amount of $100 made to an outstanding student interested in the general field of public health.

Massachusetts Milk Inspectors' Association. One or more scholarships, each in the amount of $100, made to outstanding students interested in the field of sanitation or milk sanitation.

Public Health Service Traineeship for graduates and undergraduates, one or more annually, complete expenses paid as a stipend.

William B. Palmer Scholarship for juniors and seniors majoring in Sanitary Science or Public Health, $300 annually (The International Association of Milk and Food Sanitarians).

SCHOOL OF HOME ECONOMICS

Berkshire County Women's Advisory Council Scholarship. For a student majoring in Home Economics who is a resident of Berkshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Minnie R. Dwight Scholarship. For a student majoring in Home Economics who is a resident of Hampden County. This scholarship is awarded for four years if scholarship is maintained.

Mrs. Clifton Johnson Scholarship. For one or more Home Economics students who are residents of Hampshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Helen Knowlton Award and Scholarship. The award is for the highest ranking senior Home Economics student. Scholarships are for other deserving Home Economics students.

Massachusetts Home Demonstration Council Scholarship. For a Home Economics student at Framingham State Teachers College or the University of Massachusetts.

Sears, Roebuck Foundation Scholarships. For two incoming freshmen. Recipients are selected by the School of Home Economics from applications filed with the University Committee on Financial Aid and Scholarship. The basis for this award is high scholastic record, qualities of leadership and interest in Home Economics as a career.

Stouffer Restaurant Corporation Scholarship. For a Home Economics student majoring in Food and Nutrition.

Mildred Thomas Scholarship. For a student majoring in Home Economics at Regis, Simmons, State College in Framingham, or the University of Massachusetts. The applicant must be a resident of Worcester County and have completed the freshman year.

Helen A. Whittier Award. For a senior Home Economics student selected on basis of scholarship, need, and character.

4-H Scholarships

Cotting Memorial Scholarship. All college expenses of freshman year — for a woman student. Recipient of this scholarship is selected by a committee of the New England Branch of the Farm and Garden Association from among candidates proposed by State Leaders of 4-H Club work in the New England states.

Esso Scholarship. This scholarship of $800 is awarded to a freshman enrolled in the College of Agriculture. The recipient receives $200 during each of the four years he is enrolled. Applications for this scholarship must be submitted to the State 4-H Club Leader.

George L. Farley Scholarships. The Massachusetts Society for Promoting Agriculture has established a scholarship in memory of George L. Farley. The income of approximately $60 per semester is awarded to deserving 4-H Club members, men or women, recommended by the State Leader of 4-H Clubs from applications submitted by County 4-H Club Agents.

Scholarships for Women Students Only

Chi Omega Award. The local chapter of the Chi Omega Sorority offers an annual scholarship of $25 to a woman student majoring in the department of economics or psychology who has the highest scholastic average at the end of the first semester of the senior year.

Greater Springfield Panhellenic Association Award. This award is given each spring for use in the sophomore, junior, or senior year to a woman student from Western Massachusetts. The award is based on scholarship and need, character and evidence of leadership in campus activities.

Scholarships Abroad

Many U. S. Government, private foundations, and foreign government scholarships are available to qualified seniors for graduate studies abroad. Interested students should get an early start in language competence and in maintaining academic excellence. Several campus committees screen students for Fulbright Scholarships, Danforth Fellowships, Woodrow Wilson Fellowships, etc.

Applicants are usually considered in October of the senior year. Specific deadlines are posted on campus bulletin boards. The Office of Placement and Financial Aid Services maintains a library of up-to-date information about such scholarships.

Honors, Prizes and Awards

Scholastic Prizes

PHI KAPPA PHI AWARDS FOR SCHOLARSHIP. The University of Massachusetts chapter of Phi Kappa Phi, national all-university scholastic honor society, annually presents substantial monetary awards to the outstanding scholar or scholars of each of the three upper classes. These awards, based upon cumulative scholastic averages and character, are presented at the Honors Banquet in the spring.

THE BURNHAM PRIZES. These were made possible through the generosity of Mr. T. O. H. P. Burnham of Boston. Prizes of $25 and $15 are awarded through the Department of Speech to those students delivering the best and second best oral interpretation of literature in the Burnham Contest. Preliminary contests are open under certain conditions to freshmen and sophomores.

THE FLINT PRIZES. The Flint Speaking Contest was established in 1881 by a gift of the late Charles L. Flint, a former president of the College. After his death the prizes were continued by college appropriation. Awards of $25 and $15 are presented through the Department of Speech as first and second prizes respectively to those two upperclassmen delivering the best extemporaneous speeches in the contest.

HILLS BOTANICAL PRIZE. This is given through the generosity of Henry F. and Leonard M. Hills of Amherst for the first and second best herbaria. Competition is open to members of the senior, junior and sophomore classes. First prize is $20, second prize $15.

MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE PRIZES. Three prizes of $25, $15, and $10 are awarded to those senior students who are judged to have made the best record in a speaking contest held in March.

SIGMA XI SCHOLARSHIP AWARD. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of $100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

BETTY STEINBUGLER PRIZE IN ENGLISH. This prize was endowed by John L. Steinbugler, New York City, in honor of his daughter, Elizabeth Steinbugler Robertson, a graduate of this University in 1929. It is awarded to a woman in the junior or senior class who has written the best long paper on a subject of literary investigation in a course in English during the year.

L. R. WILSON AWARD IN GEOLOGY. This award, named in honor of the former head of the Geology Department, is conferred on the graduating senior with an outstanding academic record as a major in geology.

PHILIP B. HASBROUCK SCIENCE AWARD. This award was established by the Class of 1910 to honor an outstanding instructor, once head of the Department of Physics. It is intended to encourage superior scholarship in an exacting science essential to the national welfare. The award is made annually to a junior or senior majoring in Physics, upon recommendation of the Department of Physics.

Athletic Awards

CHESTER F. BOWEN JR. MEMORIAL AWARD. The class of 1949 presented the Chester F. Bowen Jr. Memorial Award in track and cross-country to the University as its class gift. Members of the class felt that this gift would be a fitting memorial to a former classmate and a worthy award for the outstanding athlete in varsity track and cross-country.

SAMUEL S. CROSSMAN MEMORIAL TROPHY. This award is made to a member of the senior class who must have received two varsity awards, had an above average academic record, possessed qualities of enthusiasm, cooperation, leadership, and be recognized as the outstanding student-athlete on the campus. The award established by the University Athletic Council, is dedicated to the memory of Samuel S. Crossman and consists of a trophy upon which the name of the student chosen is inscribed. A small replica is presented for his permanent possession.

L. L. DERBY AWARD. This plaque is presented by the Alumni Varsity M Club each year at its Commencement meeting to that member of the track team considered to have been the most valuable member of the team during the past season.

EASTERN COLLEGE ATHLETIC CONFERENCE AWARD. This award is designed to honor the student having a combined record of academic and athletic excellence at each Conference member college. The E.C.A.C. is composed of 114 colleges and universities located in the eastern section of the United States.

THE WILLIAM T. EVANS MEMORIAL TROPHY. This trophy is given each year to that member of the varsity football team who through his sportsmanship, football ability, character and personality, has exemplified the character and spirit of the person in whose memory this memorial trophy is dedicated. The trophy is dedicated to the memory of William T. Evans, a former member of the class of 1942, who died December 9, 1941. This trophy is presented annually by the class of 1942.

GOLF AWARD. Presented to the most valuable member of the Golf Team as chosen by the letter men of the squad.

GYMNASTICS CUP. Awarded to the most valuable member of the Gymnastics Team.

HOCKEY AWARD. Awarded annually at the Commencement meeting of the Varsity Club to that member of the hockey team who is considered to have been the most valuable player on the team.

THE JOSEPH LOJKO MEMORIAL PLAQUE. Presented to a senior three-sport letter man, having a satisfactory scholastic record and showing those qualities of enthusiasm and cooperation which make for leadership. It is awarded in honor of Joseph Lojko of the Class of 1934, outstanding athlete who died while a senior in the College.

MANAGER OF THE YEAR AWARD. The Athletic Association awards a gold plaque to that varsity sports manager who has demonstrated initiative and proficiency in managerial duties.

PISTOL MEDAL. Awarded on a point basis to a member of the varsity team.

THE ALLAN LEON POND MEMORIAL MEDAL. Awarded for general excellence in football in memory of Allan Leon Pond of the class of 1920, who died February 26, 1920. He was described as "A congenial companion, a devoted lover of Alma Mater, a veteran of World War I, a fine all-around athlete and a true amateur. He would rather win than lose, but he would rather play fair than win." He has been characterized as a typical student of the University.

RIFLE AWARD. Awarded on a point basis to the outstanding member of the varsity rifle team.

PAUL SEARS PUTNAM MEMORIAL TENNIS TROPHY. Awarded to that member of the varsity tennis team who has displayed by his conscientious endeavor, clean play, good sportsmanship and all-around ability as an athlete and scholar, that he is a credit to his team and University. The recipient shall have his name inscribed on the trophy. He shall also be presented with a suitable medal or watch charm. The trophy is established in memory of Paul Sears Putnam, '38, by

the members of his family, in the hope that it will stimulate and encourage students to emulate his characteristics of whole-hearted enthusiasm and good sportsmanship, true cooperation and the constant endeavor to always give to the best of their ability in any project they may undertake.

GEORGE HENRY RICHARDS MEMORIAL CUP. Awarded annually to the member of the basketball team who shows the greatest improvement in leadership, sportsmanship, and individual and team play during the year. It is in memory of George Henry Richards of the Class of 1921 who died suddenly while a student at the College.

SAMUEL B. SAMUELS BASKETBALL CUP. Presented annually in the name of Samuel B. Samuels of the Class of 1925 who was an outstanding basketball player during the early years of basketball as a varsity sport at the University. The trophy is awarded to that letter man who is a regular member of the varsity team and who has performed with excellence during scheduled varsity games.

MAURICE SUHER SOCCER PLAQUE. Awarded annually to that letter man of the varsity team deemed to have been the most valuable member of the team. It is presented to the University by Maurice Suher of the class of 1930, who was one of the two students largely instrumental in having soccer recognized as a varsity sport at the University. He played on the first varsity soccer team at the University of Massachusetts, in the fall of 1929.

SPORTS DAD AWARD. The Sports Dad Association was formed in 1958 and consists of fathers of all varsity athletes. This association awards three trophies to outstanding athletes for scholastic achievement and athletic excellence.

SWIMMING TROPHY. Awarded to the most valuable member of the varsity swimming team.

E. JOSEPH THOMPSON MEMORIAL TROPHY. This baseball trophy is given by Thomas Thompson in memory of his brother, E. Joseph Thompson who graduated from Massachusetts State College in 1932. He was president of the Student Senate, a varsity letter man in football and baseball, and an outstanding campus citizen. The award goes to that member of the varsity baseball team who best exemplifies the most admirable characteristics of the sport each year.

WRESTLING TROPHY. Awarded to the most valuable member of the varsity wrestling team.

MILITARY AND AIR SCIENCE HONORS AND AWARDS

Leadership, scholarship, and proficiency in the work of the Military and Air Science departments are recognized by honors and awards announced at the Annual Spring Review in May or at other ceremonies during the year.

DEPARTMENT OF MILITARY SCIENCE

DISTINGUISHED MILITARY STUDENTS. Members of the first year advanced course who, as designated by the Professor of Military Science, possess outstanding qualities of leadership, high moral character, and definite aptitude for military service. Students so designated must possess an academic standing in the upper half of their class or stand in the upper ten per cent of their class in military subjects. All distinguished military students are authorized to wear the Distinguished Military Student Badge.

DISTINGUISHED MILITARY GRADUATES. Members of the graduating class who were previously designated as Distinguished Military Students, who have maintained the same high standards required for such designation, and who have successfully completed training at the Reserve Officers' Training Camp.

SILVER STAR FOR ACADEMIC EXCELLENCE. Awarded to those cadets who maintained a University academic average of over 3.0 for the previous semester. The award is authorized for wear only until the next semester grades are published.

GOLD STAR FOR ACADEMIC EXCELLENCE. Awarded to those cadets who maintained a University academic average of between 2.5 and 3.0 for the previous semester. The award is authorized for wear only until the next semester grades are published.

MILITARY PROFICIENCY RIBBON. Awarded to those cadets superior in military knowledge each semester. To be eligible for this award a basic-course cadet must be in the upper third of his military class and found superior in military bearing. Advanced-course cadets must be in the upper half of their class and found superior in military bearing. The award is authorized for wear only until the next semester grades are published.

ARMED FORCES COMMUNICATIONS ASSOCIATION HONOR AWARD. Awarded by the Armed Forces Communications Association to the outstanding senior ROTC cadet majoring in electrical engineering. The winner is presented with an appropriately engraved gold medal and scroll.

MILITARY SCIENCE FACULTY AWARD. Awarded by the Military Science faculty to the Advanced Course Flight Trainee who has demonstrated outstanding qualities of scholarship, military proficiency and flight proficiency.

RESERVE OFFICERS ASSOCIATION AWARD. Awarded by the Reserve Officers Association of the United States, Massachusetts Department, to the Senior Army ROTC cadet who is outstanding in military proficiency. The winner's name is engraved on a plaque, and a medal, appropriately engraved, is given by the Massachusetts Department. An award is also presented to the individual by the Amherst Chapter.

ELIZABETH L. McNAMARA TROPHY. Awarded in honor of Mrs. Elizabeth L. McNamara, a former trustee of the University of Massachusetts, to the Army ROTC cadet ranking first in scholarship in the second-year basic course. The winner's name is engraved on a plaque and a sterling silver goblet, appropriately engraved, is given to the individual.

AMHERST LIONS CLUB AWARD. Awarded by the Amherst Lions Club to the Military Science Cadet who contributed the most to the Army ROTC Brigade.

DEPARTMENT OF THE ARMY AWARDS. The Department of the Army awards annually the Superior Cadet Ribbon with certificate and lapel device to one outstanding student in each academic class. The winner of the award must be in the upper one fourth of his academic class and be selected by the PMS and Dean of Men.

JOHN C. HALL TROPHY. Awarded annually to the second-year basic course student who ranks number one in military proficiency. The winner's name is engraved on a loving cup on display in the military offices. A cordial type sterling silver goblet appropriately engraved is presented to the winner.

ASSOCIATION OF THE UNITED STATES ARMY MEDAL AND CERTIFICATE. Awarded annually by the publishers of Army Magazine to the Junior Cadet who has demonstrated outstanding qualities of leadership and efficiency.

CHICAGO TRIBUNE AWARDS. Awarded annually to two Military Science I and Military Science II cadets. The recipients must be members of the Bay State Special Forces who have demonstrated outstanding qualities of leadership and military proficiency.

SOCIETY OF AMERICAN MILITARY ENGINEERS AWARD. A gold medal presented annually by the Society of American Military Engineers to the outstanding engineering student enrolled in advanced Military Science.

DEPARTMENT OF AIR SCIENCE

DISTINGUISHED AFROTC CADET BADGE. Awarded to students completing the second-year advanced course who possess outstanding qualities of character, leadership, and definite aptitude for military service as Distinguished AFROTC Cadets.

DISTINGUISHED AFROTC GRADUATES. Each year the Professor of Air Science will designate the Distinguished AFROTC Graduates from those Distinguished AFROTC Cadets who have completed the advanced course and who will receive their baccalaureate degree. The Distinguished AFROTC Graduates are eligible for a regular Air Force Commission.

CHICAGO TRIBUNE AWARDS. Awarded to four outstanding cadets whose qualifications include military achievement, scholastic achievement, possession of strong moral character befitting a potential Air Force officer, and expression of a sustained desire for an Air Force commission. The awards are engraved gold and silver medals.

GENERAL DYNAMICS AWARD. Awarded to an outstanding Air Science 2 cadet who has been selected for the Advanced Course. The award consists of a plaque with a special name plate.

AIR FORCE ASSOCIATION AWARD (DETACHMENT). Awarded by the Air Force Association to the cadet recommended by the Professor of Air Science as the outstanding Air Science 4 cadet in the Advanced Course. The award consists of a silver medal and ribbon.

RESERVE OFFICERS' ASSOCIATION MEDAL AND CERTIFICATE. Presented annually to an outstanding Air Science cadet who possesses characteristics contributing to leadership and who has attained a grade average of "A" in Air Force ROTC subject matter. The award consists of a gold medal with certificate.

SONS OF THE AMERICAN REVOLUTION MEDAL. Presented to an Air Science 1 cadet who has shown firm belief in, knowledge of, and a positive attitude toward the Constitution of the United States of America; who has maintained a grade average of "A" in Air Force ROTC subjects; and who has expressed and demonstrated an interest in both the Advanced Course and in duty as an Air Force officer. The award consists of a bronze medal with a ribbon service bar.

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION AWARD. Presented annually to an outstanding Air Science 4 cadet majoring in Electrical, Electronics, or Communications Engineering. The award consists of a gold medal and a certificate of recognition.

AIR FORCE ROTC COMMANDANT'S AWARD (STU). The award is presented annually to the most outstanding cadet at each Summer Training Unit. All cadets attending a Summer Training Unit are eligible to compete. The award consists of a silver medallion and a ribbon. A letter signed by the Summer Training Unit commander also is presented.

AIR FORCE ROTC VICE COMMANDANT'S AWARD (STU). Presented annually to the most outstanding cadet of each flight at each Summer Training Unit. All cadets attending a Summer Training Unit are eligible to compete. The award consists of a certificate signed by the Vice Commandant, Air Force ROTC, and a ribbon.

AIR FORCE ASSOCIATION AWARD (AREA). Presented to the outstanding area cadet previously awarded the Air Force Association Award (Detachment). Selection is made by the Area Commandant. The award consists of a citation presented at the time of the annual Arnold Air Society National Conclave.

LEGION OF VALOR BRONZE CROSS OF ACHIEVEMENT AWARD. The Legion of Valor makes the award annually to one Air Science 3 or 4 cadet in each geographical area, based on his performance and achievements as an Air Force ROTC cadet through Air Science 3, including completion of Summer Training. The award consists of a Bronze Cross and Certificate.

AIR COMMAND AND STAFF COLLEGE AWARD. Presented annually to the Air Science 4 cadet selected as the outstanding cadet in the nation. The winner will be selected from cadets previously chosen as recipients of the Legion of Valor Bronze Cross of Achievement Award and/or the Air Force Association Area Award. The award consists of a certificate and a selection of professional reading material.

SOCIETY OF AMERICAN MILITARY ENGINEERS ROTC AWARD. Awarded by the Society of American Military Engineers to the Air Science cadet who is the outstanding engineering student of the year in his group in the AFROTC unit, as recommended by the Dean of the School of Engineering and the Professor of Air Science.

AIR FORCE TIMES AWARD. Presented annually to one graduating AFROTC cadet who has distinguished himself by contributing materially to constructive public attention for his cadet corps. The award consists of a Certificate of Merit and a 12-month subscription to the Air Force Times newspaper.

NATIONAL DEFENSE TRANSPORTATION ASSOCIATION AWARD. Presented to an Air Science 4 cadet who will potentially qualify for a baccalaureate degree in Business Administration. His degree qualifications must include 25 semester hours in courses related to air and/or surface transportation. He must also have demonstrated outstanding leadership qualities, academic achievement, aptitude for military service, and meritorious achievement and noteworthy service in the promotion of preparedness for national defense of the United States. The award consists of a silver medal.

AIR FORCE ROTC MARKSMANSHIP AWARD (STU). Presented annually to the cadet attaining the highest marksmanship score in small arms at each of the various Summer Training Units. The award consists of a certificate signed by the Summer Training Unit Commander and a ribbon.

AIR FORCE ROTC ATHLETIC AWARD (STU). Presented to the most outstanding athlete at each Summer Training Unit. The award consists of a certificate signed by the Summer Training Unit Commander and a ribbon.

AIR FORCE TIMES AWARD (STU). Presented annually to a cadet at each Summer Training Unit who has distinguished himself through notable contributions to the morale and *esprit de corps* of his Summer Training Unit organization. The award consists of a Certificate of Merit and a 12-month subscription to the Air Force Times newspaper.

AMHERST LIONS CLUB AWARD. Awarded to the Air Science 4 cadet who has contributed most to the Cadet Wing.

AMHERST POST AMERICAN LEGION TROPHY. Awarded to the Air Science cadet who has demonstrated outstanding abilities in leadership and scholarship.

Honor Societies

Academic Honor Societies

Phi Beta Kappa. Phi Beta Kappa, the oldest honorary scholastic society in the United States, was founded at the College of William and Mary on December 5, 1776. The Society recognizes superior scholastic attainment and capacity for high achievement in the arts, humanities and sciences. At the University of Massachusetts an informal association of Phi Beta Kappa was founded in 1931 by members of the faculty having official standing in the Society. In 1932 the University association, while not authorized to elect students to official membership, was permitted to designate an outstanding student as a Phi Beta Kappa Scholar who would be listed as such in the Commencement program. Selection of such a student has been made each year since 1932. In August, 1964, at the Triennial Meeting of the Society, the University of Massachusetts was authorized to open an official chapter, Nu of Massachusetts, and to elect students to membership in the Society. Installation of Nu chapter was scheduled for March 30, 1965, with selection of students to be made according to the general criteria of academic excellence prescribed by the national society for eligible students in the arts and sciences. Listing of such students, as official members of Phi Beta Kappa, will be made for the first time in the program for the University's 95th Commencement.

Phi Kappa Phi. The Honor Society of Phi Kappa Phi is a national organization, and has been represented on this campus since 1904. Its primary objective is the recognition and encouragement of superior scholarship in all fields of study. Good character is an essential supporting attribute. The Massachusetts chapter elects undergraduates in either their junior or senior years. Members of the Faculty and graduate students are also eligible for election.

Sigma Xi. The Society of the Sigma Xi is the national honor society whose objective is the encouragement of original investigation in science, pure and applied. Since 1938, a chapter of the Society has been active on the campus of the University. The Chapter may elect to associate membership undergraduate students who have shown marked excellence in the study of recognized fields of the sciences and engineering. Election to full membership is accorded those who have clearly demonstrated ability to pursue independent scientific research. The Chapter sponsors a program of public lectures and a number of awards designed to foster the objectives of the Society.

Sigma Gamma Epsilon. The Beta Theta chapter of the Sigma Gamma Epsilon Fraternity was installed at the University of Massachusetts in 1951. The purpose of the fraternity is to stimulate scholastic, scientific, and social advancement of students of the earth sciences in universities and scientific schools with recognized standings in the United States and Canada. Membership is open to men majoring in geology, mining, metallurgy, ceramics, petroleum engineering, or other branches of earth sciences, who meet the requirements of the fraternity.

Omicron Nu. The Alpha Pi chapter of the Society of Omicron Nu was installed on the campus in 1952. The purpose of the Society is to recognize superior scholarship and to promote leadership and research in home economics. Membership is open to juniors and seniors majoring in home economics who meet the requirements of the society.

Phi Tau Sigma. Phi Tau Sigma Honorary Society is the international honor society for food science. It was founded at the University of Massachusetts in 1953, and its executive headquarters are permanently located here. Its purpose is to en-

courage and recognize achievement in food science. Senior students from all departments related to food science are eligible for election to membership if they meet scholastic and character requirements of the University Chapter.

Tau Beta Pi. The Massachusetts Zeta Chapter of Tau Beta Pi was installed on campus in the fall of 1955. The society exists for the purpose of honoring engineering students of high scholarship, character, and interest in campus activities. Senior and junior students in the School of Engineering are eligible for election to membership if they meet the requirements.

Beta Gamma Sigma. The Gamma Chapter of the University of Massachusetts was installed in 1959. The purposes of the Society are to encourage and reward scholarship and accomplishment among students in commerce and business administration; to promote the advancement of education in the art and science of business; and to foster integrity in the conduct of business operations.

Alpha Lambda Delta. The Scholastic Honor Society for Freshman Women was installed at the University of Massachusetts as a chapter of Alpha Lambda Delta, national honor society, in 1960. The purpose is to promote intelligent living and to encourage superior scholastic attainment among freshman women. Members are students who achieve averages of 3.5 or above in the first semester or in cumulative average at the end of the first year of college.

Phi Eta Sigma. The Society of Phi Eta Sigma was installed on the campus in 1955. The purpose of the Society is to recognize outstanding scholastic achievement by freshmen men and to encourage a higher standard of learning among all freshmen. Honorary membership is granted those faculty members who are most effective in encouraging students in the att inment of these goals.

Eta Kappa Nu. Delta Eta Chapter of the Eta Kappa Nu Association was installed on this campus in 1960. The purpose of the association is to recognize outstanding scholarship and leadership in the field of Electrical Engineering. Superior junior and senior students are selected for membership in the fall and spring of each year.

Alpha Zeta is an honorary fraternity with membership limited to men majoring in the College of Agriculture. Election to membership is based upon academic excellence and qualities of leadership.

Xi Sigma Pi. The Psi Chapter of Xi Sigma Pi, national forestry honor fraternity, was inaugurated at the University in 1962. The purpose of the fraternity is to secure and maintain a high standard of scholarship in forestry education. Membership is open to juniors and seniors majoring in forest management, wood utilization, and wildlife management who demonstrate leadership ability and who meet other requirements of the fraternity.

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Roger McKee Harrison, b.s. (Pennsylvania State University), m.s. (University of Massachusetts), *Regional Agricultural Agent.*

Walter Melnick, b.s., m.s. (University of Massachusetts), *Regional Agricultural Specialist.*

Mrs. Barbara Farnsworth Sheldon, b.s. (University of Massachusetts), *County Extension Agent in 4-H Club Work.*

Charles Erhard Wissenbach, b.a. (University of Massachusetts), *County Extension Agent in 4-H Club Work.*

MIDDLESEX COUNTY, CONCORD

Mrs. Priscilla Davis Beebe, b.s. in home economics (Boston University), *County Extension Agent in 4-H Club Work.*

Joseph True Brown, b.s. (University of New Hampshire), *Director, Middlesex County Extension Service.*

Mrs. Anna Cole Carey, b.s. (Simmons College), m.a. (Columbia University), *County Extension Agent in Home Economics.*

Beverly G. Duncan, b.a. (University of Toronto), *County Extension Agent in 4-H Club Work.*

Max George Fultz, b.s. (Purdue University), *Regional Agricultural Specialist.*

H. Thurston Handley, Jr., b.s., m.s. (University of Massachusetts), *Regional Agricultural Specialist.*

Mrs. Irene Davis Hermanson, b.s. in ed. (Framingham State College), *County Extension Agent in Home Economics.*

Francis Gould Mentzer, Jr., b.s. (University of Massachusetts), *Regional Agricultural Specialist.*

Mrs. Nancy Stepan Stutzman, b.s. in home economics (University of Illinois), *County Extension Agent in Home Economics.*

Mrs. Marion Lee Telford, b.s. in home economics (Oklahoma State University), *County Extension Agent in Home Economics.*

James T. Williams, b.s. (University of New Hampshie), *County Extension Agent in Agriculture.*

NORFOLK COUNTY, WALPOLE

Marie Anita Antonelli, a.b. (Regis College), *County Extension Agent in Home Economics.*

Catherine Cook, b.s. in ed. (Framingham State College), m.ed. (Boston University), *County Extension Agent in 4-H Club Work.*

Mrs. Santina Riley Curran, b.s. in ed. (Framingham State College), m.a. (Boston University), *County Extension Agent in Home Economics.*

Peter William Larson, b.s. (University of Massachusetts), *County Extension Agent in Agriculture.*

Lynda Jean Marshall, b.s. (Cornell University), *County Extension Agent in Home Economics.*

HERBERT W. TAYLOR, B.S. (University of Rhode Island), *County Extension Agent in 4-H Club Work.*

HOWARD D. WILSON, JR., B.S. (University of Massachusetts), *County Extension Agent in Agriculture.*

CHARLES YERGATIAN, B.S. (University of Massachusetts), *County Extension Agent in Agriculture.*

PLYMOUTH COUNTY, BROCKTON

PHYLLIS BRIGHTMAN, B.S. (Temple University), *County Extension Agent in Home Economics.*

ROBERT BRUCE EWING, *County Agent-Manager.*

MARJORIE A. MAHONEY, B.S. in ED. (Framingham State College), *County Extension Agent in 4-H Club Work.*

DOMINIC ALEXANDER MARINI, B.S., M.S. (University of Massachusetts), *County Extension Agent in Agriculture.*

CHARLES GEORGE SIMMONS, B.V.A. (University of Massachusetts), *County Extension Agent in Agriculture.*

EDGAR WINFRED SPEAR, B.S. (University of Massachusetts), *County Extension Agent in Agriculture.*

TRUE TOWER, B.S. (University of Massachusetts), *County Extension Agent in 4-H Club Work.*

BEATRICE ISABELLE WHITE, B.S. in ED. (Framingham State College), *County Extension Agent in Home Economics.*

WORCESTER COUNTY, WORCESTER

BARBARA L. BANKART, B.S. (University of Connecticut), *County Extension Agent in Home Economics.*

ALAN R. CORWIN, B.S. (University of Vermont), M.S. (University of Massachusetts), *Regional Agricultural Specialist.*

MARGARET JANE CYR, B.S. (St. Francis Xaviar University), *County Extension Agent in Home Economics.*

WILLIAM RICHARD GOSS, B.S. (University of Massachusetts), *Director of County Extension Service.*

MRS. JEANNINE T. HENDRICKS, B.S. (Ohio State University), *County Extension Agent in Home Economics.*

LEWIS ALBERT HODGKINSON, B.S. (University of Rhode Island), *County Extension Agent in Agriculture.*

R. ALDEN MILLER, B.S. (Southern Illinois University), M.S. (University of Illinois), *Regional Agricultural Specialist.*

MRS. MARGUERITE RUGGLES PATTEN, B.S. (University of New Hampshire), *County Extension Agent in 4H Club Work.*

MRS. OLIVE L. PRUNIER, B.S. (University of Rhode Island), *County Extension Agent in 4-H Club Work.*

LOUIS HOOKER RUGGLES, B.S. (University of Massachusetts), *Regional Agricultural Agent.*

MRS. SYLVIA SHAPIRO, B.S. (Simmons College), ED.M. (Boston University), *County Extension Agent in Home Economics.*

WALTER BRUCE SHAW, *Regional Agricultural Specialist.*

ROBERT SMILEY, B.B.A. (University of Massachusetts), *County Extension Agent in 4-H Club Work.*

MRS. EVANGELINE D. STANDISH, B.S. (University of Rhode Island), *County Extension Agent in 4-H Club Work.*

Index

UNIVERSITY OF MASSACHUSETTS ENROLLMENT—SEPTEMBER, 1964
UNDERGRADUATE COLLEGE

Class	1965		1966		1967		1968		Total		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Total
Agriculture	80	1	101	6	113	8	75	11	369	26	395
Arts and Sciences	479	328	593	374	667	550	768	888	2507	2140	4647
Business Administration	115	8	190	10	202	21	126	6	633	45	678
Education	3	130	7	125	8	167	2	165	20	587	607
Engineering	165	2	211	1	215	1	300	3	891	7	898
Home Economics	—	31	—	37	—	54	—	72	—	194	194
Nursing	—	27	—	34	—	46	—	69	—	176	176
Physical Education	49	24	46	24	35	25	45	30	175	103	278
Public Health	11	16	8	14	1	22	2	30	22	82	104
Total	902	567	1156	625	1241	894	1318	1274	4617	3360	7977
Total by Classes	1469		1781		2135		2592		7977		
Specials									64	126	190
TOTAL											8167

STOCKBRIDGE SCHOOL OF AGRICULTURE

	Men	Women	Total
1965	203	10	213
1966	244	10	254
			467
		Special	17
		Total	484

GRADUATE SCHOOL

Men	Women	Total
1346	500	1846

SUMMARY

Undergraduate School	8167
Stockbridge School	484
Graduate School	1846
TOTAL	10,497

OFFICE OF INSTITUTIONAL STUDIES
University of Massachusetts
Amherst, Mass.

GIFTS AND BEQUESTS

For the information of those who may wish to make a gift or a bequest to this University, the following suggestion is made as to a suitable form which may be used.

There are a number of worth-while activities of the University which are handicapped by lack of funds and for which small endowments would make possible a greater measure of service to our students and to the Commonwealth. The religious work on the Campus is an example. This is now carried on in a very limited way by current private contributions. Further information concerning this and other activities in similar need will be gladly furnished by the President.

Suggested Form

"I give and bequeath to the Trustees of the University of Massachusetts, at Amherst, Massachusetts, the sum of.....dollars."

(1) (Unrestricted)
"To be used for the benefit of the University of Massachusetts in such manner as the Trustees thereof may direct."

or (2) (Permanent Fund: income unrestricted)
"to constitute an endowment fund to be known as the..... Fund, such fund to be kept invested by the Trustees of the University of Massachusetts and the income used for the benefit of the College in such manner as the Trustees thereof may direct."

or (3) (Specific Purposes)
"to be used for the following purposes,"
(Here specify in detail the purposes.)

18M-3-65-755084


UNIVERSITY OF MASSACHUSETTS AMHERST

University of Massachusetts

BOSTON

1965 – 1966

UNIVERSITY OF MASSACHUSETTS
BULLETIN

This catalog of the University of Massachusetts — Boston presents announcements of offerings for the sessions of 1965-1966. The University reserves, for itself and its departments, the right to change or withdraw the announcements made in its catalog.

VOLUME LVII MARCH 1965 NUMBER III
Published seven times a year in February,
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Second class mail privileges authorized at Amherst, Mass.

UNIVERSITY OF MASSACHUSETTS

Boston

1965–1966

Catalog of the University

First Academic Year

The University of Massachusetts — Boston is situated at 250 Stuart Street at the corner of Arlington Street (see map at back of catalog). Constructed in 1926-27, the building has thirteen floors above ground level and two below. Its exterior walls on the street sides are composed of Indiana limestone. Ornamental arches decorate the entrance areas as well as the top floor. Occupied for many years as a modern office building, the structure in overall design is readily adaptable for use as an educational center in a great metropolitan area.

CONTENTS

CORRESPONDENCE

Inquiries regarding the general program of the University should be directed to:

Office of the Chancellor
University of Massachusetts — Boston
250 Stuart Street
Boston, Massachusetts 02116

Inquiries regarding admission, expenses and financial aid should be directed to:

Mr. F. Donald Costello
Admissions Counselor
University of Massachusetts — Boston
250 Stuart Street
Boston, Massachusetts 02116

ACADEMIC CALENDAR FOR 1965-1966

1965	Thursday, September 9	Registration
	Friday, September 10	Classes begin: 8 a.m.
	Tuesday, October 12	Columbus Day: no classes
	Saturday, October 30	Mid-term marks close
	Thursday, November 11	Veterans' Day: no classes
	Friday, November 12	Thursday class schedule will be followed
	Wednesday, November 24	Thanksgiving recess begins after last class
	Monday, November 29	Classes resume
	Wednesday, December 1	Counseling Day: no classes
	Saturday, December 18	Christmas recess begins after last class
1966	Monday, January 3	Classes resume
	Saturday, January 8	Last day of classes
	Wednesday, January 12	Final examinations begin
	Thursday, January 20	Last day of final examinations
	Monday, January 31	Registration
	Tuesday, February 1	Classes begin: 8 a.m.
	Tuesday, February 22	Washington's Birthday: no classes
	Saturday, March 19	Mid-term marks close
		Spring Recess begins after last class
	Monday, March 28	Classes resume
	Tuesday, April 19	Patriots' Day: no classes
	Wednesday, May 4	Counseling Day: no classes
	Tuesday, May 24	Last day of classes
	Thursday, May 26	Final examinations begin
	Monday, May 30	Memorial Day: no classes
	Saturday, June 4	Last day of final examinations

TRUSTEES OF THE UNIVERSITY OF MASSACHUSETTS

Organization of 1965

Members of the Board	*Term Expires*
Dennis Michael Crowley of Boston	1966
Martin Sweig of Winthrop	1966
Frank Learoyd Boyden of Deerfield	1967
George L. Pumphret of Dorchester	1967
Harry Dunlap Brown of North Chatham	1968
John William Haigis, Jr. of Greenfield	1968
Most Reverend Christopher Joseph Weldon of Springfield	1969
Fred C. Emerson of Agawam	1969
Edmund J. Croce of Worcester	1969
Calvin H. Plimpton of Amherst	1969
Hugh Thompson of Milton	1969
Joseph P. Healey of Arlington	1970
Frederick Sherman Troy of Boston	1970
Robert D. Gordon of Lincoln	1971
Louis Martin Lyons of Cambridge	1971
Mrs. George R. Rowland of Boston	1972
John J. Maginnis of Worcester	1972

Members Ex Officio

His Excellency, John A. Volpe, *Governor of the Commonwealth.*
John William Lederle, *President of the University.*
Alfred L. Frechette, *Commissioner of Public Health.*
Owen B. Kiernan, *Commissioner of Education.*
Charles Henry McNamara, *Commissioner of Agriculture.*
Harry C. Solomon, *Commissioner, Department of Mental Health.*

Officers of the Board

His Excellency, John A. Volpe, *Governor of the Commonwealth, President of the Board.*
Frank Learoyd Boyden of Deerfield, *Chairman.*
Robert Joseph McCartney of Amherst, *Secretary.*
Kenneth William Johnson of Amherst, *Treasurer.*

OFFICERS OF ADMINISTRATION

JOHN WILLIAM LEDERLE, A. B., A. M., LL. B., Ph. D. (University of Michigan), LL. D. (Hon., Amherst College), LITT. D. (Hon., Holy Cross College), LL. D. (Hon., Hokkaido University, Japan), *President of the University of Massachusetts.*

JOHN WILLIAM RYAN, B. A. (University of Utah), M. A., Ph. D. (Indiana University), *Chancellor of the University of Massachusetts — Boston.*

OSWALD TIPPO, B. S. (University of Massachusetts), A. M., Ph. D. (Harvard University), *Provost of the University of Massachusetts.*

DONALD WINSLOW CADIGAN, B. S., M. S. (University of Massachusetts), *Director of Planning, University of Massachusetts — Boston.*

ROBERT JOSEPH MCCARTNEY, B. A. (University of Massachusetts), *Secretary of the University of Massachusetts.*

KENNETH WILLIAM JOHNSON, B. S. (University of Vermont), *Treasurer of the University of Massachusetts.*

WILLIAM DAVID TUNIS, B. S., Ph. D. (University of Massachusetts), M. S. (University of Minnesota), *Dean of Admissions and Records of the University of Massachusetts.*

F. DONALD COSTELLO, B. S. (University of Massachusetts), M. Ed. (Northeastern University), *Admissions Counselor, University of Massachusetts — Boston.*

ALVAN S. RYAN, B. S. (University of Massachusetts), A. M. (Harvard University), Ph. D. (State University of Iowa), *Professor of English and Chairman of Humanities, University of Massachusetts — Boston.*

FRANK JOSEPH SEEGRABER, A. B. (Holy Cross College), B. S. in L. S. (Columbia University), *Assistant University Librarian, University of Massachusetts — Boston.*

GENERAL INFORMATION

THE University of Massachusetts is the State University of the Commonwealth, founded in 1863 under provisions of the Morrill Land-Grant Act passed by the United States Congress in July, 1862. Now in its second century, the University serves the state and nation as a principal resource of higher education as well as a center of research and public service. Chartered as the Massachusetts Agricultural College on April 29, 1863, the institution was established at Amherst and formally opened its doors to a handful of students in 1867. Reflecting the broadening interests of its students, the General Court of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Under authorization of Chapter 562 of the Acts of 1964 (General Laws of the Commonwealth of Massachusetts), the University of Massachusetts — Boston is to be opened in September, 1965, as a means of extending higher education opportunities in the Greater Boston area to increasing numbers of students.

As directed by legislative mandate, the new University is planned as a high-quality institution whose curriculum will consist of a strong core in the liberal arts and sciences, with additional opportunities for work in the more specialized professional fields to be developed in the near future. Operating on the low-tuition principle of modern public higher education, the University is designed for commuting students who can take advantage of the intellectual, cultural and recreational life of a great metropolitan center. The opening of a freshman program for the class entering in September, 1965, will be followed by the addition of sophomore, junior and senior programs in succeeding years. The operation of both campuses of the University of Massachusetts under a single governing board will bring a new level of coordinated service in the expanding field of public higher education in the Commonwealth.

PROGRAM OF INSTRUCTION

The aim of the four-year course of instruction at the University of Massachusetts — Boston is to give as high a degree of proficiency as possible in a particular branch of learning without sacrificing the breadth of knowledge that should characterize a well-rounded college education. The program will be directed toward giving students every opportunity for intellectual and cultural growth, including the systematic gathering of knowledge, development of sound standards of judgment, an appreciation of the uses of the past, familiarity with the main characteristics of American society as well as those of other nations and other peoples, and appropriate training in the tools and techniques necessary for disciplined thinking and responsible action in a highly complex world.

DEGREES

Successful completion of the four-year curriculum will lead to the degree of Bachelor of Arts or Bachelor of Science. Students may eventually major in arts and sciences curricula generally similar to those now available at the University of Massachusetts — Amherst. Professional programs will not be available in the first year, but will be offered as plans are developed. Offerings in the first year will consist chiefly of introductory courses, although there will be an opportunity for some students (such as those who pass advanced placement tests) to take courses normally given in the sophomore year. During the initial period of operation, the major fields available will be mainly in the areas of the liberal arts and sciences. Current planning also calls for offerings in education and business administration. Students who are interested in more specialized fields should, for the present, apply for admission to the University at Amherst.

FRESHMAN ADMISSIONS POLICY

WHEN AND HOW TO APPLY

Applications for admission may be obtained by writing the Admissions Office, University of Massachusetts, Amherst. High school seniors are advised to file their applications as soon as possible. College Board tests should be taken no later than the March testing date. If they are to be considered during the normal processing, applications should be received by *April 1st*. Thereafter, they may be considered only as vacancies occur. An autobiographical letter must be submitted with the application. *There is no application fee at the University of Massachusetts.*

TESTS REQUIRED

All applicants for admission, except veterans, must take the Senior Scholastic Aptitude Test given by the College Entrance Examination Board. In addition, the University requires three College Board Achievement tests, including English Composition, of every applicant whose scholastic record in grades 9 through 11 contains four or more grades below the college recommending mark of his high school. All postgraduate students are required to submit these three Achievement tests. All College Board Test reports must be sent *directly* to the Admissions Office, University of Massachusetts, Amherst from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University.

VETERANS

Veterans are expected to take certain examinations especially suited for veterans. These examinations are given on the Amherst campus and in Boston. If service duty prohibits attendance on the specified test dates, recent Scholastic Aptitude Test results may be submitted in lieu of the University Veterans' Examination. Veterans must apply to take these tests, and may receive an application and listing of test dates by writing to the Admissions Office in Amherst.

INTERVIEW

An interview is *not* part of the admissions procedure at the University of Massachusetts. A personal conference will be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence. When needed, therefore, admissions counselors are available for conferences at both Boston and Amherst. All application and record forms must be on file in the Admissions Office at Amherst for any candidates requesting such an appointment.

SUBJECT REQUIREMENTS

The subjects of preparatory study required for admission call for satisfactory completion of a four-year high school course stated in terms of units. A unit is the equivalent of at least four recitations a week for a school year. High school graduation alone is not sufficient. The applicant's record must indicate capacity for handling the quality of scholastic work which the University has established as its standard of achievement. Sixteen units of secondary school work must be offered, selected in general according to the following requirements:

College Preparatory Mathematics (Preferably two years of algebra and one of plane geometry)	3
English	4
Foreign Language (2 years of 1 language)	2
U. S. History	1
Laboratory Science	1

The remaining units are elective and may be selected from the following subject matter:

a. Mathematics
b. Science
c. Foreign Language
d. History and Social Studies
e. Free electives (not more than four units, from such courses as music, art, drawing, typewriting, home economics, etc.)

Students planning to major in the physical sciences and mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half of trigonometry.

Solid geometry, chemistry, and physics, and an introduction to analytical geometry and calculus are also strongly recommended. Candidates who are deficient in one or more subjects required for admission to the University must present records which are otherwise stronger than average.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT

Successful completion in secondary school of courses approved by the College Entrance Examination Board Advanced Placement Program, or the equivalent as approved by the University, will be regarded as meeting the equivalent requirement and will be accorded credit toward graduation.

ACKNOWLEDGMENT AND NOTIFICATION

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification.

EXPENSES

As a state institution of higher learning, the University charges a modest rate of tuition ($200 per year) to all students who are *bona fide* residents of Massachusetts. There is a matriculation charge of $15.00 which must be paid as soon as each applicant is notified that he or she has been accepted for admission. When the student matriculates, this charge is deducted from the first semester bill. Certain service and student activity fees will also be billed to the student. A detailed schedule of all fees and charges will be available in a supplementary document to be sent to all prospective entrants before matriculation. Students should also, of course, be prepared to meet the customary expenses involved in the purchase of books, stationery, laboratory and other supplies. Such costs amount normally to approximately $100 to $150 per year. Total University-related expenses, exclusive of meals, should therefore not exceed $500 per year.

FINANCIAL AID

Various types of financial aid will be available for deserving students who demonstrate that they are unable to meet their University expenses. Such assistance can be in the form of scholarships, loans, part-time employment, and work-study programs under the Economic Opportunity Act. Information about financial aid will accompany each application sent to prospective candidates for admission.

HOUSING

Since the University of Massachusetts — Boston is designed to serve a commuting student body, no University-operated or supervised housing will be provided.

GENERAL ACADEMIC REGULATIONS

CONDUCT

The customary high standard of college men and women in honor, self-respect, and consideration for the rights of others constitutes the ideal of student conduct. The privileges of the University may be withdrawn from any student at any time if such action is deemed advisable. It should be understood that the University, acting through its president or any administrative officer designated by him, distinctly reserves the right, not only to suspend or dismiss students, but also to name conditions under which they may remain in the institution. Hazing in the sense of the punishment or humiliation of students is not permitted.

ATTENDANCE

The attendance of students at all regularly scheduled classes at the University of Massachusetts — Boston is expected. No administrative control of attendance is exercised except as hereinafter provided. In cases of illness, students are to explain their absences directly to their instructors. The grade of the student who has met the requirements of the instructor in making up his work shall not be reduced for absence because of illness.

Because the University believes fully in the educational value of outside-of-class activities, including trips which will take students off campus, students are not to be penalized for official absences incurred as a result of such activities. Any student going on such a trip will be entitled to receive make-up work from the instructor in classes missed. If the instructor finds it inconvenient to give a special examination, he has the alternative of not counting the examination missed by the student in computing the final average.

The University has a responsibility for all groups of students who are to be away from their classes or from the University on trips for authorized activities. The person in charge of any such activity involving authorized absence from class shall place the trip announcement on file in the office of the appropriate dean or department head, with a copy to the schedule office. This listing

shall show the designation of the group or groups to be making the trip, time of departure, destination, and time of return. This information is to be filed at the beginning of the semester for all activities scheduled at that time, otherwise at as early a time during the semester as the information becomes available. In no event should such announcement be later than ten days prior to the day of departure.

Authorization for trips may be made by the appropriate student personnel dean for extra-curricular trips; and by the academic dean or designated department head for class trips. For trips extending beyond the normal business hours of the University, a trip list should be submitted to the student personnel dean for use in case of possible emergencies. This list should include an alphabetical list of student participants, the place at which the event is to be held, the mode of travel, and the name of the instructor or staff member who is to accompany the group. If overnight absence is involved, the place where students are staying is to be indicated in the statement. Students are expected to inform instructors of their absence on authorized trips as soon as the event is announced. Any instructor desiring additional information should make contact directly with the agency authorizing the trip. (No absence or excuse cards will be issued.)

GRADE REPORTING AND RELATED REGULATIONS

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below.

Grades

Grades shall be reported according to the following letter system. No other interpretation of this letter system shall be authorized.

A — Excellent
B — Good
C — Average
D — Passing (but not satisfactory)
F — Failure
Inc. — Incomplete

The grade of Incomplete shall only be reported:

When a portion of the assigned or required class work or the final examination has not been completed because of necessary absence of the student, serious illness, extreme personal circumstances, or for scholarly reasons at the request of the instructor. If the student's record is such that he would fail the course regardless of the result of the missing work, he is to be given a failure.

In order to qualify for an incomplete, a validation form is obtained from the instructor. One would not be issued by him if the quality of the work to date did not justify it. This form is countersigned by the Health Services or the appropriate personnel or academic dean with copies returned to the instructor and filed with the Registrar.

A student can obtain credit for an incomplete only by finishing the work of the course within two weeks from the date of the final examination. The grade of incomplete is converted to a failure if the course requirements have not been satisfied by this time. Exceptions to the two week deadline may be requested by the appropriate agency in cases of protracted illness, critical personal problems, or for scholarly reasons at the request of the instructor. The initiative for removal of the incomplete grade rests with the student, but faculty members giving an incomplete grade must be responsible for making suitable arrangements for its removal.

An incomplete on a final grade report is calculated as an F in arriving at a temporary quality point average. When the incomplete is later converted to a grade, the permanent record is changed and the student is notified.

Quality Points

Quality points per semester hour will be assigned as follows: A, 4; B, 3; C, 2; D, 1; F, 0.

Averages will be computed as follows:

Semester Grade Point Average. To compute the semester grade point average, the total points earned will be divided by the total credits carried, which includes the total credits earned and failed.

Cumulative Average. To compute the cumulative grade point average, the total points earned will be divided by

the total credits carried, which is the sum of the total credits earned and failed.

Repeated Courses

A course once passed may not be repeated for a higher grade. A student who has received two or more years of language credit in high school may not take the first year of that language for college credit.

Entrance Deficiencies

A student admitted deficient in mathematics (Algebra II) takes Mathematics 011 for no credit. A student deficient in language takes a year of college language for no credit. Neither of these courses counts in the quality point average.

Semester and cumulative grade point averages will be recorded to one decimal place. At the end of the senior year, the cumulative average for all the student's academic work will be recorded to two decimal places.

In computing cumulative grade point averages the following will not be included:

1. Courses for which the student does not receive credit toward the degree.
2. Grades not earned at the University.
3. Courses satisfied by advanced placement.

This means that the cumulative credits carried on each semester's grade report do not, necessarily, reflect the credits which have been accrued towards graduation.

Scholastic Warning

A student whose semester average is below the cumulative average required for retention of his class is warned by a statement on the bottom of both his copy and his parents' copy of the grade report. This warning is to indicate that continued below-standard performance may result in failure to graduate or academic dismissal.

Dismissal

Dismissal from the University for scholastic reasons shall be based upon regulations to be administered by the Committee on Admissions and Records. Changes in these regulations may be made by the Faculty Senate and the University faculty. By action of the University Senate, the following cutting points and graduation requirements have been set:

1. Graduation Average is 1.80.
2. Second Semester Junior Year, First Semester Senior Year:
   Cumulative Average must be 1.7 unless the Semester Average is 1.8 or better.
3. Second Semester Sophomore Year, First Semester Junior Year:
   Cumulative Average must be 1.6 unless the current Semester Average is 1.7 or better.
4. Second Semester Freshman Year, First Semester Sophomore Year:
   Cumulative Average must be 1.5 unless the current Semester Average is 1.6 or better.
5. First Semester Freshman Year:
   A student will be subject to dismissal if his semester average falls below 1.4, subject to the conditions of scholastic probation (outlined below).
6. Transfers and Returning Students:
   A transfer student must satisfy the quality point average requirements of the second semester of the freshman year. Thereafter a transfer student is required to meet the academic standards of the class to which he is assigned.

   A returning student must satisfy the cumulative quality point average of the class to which he is assigned.

No new quality point hurdle is raised against students at the end of the fall semester: the cutting point in effect for the class at the end of the preceding semester remains in effect for the class until the next requirement takes effect at the end of the academic year.

A student will be dismissed for academic deficiency at the end of seven, eight, or nine semesters if he has failed to satisfy the cutting point requirements of his class set for the seventh semester. A student so dismissed may apply for readmission in the usual way.

A transfer or returning student must satisfy the cumulative quality point average of the class to which he is assigned.

SCHOLASTIC PROBATION

Conditions

A. Upperclass students and second semester freshmen who fail to meet the retention average for their class by not more than one-tenth of a point, and first semester freshmen whose averages are within six-tenths of a point are designated as being on Scholastic Probation. No academic dismissal is charged. A student may be allowed one freshman probation and only one upperclass probation semester during his college career.

B. Any student who fails to meet the retention average for his class by more than one-tenth of a point will be dismissed and charged with an academic dismissal. He will automatically be placed on Scholastic Probation at the time of his readmission.

Eligibility

A. While on Scholastic Probation students shall *not* be eligible to hold office in any recognized student organization, to represent the University in any sense on or off campus, to participate actively in any non-academic extra-curricular activity (including fraternal, dramatic, musical and publications activities).

B. The Board of Admissions and Records shall be charged with modifying, extending or limiting the restrictions on a student during his period of Scholastic Probation, and shall report all such modifications to the Faculty Senate periodically.

Termination

A. A full summer session program, normally eleven or twelve semester hours, is considered as one semester's work for purposes of lifting probation.

B. Grades and credits transferred to the University from other institutions shall not normally be considered in reviewing a student's probationary status.

FAILURES

A failed course in a subject required for the degree must be repeated. If the failed course is not required, a substitution may be made upon the approval of the advisor. Although repeated, the original failed course continues a part of the student's quality point and course record.

FINAL EXAMINATIONS

It is University policy not to require a student to take more than two final examinations in one day. When the examination schedule is published, any student who finds himself scheduled for two examinations at the same time or for three examinations on the same day is to report this situation directly to the University Schedule Office for adjustment.

GRADUATION REQUIREMENTS

It is the responsibility of the individual student to review his own progress toward graduation and the fulfillment of University and school requirements. Through his own initiative, he should address questions concerning these matters to his adviser, dean or the registrar.

All four-year curricula of the University conform to the following basic conditions:

Accumulated Credits

A. The successful completion of at least 120 semester hours of academic credit. Individual colleges, schools, divisions and departments may require more than 120 semester hours of academic credit.

Subject Requirements

B. An introduction to the basic skills of communication by successful completion of English 111 and 112 and Speech 101.

C. An introduction to the humanities by the successful completion of English 125 and 126 (or 127 and 128) and one of the elective courses (of at least 3 credits) identified by the letter "C" in the university catalogue.

D. An introduction to the social and behavioral sciences by the successful completion of three courses (of at least 3 credits each) chosen from those identified by the letter "D" in the university catalogue and from at least two departments.

E. An introduction to mathematics and the natural sciences by the successful completion of at least four courses (each of at least 3 credits) chosen from those identified by the letter "E" in the university catalogue, and from at least two of these groups: A) logic, mathematics and statistics; B) botany, entomology, microbiology and zoology; and C) astronomy, chemistry, geology and physics.

F. Intensive or specialized work in a particular department, division, school or college constituting a major and consisting of the successful completion of at least fifteen semester hours of credit in junior-senior courses in the area of the major.

Residence Requirements

It is the policy of the University that the final year's scholastic work be accomplished in residence, which is defined for this purpose as continuous enrollment and regular attendance in classes conducted on the campus of the University. This requirement may be waived by the Board of Admissions and Records upon the recommendations of the major department and Dean of the College or School. The Board may also waive the requirement for a student admitted to an appropriate professional school after completion of six or more semesters of work at the University, provided:

1. That the cumulative average at the University has been 2.5 or higher.
2. That satisfactory evidence is presented indicating completion of work comparable to that offered at the University in amount sufficient to satisfy requirements for the appropriate bachelor's degree.
3. That the major department and Dean approve.

No student is allowed more than ten semesters, including semesters at other colleges, to attain the required graduation average. Twelve semester credits earned in summer schools at the University or other colleges constitute a semester. A student who has met the required graduation average but is deficient in course requirements may continue for one additional semester (total 11).

Financial Requirements

Diplomas, transcripts of record, and letters of honorable dismissal will be withheld from all students who have not paid all bills and all loans due the University. All such bills due the University must be paid ten days preceding Commencement. If paid after that date and the student is otherwise eligible, he may graduate the following year.

HONORS

A. *University Honors Groups.* At the beginning of each semester a list is posted of those students who, during the previous semester, made a semester grade point average of 3.0 or higher. Three groups are recognized as follows:

First Honors	3.8 (3.75) or higher
Second Honors . . .	3.4 (3.35) to 3.7 (3.74) inclusive
Third Honors	3.0 (2.95) to 3.3 (3.34) inclusive

B. *Graduation with Distinction.* High ranking students will be graduated as follows:

Summa Cum Laude — Cumulative average 3.80 or higher.

Magna Cum Laude — Cumulative average 3.40 to 3.79 inclusive.

Cum Laude — Cumulative average 3.00 to 3.39 inclusive.

A transfer, to be eligible for consideration for graduation with distinction, must have earned his final 60 semester hours of credit in residence at the University.

REPORTS

A. Mid-Semester Report:
Freshman mid-semester reports are given to students by advisers and also sent home each semester. No mid-semester reports are prepared for other classes.

B. Final Grades:
First semester; given to students before being sent home.
Second semester; mailed to homes.

TRANSCRIPTS

Two transcripts of a student's record will be furnished without cost by the Registrar's Office. For each additional copy there will be a charge of $1.

REGISTRATION

Pre-Registration

Every student must report for pre-registration on the appointed day. Late pre-registrations will be charged a fee of $5. A student who does not pre-register is not assured admission into the next semester.

Registration

Each student must report for registration on the appointed day. Late registrants must pay a $5 fine.

Course Registration

No course will be recorded on the permanent records of the University nor will a student receive credit for it unless he has registered for such a course in accordance with established procedure on a regularly scheduled registration day or unless his registration shall have been made official by the signature of the Registrar. In the latter case a Program Change Card must be signed by the student's adviser and the Registrar, approving the course, and by the instructors of the courses to be dropped and added. No instructor should allow a student to enter his class unless the student was officially enrolled on a regularly scheduled registration day or submits such a Program Change Card authorizing his admission to the class. A student may not drop a course without the approval of his advisor and the Registrar on a Program Change Card and the release of the instructor. A course dropped without this approval will be recorded as a Failure.

COURSE ENROLLMENT AND WITHDRAWALS

A. General Regulations

1. Course Loads

The normal credit load is at least 15 credit hours. Regular students will carry a minimum of twelve semester hours of credit (freshmen, eleven). The maximum semester credit load is established by the office of the Registrar. Only students of high academic standing (cumulative averages of 2.5 and above) will be permitted to take an overload of one course with the approval of the dean and the Provost. Approval forms are available in the Office of the Registrar. Seniors in their final two semesters may carry an overload of one course each semester without special permission if such an overload will enable them to graduate, or an overload of two courses each semester with the approval of the academic dean. Seniors needing six or more courses totaling at least 18 credit hours to graduate may elect to spread their course load over their final two semesters.

2. Certification of Course Changes

To add, drop, or change a course, the student must obtain the signature of the instructors concerned, the faculty advisor, and the appropriate officer in the Registrar's Office. Signed cards are to be filed with the Registrar. Instructors and advisers are referred to the Manual for Faculty Advisers for specific information.

3. Exceptions to the Regulations

Exceptions to the regulations are made only in cases of protracted illness, critical personal or academic problems, and then only with the approval of the student's Academic Dean based upon recommendation of the appropriate one of the following: Health Service, Dean of Men, Women, or Students, or Counseling and Guidance Office.

B. Course Registration Changes

ADD PERIOD Within the period of up to and including ten academic days from the beginning

of a semester a student may add, drop, or substitute a course without notation on his record. Monday through Saturday are defined as full academic days. No courses may be added after this period.

W PERIOD Within the period of the 11th academic day and up to and including 28 academic days from the beginning of a semester a student may drop a course, subject to the minimum load regulation above. The notation of withdrawal on his record as a W is the only penalty. The W period is extended to six academic days beyond the closing data for mid-semester grades (printed in the University Calendar) for the first semester freshmen and first semester transfers.

WF PERIOD After the 28th academic day and subject to general regulations above, a student may not drop a course without having a WF entered on his record at the time of withdrawal. This grade is figured in the cumulative average.

C. Withdrawal from the University

Prior to the closing date for mid-semester grades, when a student withdraws from the University, grades of W will be noted on his record. The portion of the semester will not count as one of the ten semesters permitted toward graduation.

After the closing date for mid-semester grades, grades of WF or WP will be entered, as appropriate, for all courses in which the student is enrolled. The WF's will count in the cumulative average. The semester will count as one of the ten semesters permitted for graduation.

Change of Major

A student wishing to change his major must get a Major Change Card at the Registrar's Office. This change is to be approved by the head of the Department in which he is now majoring and also by his new major adviser.

This card, properly endorsed, must be returned to the Registrar's Office before the change receives final approval. As part of the major change procedure, the student takes his Academic Records Folder to the new department.

SPECIAL COURSE REGISTRATION

Advanced Placement

If a student is given advanced placement by a placement examination or by some other means, and if he completes the advanced work (the next course when the courses are in sequence) with a grade of C or better, he will be given credit but no grade for the omitted work. If the grade in the advanced work is D, he will be considered to have completed any requirement represented by the omitted work but will not receive credit for the omitted work. Credit with no grade awarded in this manner will be treated as transfer credit in the computation of quality-point averages.

Auditing

A full-time undergraduate student may audit a course by presenting his ID card to the instructor of the course, providing that the instructor can accommodate the auditor in his class, feels that the student has sound academic reasons for the audit and that the student has the proper preparation. The student will be expected to pay laboratory fees, where applicable.

Credit by Special Examination

The requirements of any course approved for credit may be met by examination upon arrangement with the office of the dean and the head of the department offering the course, provided the student's quality point average is 2.5 or higher. All such arrangements must be completed prior to the mid-semester. No student may earn more than thirty (30) semester hours of credit in this manner.

PROGRAM PATTERN FOR FIRST YEAR

Bachelor of Arts

English 111 and 112
Foreign Language
History 100 and 101
Mathematics or Natural Science
Social Science (Government, Sociology, Economics)
Elective

Bachelor of Science

English 111 and 112
Foreign Language
Mathematics
Physical Science
Biological Science
Elective

DIRECTORY OF COURSES

THE FIRST YEAR

Roman numerals designate semester in which course is offered.

ART 115. Introduction to Art.
An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles. 3 class hours. Credit, 3.

BIOLOGY III (I), 112 (II). General Biology.
An integrated course in biology, designed as a college-level survey of the field. The subject matter is drawn principally from the areas of botany and zoology, but consideration is also given to fundamental concepts in microbiology and other related fields. 3 lecture-hours plus laboratory: practical exercises and demonstrations. Credit, 3 per semester.

CHEMISTRY III (I), 112 (II). General Chemistry.
A study of the fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in Chemistry. Credit, 3.

ECONOMICS 125 (I) (II). Elements of Economics.
A study of the basic principles which govern the allocation of resources and behavior of markets in the American economy. Credit, 3.

ECONOMICS 126 (II). Problems of the National Economy.
The determinants of stability and growth of the national economy and of world economy. Credit, 3.

ENGLISH III (I), 112 (II). English Composition.
Training in effective composition; readings. 2 class hours. Credit, 2.

ENGLISH 113 (I). Special Freshman Composition.
Prerequisite: exemption from English 111. 2 class hours. Credit, 2.

ENGLISH 125 (I), 126 (II). Masterpieces of Western Literature.
A study of selected masterpieces. The course aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues. Prerequisite, English 112 or 113. English 125 or 127 is prerequisite to English 126 and to elective courses in the department. 3 class hours. Credit, 3.

ENGLISH 127 (II). Special Course in Masterpieces of Western Literature.
A study of selected masterpieces with additional outside readings; for freshmen who have taken English 113, or are otherwise specially qualified. 3 class hours. Credit, 3.

GOVERNMENT 100 (I) (II). American Government.
Political institutions and processes, as illustrated by the American governmental system. 3 class hours. Credit, 3.

GOVERNMENT 150 (I) (II). European Governments.
A survey of the politics and governmental institutions of Great Britain, France, Germany and Soviet Russia. 3 class hours. Credit, 3.

HISTORY 100 (I), 101 (II). Modern European Civilization.
The historical development of the western European countries, their ideas and institutions. Either semester may be elected independently. 3 class hours. Credit, 3.

LANGUAGES:

FRENCH 100 (I), 102 (II). Elementary French.
For students who have had no creditable training in French. Intensive practice in the four language skills. 3 class hours, 2 laboratory periods. Credit, 3.

FRENCH 107 (I) (II). Intermediate French — French Life and Culture.
An intensive review and study of the language. Readings in modern French literature. Prerequisite, French 102 or equivalent.

FRENCH 108 (I) (II). Intermediate French — French Life and Culture.
A study of some important literary works of the 19th and 20th centuries. Composition. Prerequisite, French 107. 3 class hours. Credit, 3.

GERMAN 101 (I), 102 (II). Elementary German.
Conversation, reading, grammar, and composition. 3 class hours, one laboratory hour. Credit, 3.

GERMAN 107 (I), 108 (II). Intermediate German.
Reading, conversation. Grammar review. Prerequisites, German 101 and 102. 3 class hours, one laboratory hour. Credit, 3.

SPANISH 101 (I), 102 (II). Elementary Spanish.
For students with no previous creditable training in Spanish. Intensive practice in the language skills. Upon completion of this course, most students are required to take Spanish 107 and 108 in order to fulfill the language requirement. 3 class hours, 2 laboratory sessions. Credit, 3.

SPANISH 107 (I), 108 (II). Intermediate Spanish.
For upperclassmen who have completed Spanish 101-102, and those freshmen and transfer students who are found qualified by placement examination. Training in the language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 108 fulfill the language requirement. 3 class hours. Credit, 3.

MATHEMATICS 011. Elementary College Algebra.
Intended for those students who offer only one unit of algebra for entrance. A review of elementary algebra and a more thorough study of such topics as quadratic equations, exponents and radicals, and progression. No college credit is given for this course. 3 class hours.

MATHEMATICS 111. Introductory Mathematics.
Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions by the methods of algebra and analytic geometry. 3 class hours. Credit, 3.

MATHEMATICS 112. Finite Mathematics.
Probability, vectors, and matrices, and an introduction to linear programming. Prerequisite, Mathematics 111. 3 class hours. Credit, 3.

MATHEMATICS 121. Algebra and Trigonometry.
Fractions, quadratic equations, exponents, logarithms, variation, determinants of the second and third orders, and plane trigonometry. Students who have entrance credit in trigonometry cannot take Mathematics 121 for University credit. 3 class hours. Credit, 3.

MATHEMATICS 123. Analytic Geometry and Calculus I.
Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivations, differentiation of algebraic functions, tangent and normal lines. 3 class hours. Credit, 3.

MATHEMATICS 124. Analytic Geometry and Calculus II.
Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Mathematics 123 and Trigonometry. 3 class hours. Credit, 3.

MATHEMATICS 135. Introductory Engineering Mathematics.
Introduction to analytic geometry and calculus. 3 class hours. Credit, 3.

MATHEMATICS 136. Introductory Calculus for Engineering.
Continuation of Mathematics 135. Prerequisite, Mathematics 135. 3 class hours. Credit, 3.

MUSIC 101 (I) (II). Music Appreciation — Introduction to Music.
Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and the cultural significance of representative works from the 19th century to the present are studied and discussed. 3 class hours. Credit, 3.

PHILOSOPHY 105 (I) (II). Introduction to Philosophy.
An introduction to some of the general questions, ideas, theories, and methods of inquiry which have given direction to Western thought. 3 class hours. Credit, 3. (No prerequisite.)

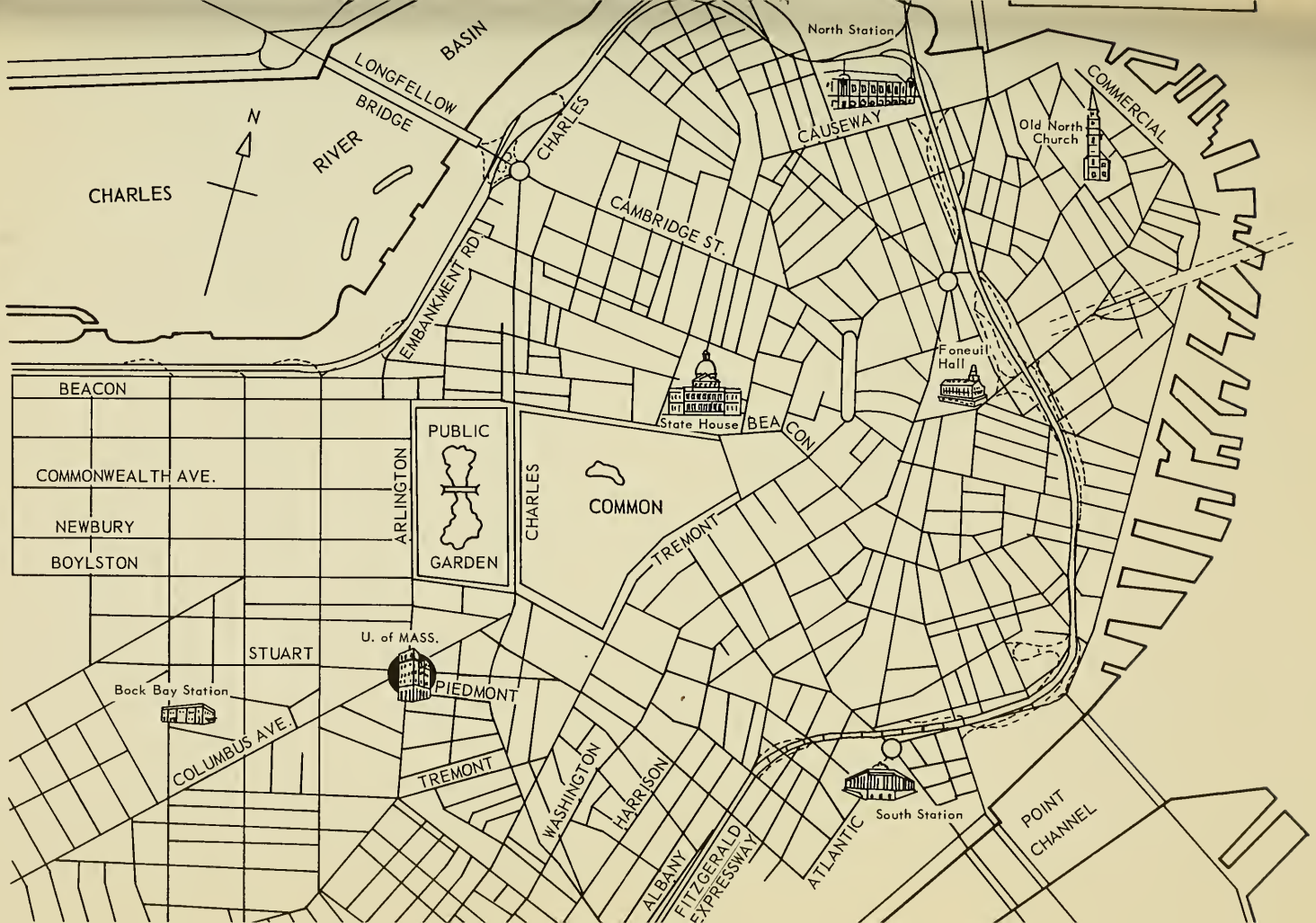
PHILOSOPHY 125 (I) (II). Introduction to Logic.
An inquiry into the nature of critical thinking, including (1) the function of language, (2) the structure of deductive arguments, (3) a glimpse at inductive methods. 3 class hours. Credit, 3. (No prerequisite.)

PSYCHOLOGY 101 (I) (II). General Psychology.
An introduction to the principles and study of behavior. Topics considered include development of behavior, sensation, learning, thinking, motivation, intelligence, attitudes, and personality. 3 class hours. Credit, 3.

SOCIOLOGY:

SOCIOLOGY 101 (I) (II). Introduction to Sociology.
A study of the social order and of the individual considered as a member of his various groups. 3 class hours. Credit, 3.

ANTHROPOLOGY 103 (I). Introduction to Physical Anthropology and Archaeology.
An introduction to the field. The course deals with human evolution, race and racism, prehistoric archaeology, culture history and the nature of culture. 3 class hours. Credit, 3.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WASHINGTON
HARRISON
ALBANY
FITZGERALD EXPRESSWAY
ATLANTIC
South Station
POINT
CHANNEL

Adventure in Higher Learning

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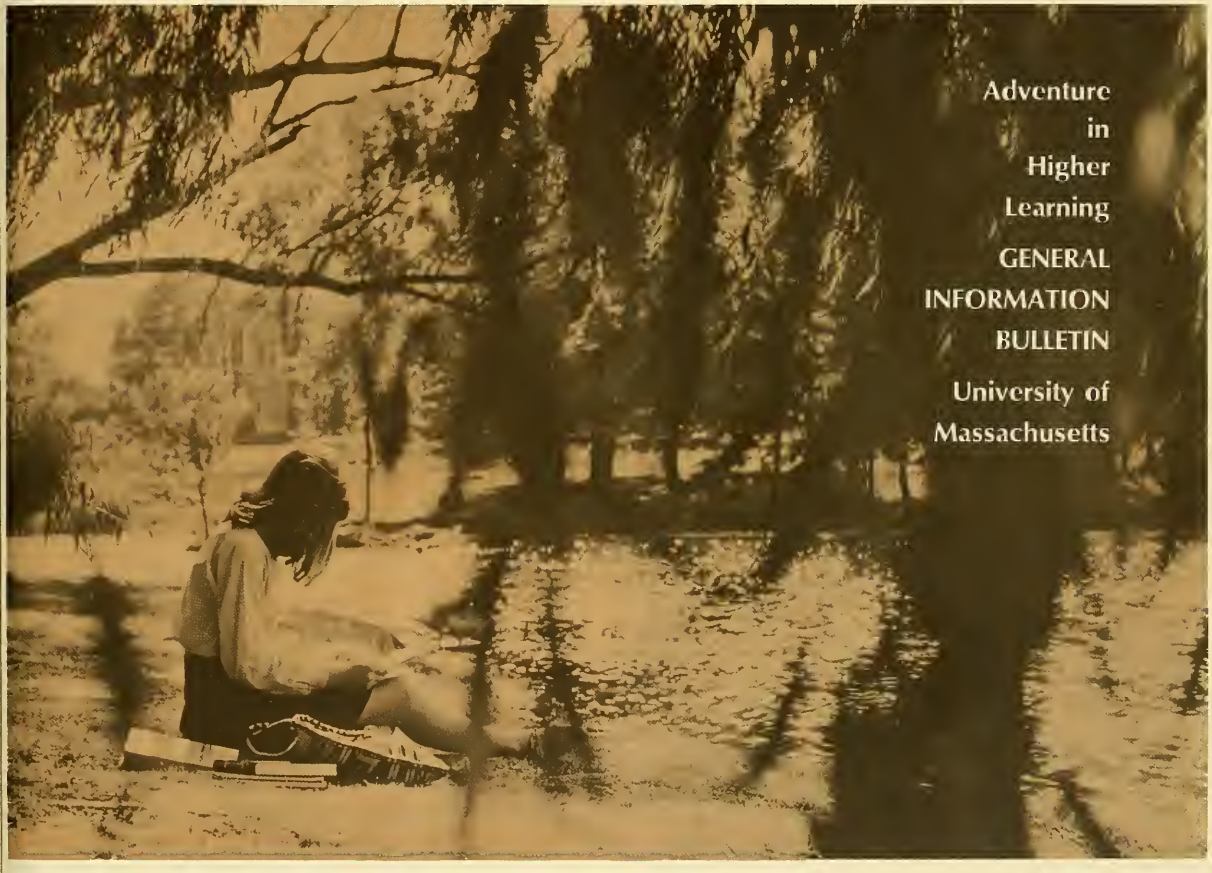
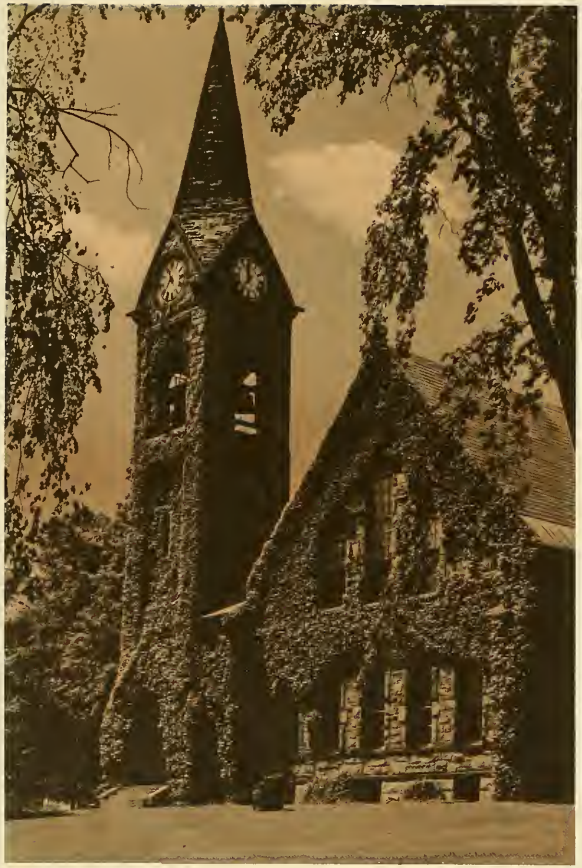


Adventure in Higher Learning

GENERAL INFORMATION BULLETIN

University of Massachusetts



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A WORD FROM THE PRESIDENT

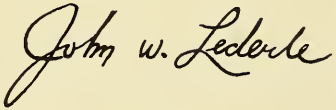
In the pages that follow, you will find the University of Massachusetts described as "a place to live, to work, to learn." The University is, in other words, not only a place — but an opportunity. And the emphasis is on people, on teachers and students, on the men and women who contribute to and make our society what it is.

The full resources of the University are therefore always at the disposal of our students, whom we regard as the most important resource of all. And certainly if the young people we accept are to live, work and learn *well*, then we must be sure that they are *interested* and *dedicated people*, who will profitably and effectively participate in all that the University has to offer.

This is important, for the University itself is committed to serving national objectives in one of the most challenging eras of world history. We therefore see our students as integrally involved in helping our society to grow and to contribute in all significant ways to fulfilling these objectives.

In the process, students can derive enjoyment and satisfaction in the largest measure. The University has rich opportunities both in its curricular and extracurricular activities. Those who wisely balance their programs, who place studies first and carefully select other activities, can experience the "connection between knowledge and the zest of life" that is reflected in the program of all true universities.

Cordially,



JOHN W. LEDERLE
PRESIDENT

THE UNIVERSITY

The University of Massachusetts is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier.

The University is a member of the great community of Land Grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry. Incorporated as the Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of such colleges as Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later, in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University on its Amherst campus joins with its academic neighbors — Amherst, Smith, and Mount Holyoke Colleges — in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus in Amherst consists of approximately 950 acres of land and 110 buildings. These structures include classroom and laboratory facilities as well as dormitories and other units.

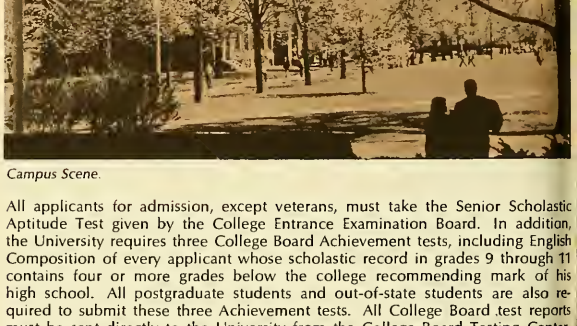
To augment the Commonwealth's facilities at the university level, the University of Massachusetts has planned and will open a campus in Boston at 100 Arlington Street in September, 1965. The new campus will offer educational programs comparable in quality to those available at Amherst, but will be a commuting institution. During the year 1965-66 the program will be largely at the freshman level as it is planned to expand the offerings by one class each year. Classes will be offered during the day, late afternoon and evening.

The total resources of the University of Massachusetts are dedicated to giving all qualified students full opportunities to develop their capabilities for service in a growing society.

ADMISSION - - HOW TO GET READY

The information given below applies to both the Amherst and the Boston campuses. For more detailed information regarding the University of Massachusetts-Boston, contact the Admissions Office located at 100 Arlington Street, Boston. (Tel. 542-6500).

Applications for admission may be obtained by writing the Admissions Office of the University. There is no application fee required at the University of Massachusetts. High School seniors are advised to file their applications early in the senior year. Out-of-state and foreign applications must be received and completed prior to February 1st, for fall admission. College Board tests should be taken no later than the January testing date. If they are to be considered during the normal processing, in-state applications should be received and completed by March 1st. Qualified applicants are admitted at the beginning of the fall and spring semesters and at the beginning of the summer session.



Campus Scene.

All applicants for admission, except veterans, must take the Senior Scholastic Aptitude Test given by the College Entrance Examination Board. In addition, the University requires three College Board Achievement tests, including English Composition of every applicant whose scholastic record in grades 9 through 11 contains four or more grades below the college recommending mark of his high school. All postgraduate students and out-of-state students are also required to submit these three Achievement tests. All College Board test reports must be sent directly to the University from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University. The Scholastic Aptitude Test may be taken on any of the scheduled dates, although the December testing date is preferred. The March and May dates are too late for seniors, but are appropriate for juniors taking the test for guidance purposes.

The University recognizes the importance of a first-hand acquaintance with the colleges a student may be considering, and hopes that he will find it possible to visit the campus for his own information and satisfaction. He should be assured, however, that it will not disadvantage his application if he is unable to do so. The University holds several Guest Days for high school seniors in the fall. These are particularly appropriate times to visit the campus and high schools are notified concerning them. An interview is, however, not part of the admissions procedure. It is physically impossible for the admissions staff to interview all applicants; therefore, personal conferences will be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence. At the Amherst campus, group interviews are scheduled for in-state candidates at 10:00 a.m., and at 11:00 a.m. for non-residents on Saturdays, excluding Holiday weekends, during the academic year. Guided tours will be available at the conclusion of each group interview.

Those interested in visiting the Boston campus should contact the Admissions Office at Boston. If it seems necessary to schedule an admissions counseling conference, it would be prudent for the applicant to make certain that his application and academic records have been received by the Admissions Office prior to his visit so that his situation may be discussed intelligently.

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

High Ranking High School Juniors

Applicants who have completed with very high academic standing work through the junior year may be admitted to the University for the semester following the junior year. Such applicants must take the Scholastic Aptitude and three achievement tests given by the College Board in May of the junior year and compile scores satisfactory to the University. They must be highly recommended by their high school principal. The maturity and social adjustment of the applicant will be considered along with his intellectual development. Such applicants should apply before the end of the junior year.

Veterans

Veterans are not required to take the Scholastic Aptitude test. Instead, they must take entrance examinations in Algebra and English and a College Qualification test. These are administered by the University Testing Service in December, May and August. Information in regard to these tests will be furnished the veteran at the time he files his application for admission. Six months Active Duty for Training students are not considered veterans. They must take the College Board Scholastic Aptitude test rather than the Veterans' Examinations. Veterans in college or in full time postgraduate studies at present are considered in the same category as other applicants and do not take the Veterans Tests.

Bachelor of Vocational Agriculture Degree

Superior graduates of vocational schools of agriculture in Massachusetts and vocational agricultural departments in Massachusetts high schools may be accepted for the Degree of Bachelor of Vocational Agriculture, provided:

They are unqualifiedly recommended by the Vocational Division of the Department of Education as *bona fide* Vocational Graduates with superior ranks; they can present at least 16 units of certified entrance credits, approved as to quality and quantity by the State Department of Vocational Education; they successfully pass the English and College Qualification Test administered by the University Guidance Office. Those who have had algebra will be required to include the algebra examination.

Transfers

A limited number of transfers from approved colleges may be admitted. Since applicants for such transfer exceed the number that can be accepted, they are placed on a competitive basis. Ratings will be based upon high school and college records and on the College Board Scholastic Aptitude Test, which is required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. Applicants for transfer should write the Registrar for a transfer application. At least 45 semester credits taken in residence at the University are required of all transfers who are candidates for the Bachelor's Degree.

SUBJECT REQUIREMENTS

The subjects of preparatory study required for admission call for the satisfactory completion of a four-year high school course or its equivalent and are stated in terms of units. A unit is the equivalent of at least four recitations a week for a school year. High school graduation alone is not sufficient. The applicant's record must indicate capacity for handling the quality of scholastic work which the University has established as its standard of achievement.

Sixteen units of secondary school work must be offered, selected according to the following requirements:

College Preparatory Mathematics	3*
English	4
Foreign Language (2 years of 1 language)	2
U. S. History	1
Laboratory Science	1

The remaining units are elective and may be selected from the following subject matter:

a. Mathematics
b. Science
c. Foreign Language
d. History and Social Studies
e. Free electives (not more than four units)

Free elective subjects are those not included in groups a-d, as for example: Music, art, drawing, typewriting, aeronautics, agriculture, home economics, etc. Such free electives are allowed in order that the student who wishes may have some opportunity to elect other high school offerings, while at the same time covering the fundamental requirements for college work.

Students planning to major in the physical sciences and mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half year of trigonometry. Analytical or solid geometry, chemistry, and physics, and an introduction to analytical geometry and calculus are also strongly recommended.

*Preferably two years of Algebra and one of Plane Geometry.

Students planning to pursue an engineering curriculum should offer two years of algebra, one of plane geometry, and one-half year each of trigonometry and solid geometry. Chemistry and physics are also advised. Those deficient in the mathematics should plan to cover it during the summer prior to entrance or expect to take five years to complete the college course.

Candidates who are deficient in any of the prescribed courses can be considered only if their over-all scholastic records indicate exceptional academic promise.

PHYSICAL EXAMINATION

Physical examination by their personal physician is required of all entering freshmen, re-entering students and all students participating in athletics. Physical report forms for this examination will be mailed to each student with the bill for the first semester and must be completed and returned to the University Health Service 10 days before the opening of the semester. Evidence of a *successful* smallpox vaccination and active tetanus immunization are required.

VETERANS' AFFAIRS

The Veterans' Coordinator is a staff member of the Placement and Financial Aid Services. All veteran affairs should clear through the Placement and Financial Aid Services.

Eligible dependents of veterans who are entering the University for the first time should have a Certificate of Eligibility at registration. This may be obtained from the nearest Veterans Administration office. Board, room, and fees must be paid in advance whether the student is enrolled under the G.I. Bill or not.

Veterans' dependents who are transferring to the University of Massachusetts from another institution or who have done summer work at another institution should present a supplemental Certificate of Eligibility at registration. This may be obtained through the veterans' office at the institution last attended.

WHAT IT COSTS TO ATTEND

AMHERST CAMPUS

Expenses vary from approximately $1,250 to $1,400 per year for the normally economical student. First year costs are usually greater than those of the other three years and there is less opportunity for earnings. Therefore, a student is advised to have a definite plan for meeting the expenses of the first year before entering.

The following estimate of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly university-related and does not include amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year. Tuition for residents of Massachusetts is $200 per year and for others $600.

	Normal
Tuition (citizens of Massachusetts)	$ 200.00
Room in University residence hall or private home (approx.)	300.00
Board at University dining halls	448.00*
Athletic Fee	30.00
Student Union Fee	20.00
Student Activity Tax (approx.)	28.00
Student Health Services Fee	40.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	18.00
Books, stationery, and other supplies (estimate)	150.00
	$1,234 .00

INITIAL PAYMENT FOR FRESHMEN

The initial payment for first semester expenses required of freshmen at the time of fall registration is indicated below and is made up of the following items:

Tuition (citizens of Massachusetts)	$ 100.00
Room rent in University residence halls (approx.)	150.00
Board at University dining halls	224.00*
Athletic Fee	15.00
Student Union Fee	10.00
Student Activity Tax (approx.)	14.00
Student Health Services Fee	20.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	18.00
Physical Education Equipment Fee (men only)	10.00
Books, stationery, and other supplies	100.00
	$ 661.00

These are only approximate figures. A bill will be rendered to the parent of each student prior to the beginning of the semester.

BOSTON CAMPUS

The expenses involved in attending the University of Massachusetts at Boston will be appreciably lower than those attending the University of Massachusetts at Amherst. The major difference is the cost for room and board; since the University of Massachusetts-Boston was created as a non-residential college, its students will be living and boarding at home or under other non-college arrangements.

*Above plan for 7 days; 5-day plan available for approximately $370.00 per year or $185.00 per semester.

Certain other expenses which are obligatory at the University of Massachusetts-Amherst are not required for University of Massachusetts-Boston students.

The following schedule of tuition and fees includes only those items which are strictly college and does not include amounts for clothing, laundry, travel, etc. Expenditures for books, stationery, and other supplies is estimated to be $100 for all full-time students.

SCHEDULE OF ANNUAL TUITION AND FEES

	Full-time	*Part-time*
Tuition (citizens of Massachusetts)	$200.00	$100.00
Tuition (not citizens of Massachusetts)	600.00	300.00
Student Activities Fee	30.00	20.00
Student Medical/Surgical Insurance, 12 months coverage (optional)	30.00	30.00

The initial payment for first semester expenses required of freshmen at the time of fall registration, is $145 for resident students and $345 for non-resident students.

TUITION

As a state institution the University of Massachusetts offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a "bona fide" residence in the Commonwealth with the intention of continuing to maintain it as such.

The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation the student, in addition to the requirements of these regulations, respecting residence, shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of the husband.

The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University. Students receiving credit by special examination must pay $5.00 per credit to be received before the examination may be taken.

SUMMER ORIENTATION FEE

Members of the incoming freshman class attending the summer orientation program on the Amherst campus will pay a non-refundable fee of $15.00 to cover the cost of meals, housing, testing and counseling. Likewise, incoming freshmen accepted at University of Massachusetts-Boston will pay a non-refundable fee of $10.00 to cover the cost of testing and counseling.

Registration.

Studying in Library.

PAYMENT DUE DATES

In accordance with University policy, all charges for tuition, fees, board and room rent in University dormitories are due and payable twenty-one days prior to the date of registration of each semester. Bills will be rendered in advance and payment may best be made by mail. Students may not register until all University charges are paid.

A WORD ABOUT FINANCIAL AID

Scholarships, loans, and part-time employment are available for a limited number of needy and deserving students. A limited number of such awards are available to entering freshmen who have made outstanding records in high school. Applicants for scholarships must file the Parent's Confidential Statement prepared by the College Scholarship Service when the Admissions Application is sent, or no later than March 1st of the admissions year. Students may also apply for certain kinds of loans, including those available under the National Defense Student Loan Program, University loans (after the first semester of the freshman year), and the Higher Education Loan Plan (at the end of the freshman year). Also, students may engage in part-time work after the completion of the first semester of their freshman year. Information about each of these programs may be obtained by writing to the Director of Placement and Financial Aid Services. Dependents of veterans who are eligible for benefits may also apply to this office for information.

Scholarships and loans are available for students at the Boston campus.

A PLACE TO LIVE, TO WORK, TO LEARN

Goodell Library.

How can I make the most of my college career? Every student asks this question just before the start of his freshman year. Specific answers usually wait until the student is actually in college where teachers and advisers help him to decide on the major course of study he should pursue Often, of course, a student has already made a decision about his "major," and if the decision is based on a sound assessment of aptitudes and abilities, this is all to the good.

But even for students who are sure about what they want to "take" in college, the question is still very important. The danger in approaching college work lies in the assumption that this is, as with many other activities, "just a routine." As a student reads the general catalogue, he finds rules, regulations, requirements, and prescribed courses of study. All these tend to make him feel that the curriculum is indeed just a routine for getting enough credits to graduate.

For many students this is certainly true. But for the wise student, the word "routine" is supplanted by the word "adventure." The rules and regulations are not thereby eliminated, for every college must have the means of order and stability by which to achieve its basic objectives to which the various groups of required courses lead. But the good student recognizes that he need not work merely to satisfy *minimal* requirements: he can do much more. If he learns early that thought is not locked within the four walls of a classroom, if he is alive with interest, if he realizes that his four years in college will be the best he will ever have for stocking his mind and exercising his imagination, then his "prescribed course of study" will become a springboard to a fascinating realm of knowledge and ideas that only he himself can attain.

The following paragraphs, therefore, are simply intended to show what the University can offer a student, what it requires of him, and what he must do to fulfill these minimal obligations. Beyond these basic offerings and requirements lies the real adventure — the adventure in learning.

A YEAR-ROUND OPERATION

The University conducts its program on virtually a year-round basis. The regular two semesters of the academic schedule are supplemented by a two-term summer session in which a student can earn nearly the equivalent of a full semester's work. Combining the work of the regular academic year with a complete schedule of courses in the summer sessions, students can finish their college careers in three years instead of four. The summer session is open to all freshmen who wish to begin their college education immediately following graduation from high school. It is also available to high school juniors who are accepted for study at the University under the Early Admission Plan (see below under Program for Superior Students).

THE ACADEMIC PROGRAM

The University consists of two main divisions, the four-year undergraduate curriculum and the Graduate School. Instruction in the undergraduate program is assigned to the College of Agriculture, the College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education, and the Department of Public Health. A qualified student may enter any one of these units and work toward the appropriate bachelor's degree, as described on Page 11. The total program is built around a core of studies designed to provide a sound general background. Beyond this, the student elects a program within a particular branch of learning in order to prepare for advanced study in that field or for a career in one of the professions. Offerings in the various branches range from accounting to zoology, and a student electing any major course of study has opportunities for a comprehensive education in the four-year program. Descriptions of the courses of study offered in each of the undergraduate branches can be found in the section beginning on Page 12.

THE PRELIMINARIES: FRESHMAN ORIENTATION

All students entering as freshmen must attend a three-day orientation program at a specified time during the summer prior to entrance. The program consists of testing, counseling, and pre-registration for courses to be taken during the coming semester. Guidance and placement tests are given and scored, and each

student is assigned a faculty adviser who will help in the selection of courses and planning of a class schedule. On the final day of each of these periods, a special program is held for parents so that they may learn about the student's proposed courses and schedule for the fall semester, the results of the testing sessions, and the facilities and opportunities available at the University.

GENERAL UNIVERSITY SERVICES

The University is a community of individuals working toward a common goal — the acquisition and dissemination of knowledge. As a community, therefore, the institution has all of the adjunct resources needed to further that goal and to provide for the general well-being of the community's members.

Thus, the University maintains an extensive library system, both through the University Library and the 30 departmental and laboratory libraries. In addition, the University is a participating member in the Hampshire Inter-Library Center, housed at the University and containing journals, documents and reference sets for use in study and research. The Center is jointly operated by Amherst, Smith, and Mount Holyoke Colleges and the University under the Four College Co-operation Program engaged in by the four institutions.

Concerned as it is with the need for spiritual undergirdings for the educated man, the University gives support to the religious life of its students in various ways. It affords the use of facilities for student groups of all faiths, and it honors the work of the Campus Religious Council which provides a cooperative inter-relationship among religious groups. Chaplains are assigned to campus by the various faiths, and students are urged to meet with their own chaplain upon coming to the campus.

The University also maintains a Counselling and Guidance Office staffed by highly trained and skilled counselors. This service is available to all students who desire to learn more about themselves and their aptitudes. This office, besides offering specialized advising in addition to that normally given in academic departments, offers courses in reading and study skills in conjunction with the School of Education.

The University Health Service, housed in one of the newest buildings on campus, is concerned with the total health of individuals and groups, as reflected in the need for complete physical, mental and social well-being. The new infirmary contains a fully-equipped out-patient department, X-ray and laboratory resources, and physiotherapy facilities. The Health Service staff of physicians, technicians and nurses is devoted to promoting good physical and mental health, conditions of safety, and other factors affecting the health of students in the campus community. In addition, the University maintains a Speech and Hearing Center to assist students and others with speech and hearing problems.

GRADING SYSTEM

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below. The quality point average required for continued enrollment and for graduation is set by the Faculty Senate. At present the graduation requirement is a cumulative average of 1.80.

Grades are reported according to a letter system, as follows: A—Excellent, B—Good, C—Average, D—Passing (but not satisfactory), F—Failure, and Inc.—Incomplete. Quality points per semester hour are assigned as follows: A, 4; B, 3; C, 2; D, 1; and F, 0. To compute the semester grade point average, as well as the cumulative average, the total points earned are divided by the total credits carried. Any student whose semester quality point average falls below the cumulative requirement is warned of his status by the Registrar and informed of the rules governing dismissal. Students who achieve high averages are placed in one of three honors groups each semester, as follows: First Honors: 3.8 or higher; Second Honors: 3.4 to 3.7 inclusive; and Third Honors: 3.0 to 3.3 inclusive.

ADVISORY SYSTEM

In order that, from the day he enrolls, the freshman may have someone to whom he may go for consultation and assistance, each student selects a tentative educational objective and is assigned a faculty adviser within that academic area.

In the second semester of the freshman year, each student is given an opportunity to change to a new department or to remain in his current department. In succeeding semesters, students may change to another major department by execution of a Major Change Card (available in the Registrar's Office). It is the function of this adviser to help the student in adjusting himself to the work and life of the University. Academic progress reports issued by the Registrar's Office are sent to the advisers periodically, and the students are expected to report to their advisers from time to time to discuss their academic standing. The University also forwards reports of academic standing to the parents. Both students and parents are encouraged to consult with the adviser whenever there are problems regarding studies or personal adjustments to college life.

PROGRAMS FOR SUPERIOR STUDENTS

The University regularly provides superior students with challenging educational programs extending from the freshman through the senior year. Under the Early Admission Plan, the University considers applications from students of high standing who have completed their junior year of secondary school.

Many entering students are able to achieve advanced standing and credit for college-level courses successfully completed in their secondary schools as part of the College Entrance Examination Board Advanced Placement Program or an equivalent. The University also administers a number of its own advanced placement tests. A student who demonstrates he is proficient in a basic college subject may by-pass the beginning course and go on to advanced work in the subject. Upon attaining satisfactory standing in many of these courses, students are granted academic credit for the courses by-passed. Also, up to thirty semes-

ter hours of credit may be granted students of high standing who can fulfill the requirements of some of their courses through independent study.

The major feature of the program for superior students is the honors curriculum available to all who qualify. Freshmen are eligible for the Honors Colloquium program conducted for the first three undergraduate classes.

The Senior Honors Program recognizes merit and gives highly qualified students time and opportunity for independent study under closer, more personal direction than is ordinarily provided in the University curriculum. Students who complete their work satisfactorily are eligible for graduation with honors.

STUDENT HOUSING

It is the policy of the Board of Trustees that all men and women undergraduate students shall be housed in campus residence halls and be required to eat at University dining halls unless given permission to commute from their parents' home or to live at sorority or fraternity houses. Sororities and fraternities may furnish regular board to members up to the approved capacity for each house.

As architect envisions new Southwest Dormitory Complex.

Most residence hall rooms are double and all are furnished with beds, mattresses, desks, chairs, mirrors, and a chest of drawers. In addition to this, many have desk lamps, waste baskets and draperies. Students care for their own rooms and are responsible for any damage. Residence halls open for occupancy on the day immediately preceding the opening of the University. All student property must be removed from the rooms and the key returned immediately after final examinations in June. Such property not removed by the owner will be removed by the University and stored at the owner's expense. Students assigned to residence hall rooms will be responsible for the room rent of the entire semester. Room rent is not refundable. Room rental charges do not include the several regular school vacation periods. The University reserves the right to change room assignments whenever necessary. The University, also, reserves the right to utilize student rooms during vacations for conferences and other groups which meet occasionally on campus.

UNIVERSITY-OWNED APARTMENTS

The University owns and operates two groups of apartments: The University Apartments for new and junior faculty, and the Lincoln Apartments for junior faculty, married graduate and undergraduate students. Apartments are unfurnished with the exception of kitchen units which contain an electric range and refrigerator. Apartments are assigned as of the date of availability. New junior faculty, married graduate students and undergraduate students with children receive consideration in that order. Further housing information and/or applications may be obtained from the University Housing Office in Draper Hall.

MOTOR VEHICLE REGULATIONS

Driving to and from classes is not permitted, and only students in the following categories will normally be authorized to possess and operate a motor vehicle in the Amherst area:

a. Commuting students who live over one mile from the center of campus during the academic year.
b. Students whose locomotive capability is so seriously impaired that they would be prevented from meeting regular class appointments without motor vehicle assistance.
c. Married students residing with spouse.
d. Students over 25 years of age.
e. Members of the senior class.
f. At the discretion of the Dean of Men or Dean of Women, students presenting extenuating circumstances in writing may be authorized to possess motor vehicles.

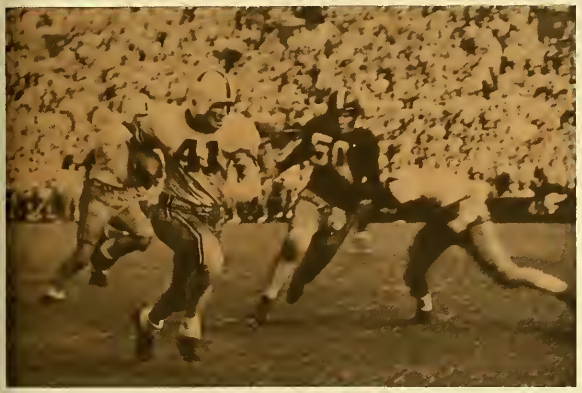
All motor vehicles must be registered with the University Police. In advance of arrival on campus, eligible students should obtain from the University Police Department a copy of the University regulations pertaining to possession, registration and operation of motor vehicles.

STUDENT ORGANIZATIONS

Participation in extra-curricular activities offers opportunities for furthering the broader objectives of a college experience. The knowledge, skills and judgment developed in the classroom can be tested and refined through use in the organizational setting. Thus, more than fifty professional clubs exist on campus as a means of stimulating vocational interest through close contact with members of the teaching staff and representatives of the professions. Student government offers a forum for debate on matters of importance to the entire University community. For those interested in communications, there are several campus publications as well as an FM radio station. Experience in music and drama is available in a number of forms.

Such activities can be a profitable means of fostering maturity and general enrichment in those students who wish to take optimum advantage of all that the University can offer. In encouraging participation in these activities, the University asks only that students plan their time well, in order that they may profit as much as possible from a total University program devoted, first and foremost, to academic studies.

All extra-curricular activities are supervised by the Committee on Recognized Student Organizations composed of alumni, faculty, and students. Recognition for outstanding achievement in this area is given at an annual Student Leaders Night held in the spring. An office devoted to administering and assisting in the conduct of student activities is located in the Student Union. Detailed information about student organizations may be obtained by contacting the Recognized Student Organizations Adviser.



UMass Redmen in action.

PLACEMENT SERVICES

The University maintains an Office of Placement and Financial Aid Services whose responsibilities include vocational and financial counseling and the administration of the affairs involved in aiding students to seek appropriate positions and careers; the granting of loans and scholarships; the assignment of part-time work; the coordination of veterans' affairs; and the dissemination of information relative to military service through the draft or reserves. While providing vocational and career counseling for all undergraduates, the emphasis is on aid to seniors in planning their future following graduation and providing them with job-hunting techniques and other media for finding permanent employment. Actual contact with employers is provided during the year when employers from business, industry, schools, and other sources visit the campus to interview prospective graduates.

Cumulative student personnel records; occupational information and industrial literature libraries; preparation of credentials including personal resumes and recommendations coupled with counseling and guidance are provided to enable senior men and women to accomplish their career objectives consistent with their interests, abilities, aptitudes and education.

THE PROGRAM AND ITS OPPORTUNITIES

The University offers four-year undergraduate curricula leading to the following degrees: Bachelor of Science, Bachelor of Arts, Bachelor of Science in Chemical, Civil, Electrical, Industrial and Mechanical Engineering, and Bachelor of Business Administration. Work toward these degrees is carried on in the College of Agriculture, the College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education, and the Department of Public Health. Special arrangements are made for some graduates of county agricultural schools and of agricultural departments of certain high schools to complete the college course with majors in agriculture and horticulture. Upon completion of their course, these students are granted the degree of Bachelor of Vocational Agriculture.

The aim of the four-year course is to give the student as high a degree of proficiency in a particular branch of learning as is possible without sacrificing the breadth, knowledge and general training which should characterize a well-rounded college education. Under this philosophy, the University has made recognized contributions, through its graduates, to the life and culture of America. University alumni hold positions in government, education, business, science and engineering, the arts, medicine, law, and many other professions. With rising enrollments, the University is educating ever greater numbers of young men and women for significant careers and important contributions to American society.

The following pages are designed to give some indication of the variety of such opportunities open to students who are accepted for admission. Descriptions of curricula are given in brief and general terms so that prospective applicants may become quickly acquainted with the entire range of offerings. Graduation requirements for each curriculum have been omitted, principally because a student admitted to the University will have ample opportunity to acquaint himself with such requirements after he has arrived on campus. Courses required in the freshman year, on the other hand, are included in the section beginning on Page 30. Further information on various phases of the major courses of study may be obtained from the Deans of the Colleges and Schools or from the Registrar. Information about other aspects of the University program may be obtained from the appropriate offices listed on Page 32.

COLLEGE OF AGRICULTURE

Arless A. Spielman, *Dean* — Stockbridge Hall

The College of Agriculture offers a broad general education with specific training in a specialized area. Upon the completion of the requirements for the Bachelor of Science degree, the student will have devoted about one-quarter of his time to pure science, one-quarter to social and humanistic studies, and about one-half to applied science and technology. A broad choice of electives within the required courses of each curriculum gives the student the opportunity to prepare for a career in research, industry, business, education, conservation, services. Each department of the College has specific requirements for graduation which are included in the General Catalog under the name of the department. During the first semester of the freshman year, students interested in teaching vocational agriculture, extension work, or specializing in research work, should consult with the head of the department in which they plan to major.

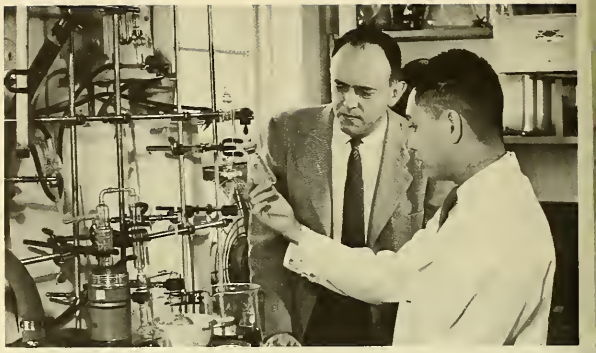
For those students interested in a two-year program in food and agricultural industries, the University provides offerings in the Stockbridge School. A separate bulletin describes these offerings in detail.

The four-year courses of study available in the College of Agriculture include the following:

AGRICULTURAL AND FOOD ECONOMICS. This curriculum is designed (1) to prepare students for employment in executive positions with firms related to agriculture or for administrative positions with governmental agencies concerned with agriculture and (2) to give the essential undergraduate preparation for a career in agricultural economics, in research, teaching, or extension work. The course of study, which leads to the degree of Bachelor of Science, combines training in technical agricultural sciences with courses in business management and economics.

AGRICULTURAL ENGINEERING. Agricultural engineering is concerned with the application of scientific engineering principles to agricultural industries. This professional field includes engineering activities related to the design, development and use of mechanical and electrical equipment; structures; and soil and water control systems for the production, processing and preservation of agricultural products and the improvement of rural living. Agricultural engineers are employed by a variety of agricultural industries and organizations for research, development, teaching, and promotional activities.

ANIMAL SCIENCES. The curriculum in the animal sciences, including poultry, is designed to provide fundamental training and knowledge in the comparative nutrition, physiology, breeding, selection and management of various classes of livestock and to understand the role of animal production in the national and world economy. The curriculum provides for an important degree of flexibility depending upon the students' interest and abilities. Options emphasizing commercial animal production are supported by electives in agricultural economics, agricultural engineering, and business administration. Students interested in graduate work in such specialized areas of the animal sciences as nutrition, physiology or genetics should elect programs with special emphasis on the basic sciences.

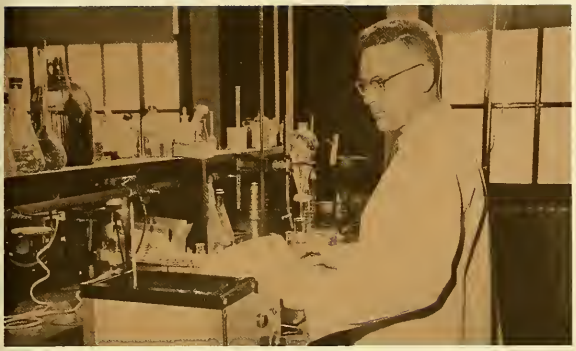


Research in Animal Science.

ENTOMOLOGY. Courses in entomology acquaint students with all phases of insects and insect control, including agriculture and medical entomology. Trained entomologists find positions in public service and industry, such as teaching at all levels; research, quarantine and regulatory work in State or Federal Service, various roles in public health and pest control activities; research, sales and public relations work in the agricultural chemicals industry; and agriculture.

FOOD SCIENCE AND TECHNOLOGY. The curriculum in Food Science and Technology provides scientific and technological training in the principles concerned with the processing, preservation, and packaging of foods and food products. The student's training is directed to the application of modern science and technology to research and to the manufacturing and distribution of foods. Major fields open to graduates include: (1) product research and development; (2) food processing and packaging; (3) technological work and research in government, industry, and education; (4) advanced graduate study.

FORESTRY AND WOOD TECHNOLOGY. The curriculum in Forestry concerns the biology and management of forests for the production of wood, water, wildlife, and opportunities for outdoor recreation. Integrated, multiple-purpose forest use is emphasized. The accredited program prepares graduates for employment with private industry, federal and state agencies, conservation and planning organizations. The program in Wood Technology emphasizes studies in the nature and properties of wood, the engineering and chemical technology



Laboratory in foods research.

Wildlife and fisheries biology.

of its manufacture into a variety of useful products, and the business aspects of industrial management and marketing. Graduates find employment in wood-processing firms and service-related industries, and in marketing and merchandising.

LANDSCAPE ARCHITECTURE. Students following this curriculum, which requires 125 credits for graduation, are prepared through a broad academic approach to take up work in the various phases of landscape architecture. This applied design profession is concerned with the development of land for human use and enjoyment. In addition to the usual areas of interest, such as site planning for private, semi-public and public works of many types, considerable city and regional planning is now available for those interested.

PARK ADMINISTRATION. This new curriculum provides a diversified program for those planning a career in park development, operation and administration. The basic background of landscape design supplemented by a wide selection from the biological and social sciences permits preparation for positions in Federal, State, local governments, and various related commercial enterprises.

PLANT AND SOIL SCIENCES. A major in plant and soil sciences permits specialization in agronomy, turf management, many areas of horticulture, soil science and plant pathology. Emphasis is on courses in the basic sciences and those dealing with the principles of plant growth and response to the environment, thereby preparing students for a variety of careers in teaching, research, industry, business, marketing, production, sales, control and regulatory services with state and federal agencies. A major in plant and soil sciences will be required to take a basic group of subjects in the physical, biological and social sciences as well as the humanities.

PRE-VETERINARY. Students may enroll in either the College of Agriculture or in the College of Arts and Sciences. However, since there is no pre-veterinary major, students will also choose a department for their area of concentration. At the summer counseling sessions, students will have an opportunity to meet and discuss their program with the pre-vet advisor, but the formal pre-registration will be handled by a member of his preselected major department. Students who, by their work in the first year, demonstrate a potential ability for success may, in their third semester, apply to the premedical advisory committee for entrance into the pre-vet program. Others may complete the work for a B.S. degree in the chosen major and then apply to Veterinary Schools.

RESTAURANT AND HOTEL MANAGEMENT. The curriculum in Restaurant and Hotel Management is offered by the Department of Food Science and Technology. The program provides technical and professional courses for persons who plan a career in ownership, management, or sales in the hotel-motel, food service or related fields. Professional courses are balanced with a selection of courses in the arts and sciences which serve to broaden the students' interests and appreciations.

WILDLIFE AND FISHERIES BIOLOGY. Wildlife and Fisheries Biology is concerned with the acquiring and application of knowledge concerning terrestrial and aquatic animal populations which are of recreational or commercial value. This knowledge includes the dynamics of animal population and their responses to changes in environmental conditions, including changes incurred by land use and direct exploitation by man. A broad understanding of geology, forestry, soils, agriculture, botany, and zoology is required.

COLLEGE OF ARTS AND SCIENCES

I. Moyer Hunsberger, *Dean* — Bartlett Hall

The College of Arts and Sciences offers instruction in the fine arts, the humanities, the social sciences, the natural sciences, and mathematics, both for students enrolled in the College and for those in other undergraduate divisions of the University. The program provides for the breadth of intellectual development essential to a liberal education and for concentration, which is the necessary foundation for competence in a selected discipline.

The Bachelor of Arts degree may be earned by students majoring in any division of the College. The Bachelor of Science degree may be earned by students in the natural sciences, mathematics, or psychology.

The following major courses of study are available in the College:

ART. The Department of Art is interested in providing two kinds of training: The first gives each student a good general historical and aesthetic knowledge of the arts; the second gives each student an opportunity to develop his creative ability in the several media of the arts.

ASTRONOMY. A Department of Astronomy conducted jointly with Amherst, Mount Holyoke, and Smith Colleges provides instruction in this field. All advanced courses are given on a joint basis for students from the four participating institutions.

BOTANY. Programs in botany prepare students for teaching and research in biological sciences in high schools, universities, industry, and experimental stations.

CHEMISTRY. The prime purpose of the Department of Chemistry is to offer sound preparation for graduate study in chemistry. Accordingly, emphasis is placed upon intellectual accomplishment and broad understanding rather than on terminal training for specific chemical tasks. The program designed for this purpose also affords sound preparation for direct entry into chemical industry, chemical institutes, or governmental laboratories.

ECONOMICS. In economics the aims are twofold: (1) to give the student an understanding of economic theory and of the application of economic principles to the organization of society; (2) to provide students with the elementary training necessary for further study and solution of economic and business problems.

ENGLISH. The major in English affords the student opportunities to improve his knowledge of the English language and his ability to use it clearly, logically, and artistically; to increase his knowledge of Western literature written in English or translated with distinction into English; to read and discuss a literary work

Top left — Bartlett Hall. Top right — Creative design class. Lower left — Foreign language study. Lower right — Symphony band in concert.

with perception and understanding, and to form an independent estimate of it by valid critical standards.

GEOLOGY. For students considering geology as a career, the opportunities are many. Those interested primarily in basic science may look to positions in teaching, in museum work, on state and federal surveys, and in various research organizations. Those concerned mainly with applied science may direct their efforts toward work in mining geology, petroleum geology, engineering geology, and ground-water geology, and industrial mineralogy.

GERMAN. The courses in German are intended to give a practical knowledge of the language for the purpose of wider reading, research, and oral communication.

GOVERNMENT. The courses offered by the Department of Government are designed to aid the student in gaining a knowledge of the nature, functions, and problems of government, and of the place of government in the modern world. Political theory, constitutional law, international relations, comparative government, politics and public administration are the principal areas covered.

HISTORY. Courses in history are designed to provide an understanding of man through a study of patterns of development in the past. The study should also give the student an introduction to major problems in world affairs.

JOURNALISM. The journalism program is concerned with: (1) the study of writing and of communication problems relevant to the media of mass communication, and (2) the best utilization of the University's liberal education resources by students who plan careers in newspaper work, communications research, public relations, magazine and radio journalism, or some other field of communications.

MATHEMATICS. The department offers courses designed to furnish a cultural background as well as a foundation for both undergraduate and graduate work in mathematics, statistics, physics, chemistry, engineering, econometrics, and biometrics.

MICROBIOLOGY. The courses in microbiology are designed to aid the student in acquiring special knowledge of the nature and function of the micro-organisms and to provide an appreciation of the role of experimental biological science in widening man's horizons.

MUSIC. The undergraduate major program in music is pre-professional, so that courses, music organizations, and private study are the means used to prepare each student. Other undergraduates may minor in music, or follow a sequence of courses for continuing study.

PHILOSOPHY. Philosophy seeks a comprehensive understanding of the various areas of man's experience in their interrelatedness. In the context of the historically important theories, the courses concentrate on methods of inquiry into the persisting questions of philosophy, standards of thought, clarification of ethical and aesthetic values, and the basis of criticism.

PHYSICS. Courses are designed to accommodate students who desire specialized training in physics, and also to provide required or elected courses for students majoring in engineering, mathematics, chemistry, or other fields.

PRE-MEDICAL AND PRE-DENTAL CURRICULUM. Pre-medical and pre-dental students are assigned to faculty advisers for their freshman year. At the end of their second semester, they will be assigned to a member of the Upperclass Committee who will be their adviser for the remainder of the course of study. Pre-veterinary students may register in the College of Agriculture or the College of Arts and Sciences.

PSYCHOLOGY. The courses in the Psychology Department are planned: (1) to impart an understanding of the basic principles, methods and data of psychology as a science, and the application of this knowledge to problems of human adjustment; (2) to prepare some majors for graduate study which may lead to a professional career in psychology; and (3) to help prepare others for non-professional careers. In carrying out these aims, majors are urged to elect, with the help of a departmental adviser, a broad program of courses.

ROMANCE LANGUAGES. Three majors are offered: French, Spanish, and Classics — the latter through cooperation with Amherst, Smith, and Mount Holyoke Colleges. The courses of these curricula are intended to give: (1) a thorough training in the language skills, (2) an appreciation of the aesthetic and intellectual qualities of the literatures, and (3) a serious insight into the cultures of the nations concerned. Language and literature courses in Portuguese and Italian also are available.

RUSSIAN. Students choosing Russian as their field of major concentration will receive training in reading, writing, speaking and understanding the language, and a knowledge of Russian literature. Russian majors will also acquire the background in Russian history, government and economy necessary for an understanding of the literature and culture of the Russian people.

SOCIOLOGY AND ANTHROPOLOGY. Students may major either in sociology or anthropology. Courses are planned with two aims in view: to give the student an understanding of the factors which influence men in their activities and interests as members of society, and to help prepare students for a wide variety of occupational outlets, including social work.

SPEECH. The courses offered in the department of speech are concerned with the theory and practice of spoken communication in its various applications. An undergraduate major in speech may choose one of five areas of communication: (1) Rhetoric and Public Address, (2) Interpretation and Theatre, (3) Radio and Television, (4) Speech Education, (5) Speech and Hearing Therapy.

STATISTICS. Although there is no undergraduate major in statistics, the courses are designed for those who are preparing for graduate work in statistics or for those who require statistics as a basic preparation for their own subject-matter discipline.

ZOOLOGY. The courses in zoology have two major aims: (1) to offer students an opportunity to develop an understanding and appreciation of the scientific method as a part of a liberal education; and (2) to provide training for prospective graduate students in biology, medicine, dentistry, and related fields, as well as future teachers and laboratory technicians in the biological sciences.

School of Business Administration building.

Lecture hall in the School of Business Administration.

SCHOOL OF BUSINESS ADMINISTRATION

H. B. Kirshen, *Dean* — School of Business Administration Building

The School of Business Administration prepares students to take advantage of important economic opportunities and eventually to assume positions of responsibility in business. The educational program is directed toward the broad aspects of business, encouraging high standards of ethical conduct, broad social responsibilities and the development of competence in courses of study of the student's interest, aptitude and choice.

The first two years emphasize general education by providing fundamental courses in the humanities, mathematics, science and social science. In addition, basic courses in accounting and economics prepare the student for further work in the School of Business Administration. The junior and senior years emphasize a greater degree of specialization. But even in these last two years all students need to view business as a whole in so far as a "core" of courses can do this. This "core" is required of all students. A total of at least 120 credit hours is required (122 in Accounting) for graduation exclusive of credit received in the required physical education courses. Each course of study leads to the degree of Bachelor of Business Administration.

All students in the School of Business Administration must attain, as a graduation requirement, a 2.0 average in Accounting 125 and 126, Elementary Economic Statistics 121, and the junior "core" courses: Finance 210, Financial Institutions; Finance 201, Corporation Finance; General Business 260, Business Law I; Management 201, Principles of Management; and Marketing 253, Principles of Marketing. The "core" must be completed by the end of the junior year unless a student, on recommendation of his department chairman, has received permission from the Dean to postpone any such course to the senior year.

Students transferring from any School or College within the University shall receive junior and senior elective credit only for those courses passed with a grade of C or better.

Students transferring from outside the University as juniors or seniors must complete a minimum of 12 credit hours in courses offered by his major Department.

Students transferring from junior or community colleges should complete two years of a program in the Liberal Arts including only the one year course in Accounting and in Economics. Students from junior or community colleges who wish credit for completed courses that are offered here on the junior or senior level must pass an examination in each such course conducted by the department concerned.

The School of Business Administration is a member of the American Association of Collegiate Schools of Business.

Major courses of study are available in the School of Business Administration as follows:

A class in computer techniques for business analyses.

ACCOUNTING. The accounting program is designed to prepare students for public accounting and for positions as accountants in business, industry and government.

GENERAL BUSINESS AND FINANCE. The department has four major programs: *Finance, Business Administration and Economics, General Business* and *Urban and Regional Studies*. The curriculum in Finance is directed towards the fields of banking, investment, brokerage, insurance or governmental agencies concerned with finance. The curriculum in Business Administration and Economics comprehends a wider field to balance a knowledge of both economics and business. The curriculum in General Business was designed for students who do not wish to specialize in any particular field. The curriculum in Urban and Regional Studies is an interdisciplinary program directed toward the problems of metropolitan areas.

MANAGEMENT. Industry and business offer qualified students an opportunity to find careers in General Management, Production Management, and in Personnel Management and Industrial Relations. Course programs are offered in each of these fields and provide the student both a specialized and a comprehensive understanding of the managerial process in industrial enterprises.

MARKETING. Students in marketing prepare for a variety of positions in wholesale and retail enterprises and in the sales activities of manufacturers. The program includes specialized study of basic types of market operations such as advertising, sales management and retailing.

View of the Ralph C. Mahar Auditorium.

Students learn to use complex office machines.

Class in audio-visual methods.

Observation classroom in the Mark's Meadow Laboratory School.

SCHOOL OF EDUCATION

Albert W. Purvis, *Dean* — School of Education Building

The School of Education through its undergraduate program seeks to utilize the forces of the University to prepare teachers for elementary and secondary schools and through its graduate offering to prepare administrators and specialists in public education. Its program is based upon the assumption that teachers and other school personnel should have a broad liberal education, considerable mastery of at least one field, and professional courses which should lead to a knowledge of the persons to be taught, familiarity with the problems to be met, and practice in the best techniques of teaching and supervision. In all of this the School of Education takes the position that teacher education is a University function and that success will come only if the School is successful in maintaining the closest possible relationships with other schools and departments that contribute to the program.

All students who contemplate teaching as a career should register early, in their freshman year if possible, with the School of Education although their courses in education do not begin until the junior year. In general, students are admitted without question to the various service courses of the junior and senior years, but admission to the teacher-training program of the concentrated semester block is determined by a composite rating based on scholarship as shown by University grades (a three-year average at least as high as the University median is desired), success in the beginning courses in education, recommendations of University teachers in general education fields, and personality ratings by members of the staff.

ELEMENTARY SCHOOL TEACHING. Candidates for this program major in elementary education. In certain cases, with the approval of the Dean of the School of Education, the student may be permitted to major in some department of the College of Arts and Sciences where the general education program is deemed the equivalent of that designed for elementary education majors. This permission should be requested in freshman year. Such students will satisfy the requirements of their major department so far as the first two years are concerned but they should utilize their electives to take such courses as Government 100, Zoology 200, History 150, 151 and Art or Music which are

Learning experience for students majoring in elementary education.

Artistic expression is encouraged at Mark's Meadow.

recommended by the School of Education. They should take Education 009, 039, 059. The core program for elementary education majors including Education 251 and 264, and Psychology 261 or Home Economics 270, Music 231 and the Elementary Education Block should be taken in the junior and senior years.

SECONDARY SCHOOL TEACHING. All candidates for secondary school teaching will major in the subject field to be taught and minor in education. A maximum of eighteen hours should be taken in this minor. Education 251 and Psychology 301 are required during junior year and Education 310, 311, 385 (called the secondary block) in one semester of senior year. Since the concentrated semester block in secondary school teacher-training carries only twelve credits for some majors, students should consult with their major adviser regarding means of making up the extra three credits, and of meeting all their major requirements in the three semesters of junior and senior years.

SPECIAL FIELD PROGRAMS FOR PROSPECTIVE TEACHERS. In Vocational Agriculture. This program is based on a cooperative agreement between the University and the Vocational Division of the State Department of Education which provides supervisors and consultants in conducting the program. Students otherwise qualified may prepare to teach vocational agriculture by the satisfactory completion of Education 372, 373, and 375. Education 310 is also recommended. To insure a desirable range of preparation, students who contemplate vocational teaching should consult the Dean early in the freshman year if possible.

A vocational teacher-training certificate is awarded by the Vocational Division to those who fully qualify.

In Home Economics (Mrs. Marjorie Sullivan, adviser). These students will major in home economics and minor in education. They should elect Education 251, Psychology 301, Home Economics 381 and the concentrated semester block (Education 311, 385).

In Teacher Coaching (S. W. Kauffman, adviser). These students will major in physical education and minor in education. They should elect Psychology 261 and the concentrated semester block (Education 310, 311, 385). They should elect a minor teaching field from the College of Arts and Sciences consisting of a minimum of eighteen hours.

In Music. These students will major in music and minor in education. They should elect Education 251, Psychology 261, Music 321, and the concentrated semester block (Education 311, 385).

SCHOOL OF ENGINEERING

E. E. Lindsey, *Acting Dean* — Main Engineering Building

The departments of Chemical Engineering, Civil Engineering, Mechanical Engineering and Electrical Engineering comprise the School of Engineering. Each department offers a curriculum leading to a Bachelor of Science degree in that particular branch. A curriculum in Industrial Engineering is offered in the Mechanical Engineering department. All curricula are accredited by the Engineers Council for Professional Development.

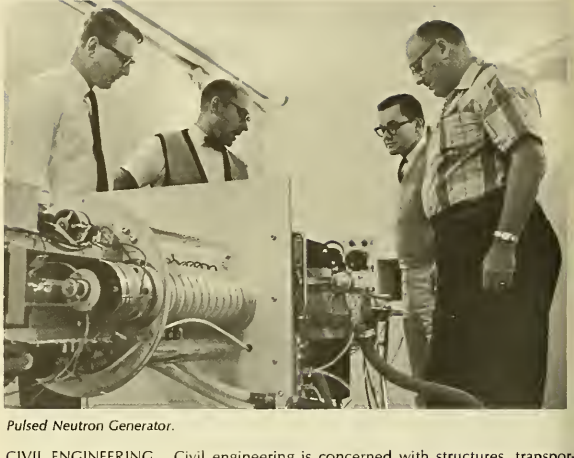
Engineering can be defined as the combination of science and art by which materials and power are made useful to mankind. An engineer requires intensive technical training but at the same time he should acquire the broad education that distinguishes the professional man from the technician. His education does not end with formal schooling but continues throughout his life as he accumulates experience.

The curricula in engineering have been carefully prepared to offer each student the opportunity to acquire the sound training in mathematics and the basic sciences of chemistry and physics upon which is built the work in the engineering sciences. In the senior year courses are offered which enable the student to use his previous training for engineering analysis, design and engineering systems in his particular field of interest. About twenty per cent of his time is devoted to studies in the social science and humanistic area. Some opportunity is provided to elect courses from both the technical and humanistic-social fields.

The curriculum of the freshman year is the same for all. Specialization to a limited extent begins in the sophomore year.

CHEMICAL ENGINEERING. Chemical Engineering is concerned with the development of manufacturing processes in which chemical or certain physical changes of materials are involved. These are resolved into a coordinated series of unit operations (physical changes) and unit processes (chemical changes). The work of the chemical engineer is primarily concerned with the design, construction, and operation of equipment and plants in which these are applied. Chemistry, physics, and mathematics are the underlying sciences of chemical engineering, and economics is its guide in practice.

Chemical engineers are employed not only in industry manufacturing chemicals but in many others, such as petroleum refining, coal processing, refractories and clay products, cement, waste treatment, pulp and paper, rayon and textiles, paint and varnish, natural and synthetic rubber, foods, leather, plastics, soap, penicillin and other antibiotics. Much of the work of the atomic energy program is chemical enigneering. The types of work done by chemical engineers include: design, construction, research, development, production, financial and patent appraisal, management, and sales.



Pulsed Neutron Generator.

CIVIL ENGINEERING. Civil engineering is concerned with structures, transportation, movement of fluids, use and storage of water, sanitation, and surveying and mapping. A civil engineer may be engaged in research, in planning and designing, in construction, or in maintenance and operation.

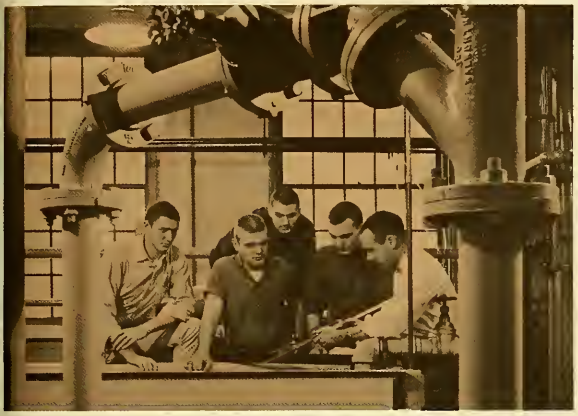
The curriculum gives a thorough training in the fundamental physical sciences and at the same time prepares a student for work in any branch of civil engineering, allowing him to specialize to some extent in whatever branch is most interesting to him — sanitation, mechanics and structures, hydraulics, foundation engineering, highway engineering.

ELECTRICAL ENGINEERING. Electrical engineering deals with the engineering applications of electricity. Because of its unusual amount of diversity, it is usually convenient to separate it into such main divisions as power, communications, electronics and control, and others.

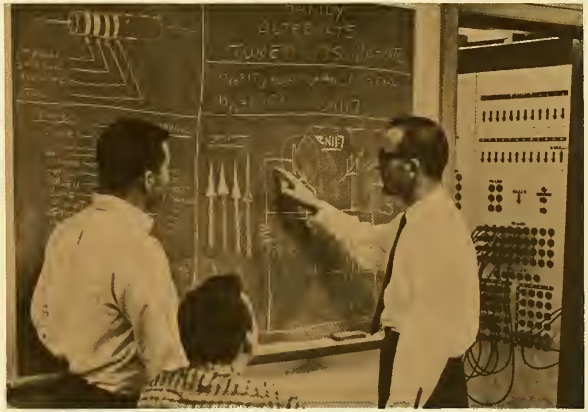
The undergraduate curriculum is designed to prepare the student for work in any of these fields and to serve as a basis for further specialization. Courses in liberal arts and in engineering courses outside of the department give the student an understanding of the broader aspects of engineering and other fields.

MECHANICAL ENGINEERING. Mechanical engineering is that branch of the profession which, broadly speaking, covers the fields of heat, power, design of machinery, industrial management and manufacturing problems.

Building upon a foundation of mathematics, physics, and chemistry, the department of mechanical engineering undertakes to show the student how funda-

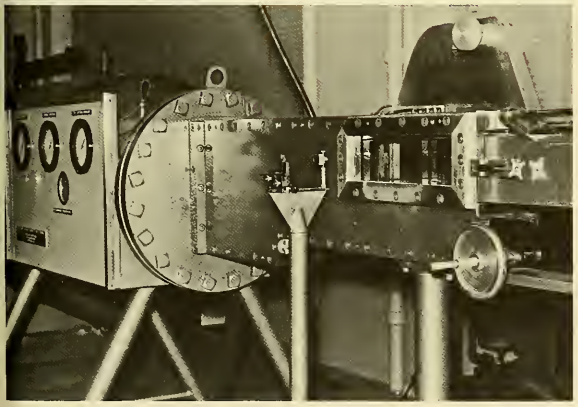


Fluid mechanics laboratory.



A demonstration in electrical engineering.

Test section of Mach 4 wind tunnel.



mental physical laws apply to this field and to give him thorough training in the basic principles so that particular application can be mastered in professional practice. Therefore, no attempt is made to give highly specialized instruction.

INDUSTRIAL ENGINEERING. Industrial engineering is concerned with the engineering aspects of the organization, operation and management of manufacturing plants. Consequently, the industrial engineering curriculum is built on a foundation of mechanical engineering. To the technical knowledge and scientific attitude developed through the study of engineering is added the study of certain courses in the humanities, in economics, and in management.

ENGINEERING SCIENCE OPTION. Engineering science is concerned with the application of the basic sciences to research and development in the engineering field. As such the curriculum contains extensive mathematics, physics, and other courses in the basic sciences designed to develop the student's skill in precise physical reasoning, analysis and synthesis. The student may elect the option from one of the four major departments at the end of his sophomore year provided he has completed his freshman and sophomore years with a quality point average of 2.80 or above or has achieved a cumulative average of 3.20 for the two preceding semesters.

The freshman year is the same for all students and the sophomore year corresponds to that major department in which the student is enrolled.

Skinner Hall: the School of Home Economics.

Projects in fashion merchandising prepare students for careers in business.

SCHOOL OF HOME ECONOMICS

Marion A. Niederpruem, *Dean* — Skinner Hall

Home Economics encompasses areas of study which apply the principles and concepts of fundamental arts and sciences to the physiological, psychological, social and economic environmental needs of man.
The School of Home Economics has five subject matter areas (departments), namely: Food and Nutrition (FN); Textiles, Clothing and Environmental Arts (TCEA); Management and Family Economics (MFE); Human Development (HD); and Home Economics Education (HEEd.). The letters in parenthesis are area codes. Within these five areas the following undergraduate majors are offered:

DIETETICS AND INSTITUTIONAL ADMINISTRATION

FOODS IN BUSINESS

FASHION MERCHANDISING

HOME MANAGEMENT (Sept. 1966)

CHILD DEVELOPMENT

SECONDARY EDUCATION AND EXTENSION

The undergraduate program of the School, leading to a Bachelor of Science degree, emphasizes a liberal education in the sciences, arts and humanities with specialized instruction as preparation for professional careers. The transitional continuing relationships between liberal and professional education seek to develop in the student a disciplined mind, mental curiosity and professional competence.

Professional home economists are college and university graduates with bachelor degrees in Home Economics. They serve individuals, families, and communities through schools and colleges, extension programs, business organizations of many kinds all over the world, community and government organizations and agencies, newspapers, magazines, radio and television. Representative types of activities that Home Economists participate in include teaching, research, writing, dietetics, extension work, interior decoration, fashion merchandising, food consulting, food service management and product development. Experience and advanced study in areas of specialization lead to positions of great responsibility.

Food and Nutrition

Food and Nutrition curricula provide courses in Food and Nutrition combined with a strong foundation in the Arts and Sciences with two majors: Dietetics and Institutional Administration; and Foods in Business.

DIETETICS AND INSTITUTIONAL ADMINISTRATION. This curriculum prepares the student for positions as therapeutic and administrative dietitians; teaching and research dietitians and nutritionists with public and private agencies. An

increasing number of new opportunities continually challenge graduates in this major.

The sequence offers opportunities for further work at the graduate level. This program is planned to meet the basic requirements of the American Dietetic Association for admission to approved dietetic internships.

FOODS IN BUSINESS. This curriculum is based on professional training in Food and Nutrition combined with other selected courses in Home Economics, the humanities, Western cultures, social sciences and business. The program is designed for the student who is oriented to the business world, and leads directly into development and promotion with food, equipment and utility industries. Positions are open in the field of communications for the student who combines her knowledge of Food, Nutrition and Equipment with Journalism, English, Speech, Television and Radio. Graduates with a major in this sequence are also placed in advertising and public relations agencies or with a consulting firm. This curriculum allows students to pursue graduate study.

Textiles, Clothing and Environmental Arts

FASHION MERCHANDISING. The retailing and professional opportunities associated with clothing, textiles, home furnishings and related merchandise are limitless. They include positions with manufacturers, producers, retailers, buying organizations, newspapers and magazines, radio and TV and consumer groups, as well as educational institutions and social and government agencies. The student who is interested in the business field pursues, by specializing in this area, a curriculum with a strong program of liberal arts emphasizing the social sciences. Courses which build on this foundation providing professional business competency include fundamentals of clothing, textiles, fashion and environmental arts as well as courses in business, retailing and related subjects. Those students who are particularly interested in Interior Design may follow a slightly different sequence of courses.

Management and Family Economics

The area of Management and Family Economics is concerned with achievement of goals and mediation of values within the family. Decision-making and organizing processes are studied as the means to these ends. The field is concerned with the family as an economic unit and social system. Sociology, Economics, Anthropology and Philosophy provide support for the field.

HOME MANAGEMENT. The undergraduate specialization in this area is planned for September 1966. The curriculum provides breadth in Home Economics and depth in the Social Sciences. It will prepare students for positions as home economists in private and governmental agencies concerned with family education and welfare here and abroad. It meets the requirements for Civil Service positions. In addition, the curriculum provides the foundation for graduate work.

Field experience with agencies serving families will be provided to aid the student in gaining competence in implementing programs related to family education and welfare.

Human Development

The area of Human Development is of necessity interdisciplinary in nature. The program brings together knowledge from Psychology, Sociology, Anatomy, Physiology, Nutrition, Education, the Arts, Anthropology, and relates it to Human Development and early childhood education. It is concerned with all maturational and environmental effects upon developing individuals, and with all theoretical and empirical descriptions of how this development occurs.

CHILD DEVELOPMENT. The child development program prepares the student for work in various types of group programs serving preschool-aged children, such as laboratory, public, and private nursery schools, clinics for exceptional children, hospital recreation programs, and community and welfare agencies. In addition, the child development curriculum provides a good background for graduate work in various other child serving professions.

Directed experience with the children of the laboratory nursery school and their families provides the necessary opportunity for students to develop a sound personal philosophy of early childhood education, and to achieve competence in implementing it. More intensive specialization for qualified students may be obtained by the election of a one-semester affiliation with: (1) Merrill-Palmer Institute in Detroit, Michigan, which specializes in the study of human development and family life; (2) the Eliot-Pearson School in Boston, Massachusetts, which specializes in the education of the three-to-six-year-old child.

Students learn to use television to extend food and nutritional information to consumers.

Learning experience for student majoring in nursery school education.

Home Economics Education

Home Economics Education offers a curriculum which provides a broad cultural education and preparation for teaching in secondary schools and the Cooperative Extension Service.

SECONDARY EDUCATION AND EXTENSION. The School of Home Economics, in cooperation with the School of Education, prepares students for teaching home economics in junior and senior high schools. This curriculum serves also as a base for graduate study in subject matter areas in home economics and home economics education. Students interested in the Cooperative Extension Service will, with the assistance of an extension adviser, select courses in preparation for continuing education positions in adult and 4-H programs.

Care of the elderly patient at home as part of community nursing experience.

Western Massachusetts Public Health Center, home of the School of Nursing.

SCHOOL OF NURSING

Mary A. Maher, *Dean* — Western Massachusetts Public Health Center

The basic nursing program is designed to prepare the qualified high school graduate for a career in professional nursing, as well as for the responsibilities of family and community life.

The program aims to equip the graduate with those understandings and skills which are needed to function effectively in beginning positions in a variety of nursing situations. These include the ability to provide competent nursing care to patients and families in the hospital, home and community; to participate with allied professional and citizen groups for the improvement of total health services to individuals and communities; to participate in organizing, planning and directing the work of nursing auxiliary workers. The baccalaureate program provides a foundation for advanced study, through which the nurse may become prepared for positions in teaching, supervision, administration, consultation and research.

During the first two years, the student builds an educational foundation upon which to base the more specialized portion of the program. Courses in the humanities and in the sciences — biological, physical and behavioral — are taken with other students on the campus.

The clinical aspects of the program are developed in the next two years, when instruction and correlated clinical nursing practice are given in selected co-operating agencies by the nursing faculty of the University and the allied professional staffs of the cooperating agencies. These agencies include: the Springfield, Wesson Memorial, and Wesson Maternity Hospitals in Springfield; the Northampton State Hospital; the Visiting Nurse Association of Springfield; the Springfield Health Department, and other community health, educational and welfare resources.

The Bachelor of Science degree, awarded upon successful completion of this program, qualifies the graduate for admission to the State Board Examinations in Nursing. If achievement in these examinations is satisfactory, the candidate receives legal status as a registered nurse within the state.

The program is accredited by the Massachusetts Board of Registration in Nursing and Accrediting Service of the National League for Nursing.

Essential foundation for Nursing: Anatomy Laboratory.

Mother-newborn infant relationships taught in the Mother-Baby unit of the maternity hospital.

Clinical experience with children in a hospital unit.

Essential foundation for Nursing: Physiology Laboratory.

SCHOOL OF PHYSICAL EDUCATION

Warren P. McGuirk, *Dean* — Frank L. Boyden Physical Education Building

The School of Physical Education includes the Departments of Physical Education for Men, Physical Education for Women, Recreation, and Athletics. It offers undergraduate majors in Physical Education and in Recreation and a graduate degree in Physical Education.

Physical Education for Men

GENERAL PROGRAM. Each male freshman and sophomore student, unless exempted under certain conditions, must successfully complete four semesters of physical education and demonstrate his ability to swim as a requirement for his degree. The physical education requirement does not apply to those students excused by the University physician, veterans of more than six months of military service, and certain transfer students.

Students may receive credit for physical education, during the sport in season by becoming squad members of any freshman or varsity team. Freshmen who elect an athletic team sport for physical education credit must rejoin their class sections at the termination of the seasonal sport. Students may not participate in a given sport for credit for more than two semesters.

MAJOR PROGRAM. The major program leading to the degree of Bachelor of Science in physical education is designed to train the student for a career as a teacher of physical education. The curriculum combines both general and professional education and provides for full teacher certification for the student who has met the prescribed requirements of preparation. The program also provides for adequate training in a minor area of teaching, elected by the student, including the coaching of inter-school athletics.

Physical Education for Women

GENERAL PROGRAM. Physical Education is required of all women students during their freshman and sophomore years. The courses are planned to provide recreative activity, to improve individual skills, to develop body grace and efficiency and to increase health and vigor.

The first and second year women students are required to take three class hours a week for a total of eight credits, one for each quarter of satisfactory work.

MAJOR PROGRAM. The major course in physical education is planned to prepare women students for professional careers. Special attention is given to preparing teachers for elementary and secondary schools in both physical and health education. Other areas for which the graduate will qualify are teaching sports and dance in social agencies, industrial plants, civic centers and camps. A foundation will be laid for specialization in graduate study.

The curriculum gives a broad general background as well as the professional preparation.

Recreation

MAJOR PROGRAM. The department seeks to prepare men and women for positions involving administrative, supervisory and program leadership responsibilities in municipal recreation agencies, voluntary and youth-serving agencies, hospitals, and industrial and institutional organizations.

The program is designed to provide opportunities for a general education, a knowledge and understanding of people and society, activity skills and resource knowledge, professional competency, and practical experience in various leadership situations.

In addition to completing the curriculum as described below, the student is required to:

(1) attend a professional conference approved by the department;

(2) participate in programming activities at the Student Union, with a scout troop, or in a similar setting approved by the department;

(3) devote one summer (minimum of six weeks) to a recreation position, preferably with pay, in a camp, playground, or similar setting approved by the department.

Intercollegiate and Intramural Athletics

The University supports the Department's belief that there are educational advantages in a well-organized intercollegiate and intramural sports program. In intercollegiate athletics, the University is represented by teams in all the leading sports, including football, soccer, cross-country, basketball, swimming, wrestling, indoor and outdoor track, hockey, rifle and pistol, baseball, tennis, golf, lacrosse, gymnastics, and skiing.

The Athletic Department also supports a broad program of intramural activities, in which all students are encouraged to participate. The range of sports available each year includes the team sports of touch football, basketball, softball, and volleyball. Individual activities include tennis, bowling, badminton, golf, squash, and handball.

The University Intercollegiate Athletic Program is supervised by the University Athletic Council and is composed of the following members: five faculty members appointed by the President, three alumni representatives appointed by the Directors of the Alumni Association, the Executive Director of the Alumni Association, and ex officio, the Director of Athletics.

The University of Massachusetts is a member of the Yankee Conference, the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association of New England Colleges for Conference on Athletics, and the Intercollegiate Athletic Association.

Women's Physical Education Building.

Frank L. Boyden Physical Education Building for Men.

A few of the activities associated with the major areas in the School of Physical Education.

Student-Faculty Research Projects are part of the Public Health teaching program.

DEPARTMENT OF PUBLIC HEALTH

Robert W. Gage, *Chairman*

The Department of Public Health offers undergraduate instruction in the area of environmental health, public health administration, and medical technology. It also offers a graduate program leading to the degree of Master of Science in Environmental Health.

PUBLIC HEALTH. Public health practice is offering an increasing variety of significant career opportunities in many areas. Among these are the following: (1) administration of community health services; (2) general or specialized direction of environmental health services; (3) work and research in the basic sciences related to health; (4) work in the food and drug protective services; (5) involvement in health education, and (6) participation in programs of health

Faculty study new methods for solving environmental health problems.

information and communication. It is the intent of the Department of Public Health to provide, within the University's framework of presenting a liberal education to all its students, a basis for competence and skill in at least one of these areas. In addition, the program is intended to provide a solid comprehensive foundation upon which subsequent specialized or graduate study can be continued in any of the major areas of public health.

MEDICAL TECHNOLOGY. The curriculum in medical technology is recommended for young men and women in preparation for a wide variety of occupational opportunities. Medical technology graduates may be prepared for positions in medical laboratories, in federal, state, and local health departments, and in commercial and research laboratories. In this area there are two possibilities for arrangement of the curriculum. Students may complete the full four years of undergraduate instruction and, after receiving their baccalaureate degree, enter a 12-month internship in an approved hospital laboratory. At the end of this (fifth) year of preparation, the student will be eligible for examination by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology.

An optional three-and-one program is now offered which allows the student to obtain the baccalaureate degree and complete the requirements for examination for registration in a total of four years. In this program the student is able to complete the University's core requirements and complete the preparation for the clinical laboratory training within three years. The fourth year of study is taken in one of the hospitals affiliating with this department and approved for clinical laboratory training. Academic credit is granted for participation in this program so that by the end of four years, a student will have gained a total of 120 credits, which is sufficient for graduation.

ROTC — Ready for action.

Army ROTC Cadets on a winter practical training exercise.

UMass Cadet is given a pre-flight briefing on the F-106.

Cadets are briefed at Pentagon by Secretary of the Air Force, Eugene Zuckert.

DIVISION OF MILITARY AND AIR SCIENCE

The Division of Military and Air Science includes the Department of Military Science and the Department of Air Science. No major is offered in either department. Effective academic year 1963-1964, the ROTC (Army and Air Force) program became voluntary. Male students who are physically qualified may register in the two-year basic ROTC course and receive credit toward graduation. Completion of the basic course is a requirement for enrollment in the advanced course which leads to a commission in the armed forces.

DEPARTMENT OF MILITARY SCIENCE (GMS)

Joseph A. Bohnak, Colonel, U. S. Army, *Head*

The Army Reserve Officers Training Corps is the means by which young men who have taken the leadership step of coming to the state university may assure themselves that their military service is performed in commissioned status. The first two years are basic training in leadership and citizenship. The student is informed on the position of the military in the current scene and as it relates to his future. The second two years of ROTC are not only elective, but selective. The best qualified students are selected and are permitted to contract to continue on to a commission. The Army provides these men a subsistence allowance and additional emoluments. There is a six-week summer camp training period between the junior and senior year. Participation in ROTC has notable effect in character development. It also discloses to the Army existing officer material and its potential leaders. Successful completion of this program leads to a commission as a Second Lieutenant, U. S. Army. Active duty requirements are, at the present time, two years service with an active Army unit.

Beginning with school year 1965-66 a two (2) year program, which substitutes an additional six (6) week summer camp for the basic course, is offered to transfer students and others unable to take the basic course. As of school year 1965-66 ROTC scholarships are also available to members of the advanced course.

DEPARTMENT OF AIR SCIENCE

Roy D. Simmons, Lt. Colonel, USAF, *Head*

The mission of the Department of Air Science is to develop in select students those qualities of leadership and other attributes essential to their progressive advancement to positions of increasing responsibility as commissioned officers. It is not expected that all students commissioned will select the United States Air Force as a career; however, the program provides excellent preparation for such a career. Further, even though an Air Force career is not selected, the experience gained and the leadership qualities developed will enhance professional and managerial opportunities in the business society.

The program is presented in two phases; the Freshman and Sophomore years are designated as the Basic Course, and the Junior and Senior years as the Advanced Course.

The first two years of the program are not obligatory and are designed primarily to educate the student to the point where he can make a more intelligent decision concerning his military obligation and whether a tour of active duty as a commissioned officer corresponds with his career objectives.

COURSE REQUIREMENTS IN THE FRESHMAN YEAR

The following listings are designed to give prospective students a complete schedule of the courses required in the freshman year in all colleges and schools of the University.

Notes: Courses in Military and Air Science, although listed among the programs below, are elective offerings and are not required for graduation.

COLLEGE OF AGRICULTURE

1st Semester	*Credits*
ENGLISH 111	2
SPEECH 101*	2
MATHEMATICS	3
CHEMISTRY 111	3
BOTANY 100	3
MILITARY OR AIR SCIENCE 111 (MEN)	1
AGRICULTURAL AND FOOD ECONOMICS 110	2
PHYSICAL ED. 001A, B	0

2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101*	2
MATHEMATICS	3
CHEMISTRY 112	3
ZOOLOGY 101	3
ELECTIVE[1]	3
MILITARY OR AIR SCIENCE 112 (MEN)	1
PHYSICAL ED. 002A, B	0

[1]A foreign language may be substituted for the Agricultural and Food Economics-elective sequence.

*May be taken either semester or during a later year.

Freshmen majoring in Agricultural Engineering take the program listed under the School of Engineering. Freshmen majoring in Landscape Architecture will take Government 125 in place of Zoology 101, Art 100 in place of Food Economcis 110, and Sociology in place of Chemistry 112. Majors in Restaurant and Hotel Management take Restaurant and Hotel Management 100 in place of Botany 100, and Microbiology 150 in place of Zoology 101.

COLLEGE OF ARTS AND SCIENCES

1st Semester	*Credits*
ENGLISH 111	2
SPEECH 101*	2
MATHEMATICS OR NATURAL SCIENCE[1]	3
NATURAL SCIENCE OR HISTORY 100[2]	3
FOREIGN LANGUAGE[3]	3
ELECTIVE[4]	3
MILITARY OR AIR SCIENCE 111 (MEN)	1
PHYSICAL ED. 001A, B	0

2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101*	2
MATHEMATICS OR NATURAL SCIENCE[1]	3
NATURAL SCIENCE OR HISTORY 101[2]	3
FOREIGN LANGUAGE[3]	3
ELECTIVE[4]	3
MILITARY OR AIR SCIENCE 112 (MEN)	1
PHYSICAL ED. 002A, B	0

[1]Candidates for the B.S. degree take Mathematics. Those planning to major in chemistry or physics should, if possible, elect Mathematics 135 and 136.

[2]Candidates for the B.S. degree take natural science; candidates for the B.A. degree take History 100 and 101.

[3]Subject to exemption on basis of proficiency examination.

[4]Candidates for the B.S. degree take science.

*May be taken either semester.

SCHOOL OF BUSINESS ADMINISTRATION

In each subject a one year sequence is required.

1st Semester	*Credits*
ENGLISH 111	2
SPEECH 101*	2
MATHEMATICS	3-4
HIST. 100, 150, OR GOVT. 100	3
SCIENCE: ELECT ONE	3
CHEMISTRY 111	
PHYSICS 103	
BOTANY 100	
GEOLOGY 101	
ZOOLOGY 101	
ELECTIVE	3
MILITARY OR AIR SCIENCE 111	1
PHYSICAL ED. 001A, B	0

2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101*	2
MATHEMATICS	3-4
HIST. 101, 151, OR GOVT. 150	3
SCIENCE: ELECT ONE	3
CHEMISTRY 112	
PHYSICS 104	
BOTANY 125	
GEOLOGY 102	
ZOOLOGY 125 AND 135	
ELECTIVE	3
MILITARY OR AIR SCIENCE 112	1
PHYSICAL ED. 002A, B	0

*May be taken either semester.

SCHOOL OF EDUCATION

1st Semester	*Credits*
ENGLISH 111	2
SPEECH 101*	2
MATH. 111 OR CHEM. 111	3
ZOOL. 101 OR BOT. 100	3
FOREIGN LANG.**	3
HISTORY 100	3
EDUCATION 109†	0
MILITARY OR AIR SCIENCE 111 (MEN)	1
PHYSICAL ED. 001A, B	0

2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101*	2
MATH. 112 OR CHEM. 112	3
BOT. 100 OR ZOOL. 101	3
FOREIGN LANG.**	3
HISTORY 101	3
EDUCATION 109†	0
MILITARY OR AIR SCIENCE 112 (MEN)	1
PHYSICAL ED. 002A, B	0

*May be taken either semester.

**Intermediate Proficiency Required.

†To be completed in a school year.

SCHOOL OF ENGINEERING

1st Semester	*Credits*
ENGLISH 111, COMPOSITION	2
SPEECH 101, PUBLIC SPEAKING	2
MATH, 135, CALCULUS	3
CHEM. 111 OR 113, GENERAL*	3-4
ENGINEERING 103, GRAPHICS	3
SOCIAL SCIENCE ELECTIVE	3
MILITARY OR AIR SCIENCE 111**	1
PHYSICAL ED. 001A, B	0

2nd Semester	*Credits*
ENGLISH 112, COMPOSITION	2
MATH. 136, CALCULUS	3
CHEM. 112 OR 114, GENERAL*	3-4
ENGINEERING 104, PROBLEMS	2
PHYSICS 105, GENERAL	3
SOCIAL SCIENCE ELECTIVE	3
MILITARY OR AIR SCIENCE 112**	1
PHYSICAL ED. 002A, B	0

*It is recommended that Chemical Engineering majors take Chemistry 113 and 114 in place of Chemistry 111 and 112.

**Military or Air Science is optional.

SCHOOL OF HOME ECONOMICS

Key: FN — Food and Nutrition
TCEA — Textiles, Clothing and Environmental Arts
HEEd. — Home Economics Education

MAJOR IN DIETETIC AND INSTITUTIONAL ADMINISTRATION

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
CHEMISTRY 111, GENERAL	3
HEEd. 120, INTRO. TO H. EC.	1
FN 127, MAN & NUTRITION	3
SOCIOLOGY 101, INTRODUCTORY	3
HISTORY, GOVERNMENT OR MATH.	3
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
SPEECH 101, ORAL COMMUNICATION	2
CHEMISTRY 112, GENERAL	3
ZOOLOGY 101, INTRODUCTORY	3
FN 130, FOOD SCIENCE & PREP.	3
PSYCHOLOGY 101, GENERAL	3
PHYSICAL ED. 002A, B	0

MAJOR IN FOOD AND NUTRITION IN BUSINESS

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
SPEECH 101, ORAL COMMUNICATION	2
SOCIOLOGY 101, INTRODUCTORY	3
CHEMISTRY 111, GENERAL	3
FN 127, MAN & NUTRITION	3
HEEd. 120, INTRO. TO H. EC.	1
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
PSYCHOLOGY 101, GENERAL	3
CHEMISTRY 112, GENERAL	3
ZOOLOGY 101, INTRODUCTORY	3
FN 130, FOOD SCIENCE & PREP.	3
ONE OF THE FOLLOWING: ART 120, PHILOSOPHY 105, 125, 110, 243, OR MUSIC 101	3
PHYSICAL ED. 002A, B	0

MAJOR IN FASHION MERCHANDISING

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
SCIENCE OR MATH	3
SOCIOLOGY 101, INTRODUCTORY	3
LANGUAGE	3
HEEd. 120, INTRO. TO H. EC.	1
TCEA 123, ART FOR LIVING	3
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
SCIENCE OR MATH	3
PSYCHOLOGY 101, GENERAL	3
LANGUAGE	3
FN 127, MAN & NUTRITION	3
TCEA 124, TEXTILES I	3
PHYSICAL ED. 002A, B	0

MAJOR IN SECONDARY EDUCATION AND EXTENSION

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
SPEECH 101, ORAL COMMUNICATION	2
CHEMISTRY 111, GENERAL	3
FN 127, MAN & NUTRITION	3
SOCIOLOGY 101, INTRODUCTORY	3
HEEd. 120, INTRO. TO H. EC.	1
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
PSYCHOLOGY 101, GENERAL	3
CHEMISTRY 112, GENERAL	3
MATH, 111, INTRODUCTORY	3
TCEA 124, TEXTILES I	3
PHYSICAL ED. 002A, B	0

MAJOR IN CHILD DEVELOPMENT

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
FOREIGN LANGUAGE OR PROFICIENCY	3
PSYCHOLOGY 101, GENERAL	3
FN 127, MAN & NUTRITION	3
SPEECH 101, ORAL COMMUNICATION	2
HEEd. 120, INTRO. TO H. EC.	1
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
FOREIGN LANGUAGE OR PROFICIENCY	3
SOCIOLOGY 101, INTRODUCTORY	3
TCEA 123, ART FOR LIVING	3
ZOOLOGY 101, INTRODUCTORY	3
ELECTIVE	3
PHYSICAL ED. 002A, B	0

SCHOOL OF NURSING

SCHOOL OF NURSING

1st Semester	Credits
ENGLISH 111, ENGLISH COMPOSITION	2
CHEMISTRY 111, GENERAL	3
PSYCHOLOGY 101, GENERAL	3
SOCIOLOGY 101, INTRODUCTION	3
ELECTIVE*	3
SPEECH 101**, ORAL COMMUNICATION	2
PHYSICAL ED. 001A, B	0
2nd Semester	Credits
ENGLISH 112, ENGLISH COMPOSITION	2
CHEMISTRY 112, GENERAL	3
ZOOLOGY 101, INTRODUCTORY	3
ELECTIVE*	3
SPEECH 101**, ORAL COMMUNICATION	2
NURSING 100, INTRODUCTION	3
PHYSICAL ED. 002A, B	0

*Elective chosen from: History, Government or Economics. Students who wish to elect a foreign language may do so providing the basic requirement of six elective credits in the social sciences is fulfilled. If a language is elected, intermediate proficiency is required.

**May be taken either semester.

SCHOOL OF PHYSICAL EDUCATION

PHYSICAL EDUCATION FOR MEN

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
HUMANITIES, ELECTIVE	3
PE 121 INTRO. TO PHYS. ED.	3
PE 123 PRINC. OF HEALTH ED.	3
PE 105 SKILLS & TECHNIQUES (LACROSSE — GYMNASTICS)	1
Elect One	
CHEMISTRY 111	3
BOTANY 100	3
ZOOLOGY 101	3
2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
SPEECH 101, COMMUNICATION	2
SOCIAL SCIENCE ELECTIVE	3
PE 122 FIRST AID & SAFETY	3
PE 106 SKILLS & TECHNIQUES (GYM — BADMINTON — VOLLEYBALL)	1
Elect One	
CHEMISTRY 112	3
BOTANY 100	3
ZOOLOGY 101	3

PHYSICAL EDUCATION FOR WOMEN

1st Semester	Credits
ENGLISH 111, COMPOSITION	2
HISTORY 100, MOD. EUROP. CIVIL.	3
PSYCH. 101, GENERAL	3
WPE 110, HEALTH FOR ADULTS	2
WPE, 105, INTRODUCTION TO PHYSICAL EDUCATION	2
WPE 111, SKILLS	1
ELECTIVE	3

2nd Semester	Credits
ENGLISH 112, COMPOSITION	2
SPEECH 101, COMMUNICATION	2
HISTORY 101, MODERN EUROP. CIVIL.	3
ZOOLOGY 101, INTRODUCTORY	3
WPE 106, INTRODUCTION TO THE CHILD THROUGH PHYSICAL EDUCATION	2
WPE 112, SKILLS	1
ELECTIVE	3

Chemistry 111 and 112 are required if students have not had chemistry in high school. Others may select from chemistry, physics, microbiology or foreign language.

RECREATION

1st Semester	
ENGLISH 111, COMPOSITION	2
SPEECH 101	2
BOTANY 100, INTRO. BOTANY	3
GOVT. 100, AMERICAN GOVT.	3
HUMANITIES ELECTIVE	3
REC. 101, INTRO. TO REC.	3
GEN. PHYS. ED. 001A, B	0
MILITARY OR AIR SCIENCE 111 (MEN)	1
2nd Semester	*Credits*
ENGLISH 112, COMPOSITION	2
STATISTICS 121	3
ZOOL. 101, INTRO. ZOOL.	3
SOC. 101, INTRO. TO SOC.	3
M. P. E. 122, FIRST AID & SAFETY	3
REC. 111, SOC. REC.	2
GEN. PHYS. ED. 002A, B	0
MILITARY OR AIR SCIENCE 112 (MEN)	1

DEPARTMENT OF PUBLIC HEALTH

PUBLIC HEALTH

1st Semester	Credits
ENGLISH 111	2
SPEECH 101, I OR II*	2
MATHEMATICS 111 OR 123**	3
CHEMISTRY 111, GENERAL	3
ZOOLOGY 101	3
PSYCHOLOGY 101 OR SOCIOLOGY 101	3
PHYS. ED. 001A, B	0
2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101, I OR II*	2
MATHEMATICS 112, OR 124*	3
CHEMISTRY 112, GENERAL	3
ZOOLOGY 135 OR ELECTIVE	3
PSYCHOLOGY 101 OR SOCIOLOGY 101	3
PHYS. ED. 002A, B	0

MEDICAL TECHNOLOGY

1st Semester	Credits
ENGLISH 111	2
SPEECH 101, I OR II*	2
CHEMISTRY 111, GENERAL	3
BOTANY 100, OR ZOOLOGY 101	3
FOREIGN LANGUAGE***	3
MATHEMATICS 111 OR 123** OR ELECTIVE	3
PHYS. ED. 001A, B	0
2nd Semester	*Credits*
ENGLISH 112	2
SPEECH 101, I OR II*	2
CHEMISTRY 112, GENERAL	3
BOTANY 100 OR ZOOLOGY 101	3
FOREIGN LANGUAGE***	3
MATHEMATICS 112, OR 124** OR ELECTIVE	3
PHYS. ED. 002A, B	0

*May be taken either semester.

**On basis of placement tests and interest in advanced science.

***If a language is elected, intermediate proficiency is required.

DEPARTMENT OF MILITARY SCIENCE (GMS)

1st Semester	Credit
MS 111	1
INTRODUCTION TO MILITARY SCIENCE	
2nd Semester	*Credits*
MS 112	1
INTRODUCTION TO MILITARY SCIENCE	

DEPARTMENT OF AIR SCIENCE

1st Semester	Credits
Air Science 111	1
FUNDAMENTALS OF MILITARY SYSTEMS II	
2nd Semester	*Credits*
Air Science 112	1
FUNDAMENTALS OF MILITARY SYSTEMS II	

WHERE TO WRITE FOR FURTHER INFORMATION

ACADEMIC AFFAIRS • Oswald Tippo, *Provost*
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RECORDS AND TRANSCRIPTS • William Starkweather, *Registrar*
STOCKBRIDGE SCHOOL OF AGRICULTURE • Fred P. Jeffrey, *Director*
STUDENT AFFAIRS • William F. Field, *Dean of Students*
SUMMER SESSIONS • William C. Venman, *Director*
WOMEN'S AFFAIRS • Helen Curtis, *Dean of Women*

All correspondence concerning the *Amherst campus* should be addressed to the appropriate office, University of Massachusetts, Amherst, Massachusetts.

All correspondence concerning the *Boston campus* should be addressed to 100 Arlington Street, Boston, Massachusetts.

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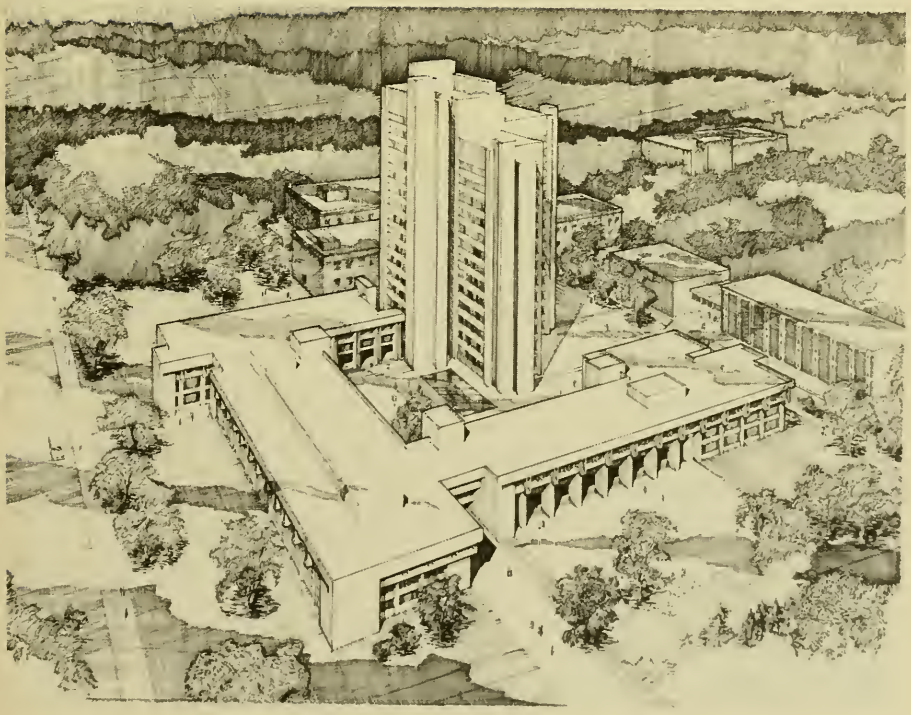
1966-1967 GRADUATE SCHOOL

University of Massachusetts
Bulletin
Amherst, Massachusetts

Volume LVII November, 1965 Number V

The Graduate School Catalog for the sessions of 1966-1967 is part of the One Hundred and First Annual Report of the University of Massachusetts and in conjunction with the General Catalog of the University it constitutes part II of Public Document 31 (Sec. 8, Chapter 75, of the General Laws of Massachusetts). ☐ Published seven times a year by the University of Massachusetts: February, March (2), August, November (2), December. ☐ Second class mail privileges authorized at Amherst, Massachusetts. ☐

Proposed Graduate Research Center
Campbell & Aldrich, Architects



1966-1967 BULLETIN

GRADUATE SCHOOL

UNIVERSITY OF MASSACHUSETTS

Amherst, Massachusetts

CONTENTS

ACADEMIC CALENDAR 1965-1966

September 9, Thursday	Registration for graduate students.
September 10, Friday	Classes begin.
September 23, Thursday	Last date to add courses.
October 1, Friday	Last day on which Ph.D. candidates who plan to complete their work by June 1966 Commencement may take the preliminary comprehensive examination.
October 12, Thursday	Columbus Day; a holiday.
October 21, Thursday	Last date to drop courses.
November 11, Thursday	Veteran's Day; a holiday.
November 24, Wednesday	Thanksgiving Recess begins after last class.
November 29, Monday	Thanksgiving Recess ends, 8:00 A.M.
December 1, Wednesday	Counseling Day for students in residence.
December 18, Saturday	Christmas Recess begins after last class.
January 3, Monday	Christmas Recess ends, 8:00 A.M.
January 8, Saturday	Last day of classes.
January 12, Wednesday	Final exams begin.
January 14, Friday	Last day on which thesis outlines may be handed in by Master's degree candidates who plan to finish their work by the 1966 Commencement.
January 20, Thursday	Final exams end.
January 22, Saturday	Graduate Foreign Language Tests.
January 31, Monday	Registration.
February 1, Tuesday	Classes begin.
February 14, Monday	Last date to add courses.
February 22, Tuesday	Washington's Birthday; a holiday.
March 14, Monday	Last date to drop courses.
April 2, Saturday	Spring Recess begins after last class.
April 11, Monday	Spring Recess ends.
April 16, Saturday	Graduate Foreign Language Tests.
April 19, Tuesday	Patriot's Day; a holiday.
May 4, Wednesday	Counseling Day, no classes.
May 24, Tuesday	Last day of classes.
May 26, Thursday	Final exams begin.
May 27, Friday	Last day for bound theses to be handed in.
May 30, Monday	Memorial Day; a holiday.
June 4, Saturday	Final exams end.
June 10, Friday	Commencement Weekend — through Sunday, June 12.
August 6, Saturday	Graduate Foreign Language Tests.

ACADEMIC CALENDAR 1966-1967

September 12, Monday	Registration for graduate students.
September 15, Thursday	Classes begin.
September 28, Wednesday	Last date to add courses.
October 3, Monday	Last day on which Ph.D. candidates who plan to complete their work by the June 1967 Commencement may take the preliminary comprehensive examination.
October 12, Wednesday	Columbus Day; a holiday.
October 27, Thursday	Last date to drop courses.
October 29, Friday	Graduate Foreign Language Tests.
November 11, Friday	Veteran's Day; a holiday.
November 23, Wednesday	Thanksgiving Recess begins after last class.
November 28, Monday	Thanksgiving Recess ends, 8:00 A.M.
December 6, Tuesday	Counseling Day for students in residence.
December 21, Wednesday	Christmas Recess begins after last class.
January 3, Tuesday	Christmas Recess ends, 8:00 A.M.
January 11, Wednesday	Last day of classes.
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February 1, Wednesday	Classes begin.
February 4, Friday	Graduate Foreign Language Tests.
February 14, Tuesday	Last date to add courses.
February 22, Wednesday	Washington's Birthday; a holiday.
March 20, Monday	Last date to drop courses.
March 25, Saturday	Spring Recess begins after last class.
April 3, Monday	Spring Recess ends.
April 15, Friday	Graduate Foreign Language Tests.
April 19, Wednesday	Patriot's Day; a holiday.
May 4, Thursday	Counseling Day.
May 18, Thursday	Last day of classes.
May 20, Saturday	Final exams begin.
May 29, Monday	Final exams end. Last day for bound theses to be handed in.
May 30, Tuesday	Memorial Day; a holiday.
June 2, Friday	Commencement Weekend—through Sun., June 4.
August 5, Friday	Graduate Foreign Language Tests.

The University Research Computer Center has two digital computers, a CDC 3600 and an IBM 1620, with allied peripheral equipment.

TRUSTEES of the UNIVERSITY

Organization of 1965

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Dean, College of Arts and Sciences.

HIMY B. KIRSHEN, Ph.D.
Dean, School of Business Administration

MARY A. MAHER, A.M.
Dean, School of Nursing.

E. ERNEST LINDSEY, D.Eng.
Acting Dean, School of Engineering.

WARREN P. McGUIRK, Ed.M.
Dean of the School of Physical Education.

MARION A. NIEDERPRUEM, Ph.D.
Dean of the School of Home Economics.

ALBERT W. PURVIS, D.Ed.
Dean of the School of Education.

ARLESS A. SPIELMAN, Ph.D.
Dean of the College of Agriculture, Director of the Experiment Station and The Extension Service.

ARTHUR C. GENTILE, Ph.D.
Assistant Dean of the Graduate School.

MEREDITH A. GONYEA, B.S.
Administrative Assistant to Dean of the Graduate School.

LEO F. REDFERN, Ph.D.
Dean of Administration.

GRADUATE COUNCIL 1965-66

EDWARD C. MOORE, *Dean of the Graduate School*

*ALBERT S. ANTHONY, *Professor of Education*

ARNOLD ARONS, *Professor of Physics, Amherst College*

DAVID C. BISCHOFF, *Professor of Physical Education*[1]

RUTH J. DEAN, *Professor of French, Mt. Holyoke College*

*JOHN H. DITTFACH, *Professor of Mechanical Engineering*

*ROBERT L. GLUCKSTERN, *Head of the Department of Physics*

I. MOYER HUNSBERGER, *Dean of the College of Arts and Sciences*

*ROBERT C. JONES, *Assistant Professor of Education*

H. B. KIRSHEN, *Dean of the School of Business Administration*

E. ERNEST LINDSEY, *Acting Dean of the School of Engineering*

*JAMES B. LUDTKE, *Chairman of the Department of General Business and Finance*

*LEWIS C. MAINZER, *Associate Professor of Government*

*WILLIAM J. MELLEN, *Research Professor of Animal Science*

MARION A. NIEDERPRUEM, *Dean of the School of Home Economics*

*ALEX PAGE, *Associate Professor of English*

ALBERT W. PURVIS, *Dean of the School of Education*

*HOWARD H. QUINT, *Head of the Department of History*

KENNETH W. SHERK, *Director of Graduate Study, Smith College*

*J. HAROLD SMITH, *Professor of Chemistry*

ARLESS A. SPIELMAN, *Dean of the College of Agriculture*

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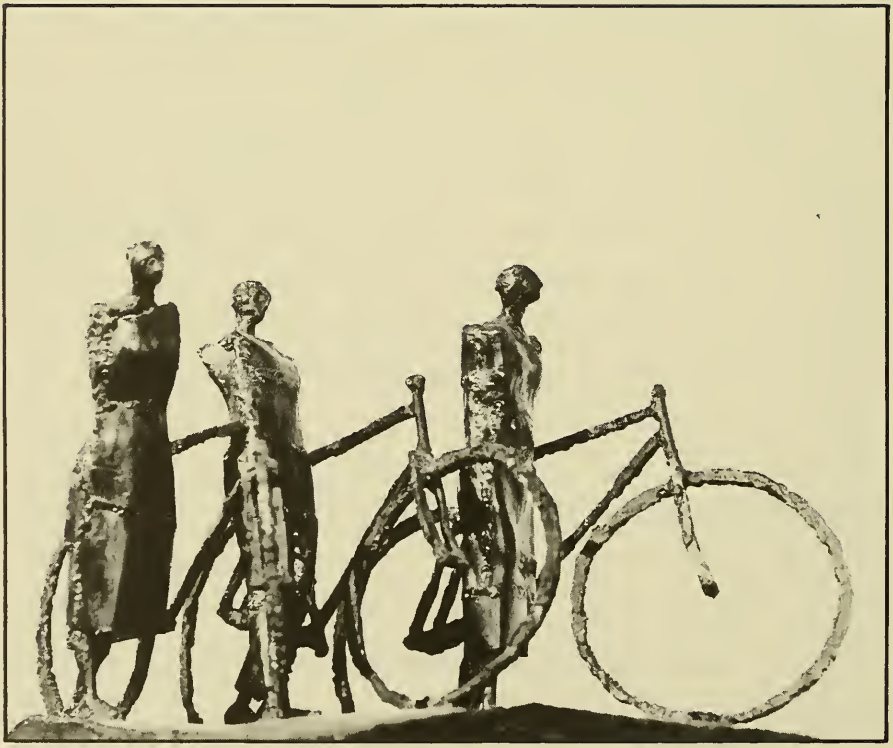
[1]Representing Dean Warren McGuirk, Physical Education
*Elected by the Graduate Faculty

Three Men with Bicycles by Leonard DeLonga



GENERAL INFORMATION

The University

The University of Massachusetts is the state university of the Commonwealth. It was founded in 1863 under the provisions of the Morrill Land-Grant Act passed by the United States Congress one year earlier.

Situated in one of the most picturesque sections of the state, the University joins with its academic neighbors — Amherst, Smith, and Mount Holyoke Colleges — in maintaining the rich tradition of educational and cultural activity associated with this Connecticut Valley region. The University's central campus consists of approximately 1000 acres of land and 100 buildings. Physical growth has been carefully planned, with provisions for additional buildings and facilities to accommodate an enrollment of approximately 20,000 students by 1975.

The Dean of the Graduate School in collaboration with the University Graduate Council exercises over-all review and supervision of graduate programs conducted in the several colleges and provides guidance in the development of new programs as well as the maintenance of standards for existing programs. Each college of the University has developed its graduate programs in accord with the highest national professional standards of the respective fields.

COLLEGES OFFERING GRADUATE PROGRAMS

Seven colleges and schools of the University and one unaffiliated department are authorized to offer graduate degrees:

College of Agriculture
College of Arts and Sciences
School of Business Administration
School of Education
School of Engineering
School of Home Economics
School of Physical Education
Department of Public Health

Application Procedures For Admission and Readmission

ADMISSION

Graduates of this University having the bachelor's degree, or of other institutions having substantially the same requirements for the bachelor's degree, are eligible to apply for admission to a program of graduate studies. Application blanks may be obtained by writing to the Admissions Office, Graduate School, University of Massachusetts, Amherst, Massachusetts.

Application for admission with supporting documents should be received prior to the first enrollment. An applicant should request registrars of colleges previously attended to send transcripts directly to the Graduate School. This should be done early enough so that the transcripts as well as the completed application form for admission will be received at least one month prior to enrollment of the applicant. If a student is also applying for a graduate assistantship or fellowship his application materials for admission to the University should be received several months earlier.

READMISSION

Any student previously enrolled in graduate study at the University of Massachusetts who has not been in attendance for one or more terms should secure an application form from the Graduate Office and apply for readmission. At least one month prior to the first day of registration of the semester in which the student expects to resume his studies, this form should be completed and sent to the Graduate School with an official transcript of any work taken while not enrolled at the University of Massachusetts. Any graduate student enrolled in the University during a spring semester may attend the following summer and/or fall semester without filing for readmission.

FOREIGN STUDENT ADMISSION

Foreign students who plan to study at the University of Massachusetts must possess a facility in spoken and written English that will permit them to enter directly on arrival into a classroom situation. All classes at the University are conducted in English.

Applicants must report to a test center where TOEFL (Testing of English as a Foreign Language) is given and will be expected to submit a score from the TOEFL examination. Applicants should write for information concerning TOEFL Centers to Test of English as a Foreign Language, Educational Testing Service, Princeton, N. J. 08540, U. S. A.

ADMISSION OF FACULTY MEMBERS TO GRADUATE STUDY

A member of the faculty of The University of Massachusetts with the rank of assistant professor or higher may not earn a graduate degree from the University of Massachusetts. He may, however, do graduate work on a non-degree basis. A full-time staff member of the University of Massachusetts may not carry more work in residence than an average of four credits per semester.

REQUIREMENTS FOR ADMISSION:

1. The applicant must have an undergraduate grade point average of 2.5 or better.

2. A Bachelor's degree or the equivalent from any college or university of recognized standing. Applications for admission from all graduates of non-accredited schools in the United States must be supported by the results of an objective test such as the Graduate Record Examination or the Miller Analogies Test.

3. Two official transcripts of all previous college work.

4. Two letters of recommendation from persons in the field of the applicant's academic major at the institution most recently attended. Applicants whose academic references would go back more than five years may substitute other references if desired.

5. Acceptance by the department and by the Admissions Committee of the Graduate Council.

Admission to the Graduate School does not imply admission to candidacy for an advanced degree. Such candidacy is subject to specific requirements as laid down by the several departments. The student must secure the approval of the Head of the Department in which he desires to major before he can become a candidate for a degree in that subject.

Applicants will be admitted to the Graduate School in one of the following two categories:

Degree Status: a student admitted as fully qualified to undertake a program toward a graduate degree.

Provisional Status: a student admitted provisionally on a probationary status. At the conclusion of a semester of work — or two semesters if the department wishes — the student is either admitted to degree status or refused admission. If he is admitted to degree status, credits earned while in a provisional status are acceptable toward his degree if approved by his Guidance Committee.

Tuition and Fees

Tuition for residents of Massachusetts is charged at the rate of $10 per credit hour up to a maximum of $100 per semester. Non-residents are charged $15 per credit hour up to a maximum of $150 per semester. In order to take advantage of the lower tuition rate, a student must have on file a Certificate of Residence properly authenticated by his Town or City Clerk.

OTHER FEES

1. Any student taking more than two courses shall be required to pay all the following fees:

Student Union	$10 per semester
Health Fee	$20 per semester
Identification Card	$ 1 per year
Blue Cross/Blue Shield	$18 per year (optional) Sept. 1-Aug. 31, $10, Feb. 1-Aug. 31

2. Any student enrolled for fewer than three courses and living in University housing shall pay the Identification Card and the Health Fee.

3. Any student enrolled for less than three courses and not living in University housing shall pay the Identification Card fee only.

WAIVER OF TUITION AND FEES

Holders of certain titles are exempt from tuition and certain fees. Waiver forms must be processed before registration in order to take advantage of waivers.

Candidates for a Master's degree who have paid a full year's tuition in the Graduate School are not required to pay tuition if they later register only for a Master's thesis.

Candidates for the Doctor of Philosophy degree who have paid two full years' tuition in the Graduate School are not required to pay tuition if they later register only for the Doctor's thesis.

BOARD

Graduate students may purchase meal tickets and eat at any line in either the North Commons or the South Commons or the Southwest Commons number 1.

Meal tickets are available at the following rates:

	One Semester	Two Semesters
5 day (15 meals Monday thru Friday)	$185	$370
7 day (21 meals Monday thru Sunday)	$224	$448

Graduate students may also buy individual meals on a cash basis.

TUITION AND FEE CHANGE

Tuition and fees are subject to change upon action of the Board of Trustees and may be changed without prior notice.

BLUE CROSS, BLUE SHIELD

All graduate assistants are required to carry Blue Cross/Blue Shield. All foreign students are required to carry Blue Cross/Blue Shield. All other students who do not have other medical insurance are strongly urged to participate in this program.

Assistantships and Fellowships

UNIVERSITY GRADUATE FELLOWSHIPS

These fellowships are unrestricted and are awarded on a University-wide basis by competition. They are intended to encourage and assist superior students in pursuing graduate study and in completing the requirements for graduate degrees in the minimum possible time.

A recipient of one of these awards must enroll as a full-time student. He is not required to give formal service to the University or to the department in which he is enrolled.

The stipend is $2,500 for the academic year. The fellowships are not renewable beyond the third year. They are payable in ten monthly installments from September through June, and carry a waiver of tuition and fees.

Application forms may be obtained by writing to the Graduate Office of the University of Massachusetts. Completed applications must be submitted before February 1 for the following September. Awards are announced by April 15. Applicants not currently enrolled in graduate study at the University should also have on file an application for admission to the Graduate School.

GRADUATE ASSISTANTS

The University offers a number of graduate assistantships for the purpose of assisting with the instructional and research programs of various departments. The stipend varies, up to a maximum of $2,500 for the academic year, depending upon the qualifications of the applicant. Graduate assistants are not required to pay tuition if their stipend is $1,250 or higher for the academic year. Such assistants may carry up to thirteen credits per semester, but the total for both semesters of any one academic year may not exceed twenty-four credits. Application should be made to the Head of the Academic department.

RESEARCH ASSISTANTSHIPS

A number of research assistantships are available to qualified graduate students. These are made possible because funds are provided by (a) various industries. (b) the Experiment Station, or (c) research grants awarded to members of the Graduate Faculty either from sources outside the University or from a fund pro-

vided by the University and administered by the Research Council. Stipends vary with the type of work and the amount of time involved. Interested students should make application to the Head of the Department in which they plan to work.

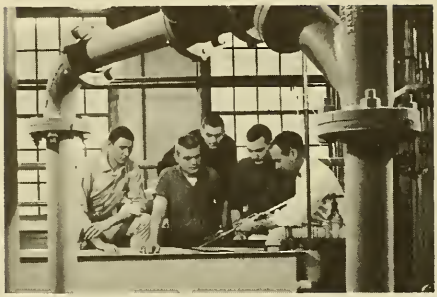
LOTTA CRABTREE FELLOWSHIPS

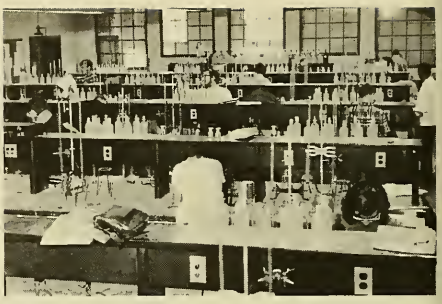
A limited number of fellowships paying $3,000 each are available to students in the broad field of agriculture. Students applying for these fellowships must be interested in earning the Doctor of Philosophy degree for the purpose of serving agricultural pursuits. Application should be made to the Dean of the Graduate School.

THE CRAMPTON RESEARCH FUND

Interest from the Guy Chester Crampton Research Fund is used to help defray the costs of publication of worthy research papers completed by students or occasionally by staff members. Information concerning the fields of work for which grants may be made, and instructions for application, may be obtained from Department Heads, the chairman of the Crampton Fund Committee or the Graduate School office.

Programs Offered





Courses available as major subjects for the Degree of Doctor of Philosophy:

Agricultural Engineering
Animal Science
Botany
Chemistry
Chemical Engineering
Civil Engineering
Economics
English
Entomology
Food Science and Technology
French
Geology
German
Government
History
Mathematics
Microbiology
Philosophy
Physics
Plant Pathology
Plant Science
Psychology
Sociology
Soil Science
Spanish
Zoology

Courses available as major subjects for the degree of Doctor of Education:

School Administration
School Guidance

Courses available as major subjects for a Master's degree:

Accounting
Agricultural and Food Economics
Agricultural Engineering
Animal Science
Anthropology
Botany
Business Administration
Chemical Engineering
Chemistry
Civil Engineering
Computer Science
Dramatic Arts
Economics
Education
Electrical Engineering
English
Entomology
Fine Arts
Food Science and Technology
Forestry and Wood Technology
Geology
German-Russian
Government
History
Home Economics
Horticulture
Industrial Engineering
Labor Studies
Landscape Architecture
Mathematics
Mechanical Engineering
Microbiology
Philosophy
Physical Education
Physics
Plant and Soil Sciences
Plant Pathology
Psychology
Public Health
Romance Languages
Sociology and Anthropology
Speech
Statistics
Wildlife and Fisheries Biology
Zoology

CERTIFICATE OF ADVANCED GRADUATE STUDY

The School of Education conducts several programs leading to the Certificate of Advanced Graduate Study. These are not degree programs. These programs call for a minimum of sixty semester hours of graduate work beyond the Bachelor's degree, of which at least thirty must be taken at the University of Massachusetts and of these at least fifteen must be taken in the School of Education. Of all the course work leading to the Certificate at least eighteen credits must be 700-900 courses. No credit is valid after ten years and the last 30 credits must be taken within a four year period.

All fees and expenses must be paid before the Certificate will be conferred.

Requirements for Doctoral Degrees

All requirements for the several advanced degrees must be completed by May 28, if the degree is to be received at the Commencement in June. (September 15 for students planning to receive their degrees in the winter, February 1, for students planning to receive their degrees in the spring.)

DOCTOR OF PHILOSOPHY

In order to provide proper direction for the Ph.D. candidate, a Guidance Committee of three will be appointed. This Committee will be appointed from members of the Graduate Faculty recommended by the Department Head of the student's major department, and will consist of two members of the major department and one other person.

This Guidance Committee shall meet with the candidate as soon as possible after the appointment has been made. The Committee shall file in the Graduate Office a summary of the proposed program of the student, including specific courses recommended by the Committee. In addition to this original meeting with the student, the Guidance Committee's responsibilities shall be to:

a. Approve the program of the student.

b. Arrange for the preliminary comprehensive examination of the student.

c. Approve the procedure for the satisfying of the language requirements by the student.

d. Supervise the dissertation project and arrange for the final examination. The Guidance Committee will serve as the Dissertation Committee for the Ph.D. candidate.

e. Report the fulfillment of all requirements to the head of the major department, the vote of the Committee to be unanimous on this.

The degree is conferred upon graduate students who have met the following requirements:

1. The preparation of a dissertation satisfactory to the Guidance Committee and the major department.

2. The successful completion of graduate courses in the major field. The Guidance Committee will determine the number of graduate credits which the student must earn.

3. The passing of a preliminary comprehensive examination to be conducted by the major department, to be passed not later than eight months before the completion of the candidate's work. This examination may not be taken until after the language requirements have been met (see number 4 below).

If the student fails the comprehensive examination he may, at the discretion of the Guidance Committee, be permitted a second and final opportunity.

4. The satisfactory completion of the following language requirements: two languages foreign to the candidate at least one of which must be a European language other than English. Proficiency tests should be passed as early as possible and must be passed prior to the preliminary examination. In lieu of one of the above foreign languages, graduate students may, upon the recommendation of their Guidance Committees, present themselves for a Tool of Research examination. If the student passes this examination, he will be required to pass only one foreign language examination. In special cases where, in the opinion of the Guidance Committee, a knowledge of two foreign languages is not likely to be greatly useful to the student, the student may substitute six hours of graduate cognate work for one of the languages. In such cases the level of proficiency for the remaining language will be increased to require functional use of it, including a reading, writing, speaking and listening knowledge of it. The language should be a *RESEARCH TOOL* to assist in opening up a body of literature not otherwise available to the student. The languages chosen by the student with the approval of his advisor should be ones which contain literature in the student's field of study.

5. The passing of a final examination, at least partly oral, conducted by the Guidance Committee primarily upon, but not limited to, the contents of the candidate's dissertation. The examination cannot be scheduled until all members of the Committee have approved the dissertation. The oral examination is to be conducted by the Committee. The Examining Committee is to consist of the Dissertation Committee and such members of the major department as the head shall appoint. In order to pass, the candidate must receive the unanimous vote of the Dissertation Committee. Not more than one dissenting vote shall be allowed for the total Examining Committee present.

6. The satisfactory completion of the residence requirement. The equivalent of at least one academic year of full-time graduate work must be spent at the University of Massachusetts. The requirement for a year in residence may be satisfied only by the student being physically present on campus for two consecutive semesters. This may be either a fall-spring sequence or a spring-fall sequence. It cannot be satisfied by a summer session and a semester of the regular school year. The student need not reside in Amherst, although he should reside in one of the surrounding communities. He cannot be holding another full-time

job off campus while satisfying the residence requirement. If he is a teacher in another school system in the area, he may teach no more than one course while satisfying the residence requirement. The requirement is not stated in terms of credit hours because the student might satisfy the requirement while working on his thesis or dissertation and not be registered for any particular number of credits. The intent is that the student should actually be on the campus so that the faculty can become acquainted with him and be in a position to recommend him in connection with his future career and have knowledge of him when it is necessary to recommend him for his degree.

7. Credits for each graduate course become invalid nine years following the date of completion of the course except that graduate credits previously earned at another institution which have been accepted by the Graduate Council for full credit toward the requirements of the Ph.D. degree shall become invalid nine years from the date of first registration in the Ph.D. degree program. A Ph.D. candidate should take a minimum of one half of his course work for the degree from the University of Massachusetts. In those cases where this would be less than the amount of course credit earned under a master's degree the full credit of the master's degree would be accepted. Where significant deviations from this policy are desired, it is suggested that they be cleared first through the Graduate Dean.

8. The payment of all fees and expenses.

DOCTOR OF EDUCATION

The School of Education offers several specialized programs leading to the Doctor of Education degree for those employed in the educational field. The requirements for this degree follow closely those outlined for the Doctor of Philosophy degree except that in place of the foreign language requirement the candidate may demonstrate a mastery of fundamental statistics and computer language and operation. Residency must be met by two consecutive semesters on campus. Prospective candidates should contact the Admissions Committee of the School of Education before starting formal application for admission.

FOUR-COLLEGE COOPERATIVE Ph.D. DEGREE

A cooperative Ph.D. program has been established by Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts. The degree is awarded by the University of Massachusetts, but some and perhaps much and in a few exceptional cases even all of the work leading to the degree might be done in one or more of the other institutions.

When a student has been awarded a degree under this program, the fact that it is a cooperative Ph.D. degree involving Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts will be indicated on the diploma,

the permanent record card and all transcripts, as well as on the Commencement Program.

The requirements for the degree are similar to those for the Ph.D. degree at the University of Massachusetts except for the statement relating to "residence." For the cooperative Ph.D. degree "residence" is defined as the institution where the thesis work is being done.

When this catalog went to press, the following Departments were authorized to offer the Cooperative Ph.D. degree: all the Departments in the Biological Sciences; Chemistry, French, Geology, German, Philosophy, Physics, and Spanish.

Students interested in this program should write to the Dean of the Graduate School.

Graduate Reading Examination in Foreign Languages

1. The Graduate School participates in the Graduate Student Foreign Language Testing Program conducted on a nation-wide basis by the Educational Testing Service. The examinations are given on campus by the Guidance Office. They are given three times during the academic year. The dates are set nationally by the Educational Testing Service. Dates and information booklets concerning the tests may be obtained from the Guidance Office, Machmer Hall.

2. The level of language competence required by the tests is intended to be the same as would be needed to produce a usable translation of a professional article in one's own field of study.

3. Upon the recommendation of the Guidance Committee, a student who has completed two years of undergraduate work in a foreign language with a grade of B or better in the second year may be certified as having satisfied the reading requirement for the Ph.D. in that language without further examination. (This option is not available to students who elect to take only one language with the course work option as a substitute for the second one.)

4. A foreign student who wishes to offer English as a foreign language must also offer another European language, other than his native tongue. The "Tool of Research" options are not available to a student who offers English as one of his languages.

If a student offers English as a foreign language no special examination will be given. His competency in it will be certified by the head of the department in which he is majoring after he has completed one full semester in residence.

TOOL OF RESEARCH EXAMINATION

A Tool of Research may be substituted for one foreign language requirement for the Ph.D. upon the recommendation of the student's Guidance Committee.

Two examinations in Tools of Research may be required for the Ed.D. degree.

1. The general standards for a Tool of Research are:
   a. The tool shall have a clearly constructive relevance to the candidate's research field.
   b. It shall replace neither a required nor a prerequisite element of the major field.
   c. It must require more than the satisfactory completion of a course.
   d. It must require a meaningful competence in the use of the tool.
   e. Evaluation of the candidate's competence shall lie outside the Guidance Committee.

2. Tool of Research examinations are presently given in three fields:

a.) Statistics: The student must demonstrate an ability to deal with the symbols used in statistics. He must be familiar with the concepts of randomness, measures of central tendency and dispersion, tests of hypotheses, confidence intervals, and relationships between variables. The student is expected to have a more detailed knowledge of one of the following fields: survey sampling, acceptance sampling, experimental design or multivariate analysis. The student must show a knowledge of the concepts and techniques that are commonly used in one of the above areas. Inquiries concerning the examination should be addressed to Professor Gail B. Oakland, Head of the Department of Statistics.

b.) Mathematics: (Not open to students in the physical sciences or mathematics.) Since the mathematical areas involved will vary greatly with each case, a committee will be appointed to draw up a list of topics for each applicant and to give the examination. The committee will consist of two members of the Department of Mathematics, one of whom will be Chairman of the Committee, and two persons from the student's major department. Inquiries may be addressed to Professor Wayman L. Strother, Head of the Department of Mathematics.

c.) Computer Language: The examination will be a written test of the student's ability to translate with mature comprehension between the following languages: English, machine language, compiler language. The particular machine language and compiler language for each examination is announced prior to the examination. Inquiries concerning the examination should be addressed to Professor J. A. N. Lee, Associate Professor of Computer Science.

Doctoral Dissertation

A dissertation must be on a topic in the field of the candidate's major subject, and must indicate that its writer possesses the ability and imagination necessary to do independent constructive thinking. The following rules should be adhered to in the preparation and presentation of a dissertation:

The objective should be to make a contribution to knowledge. When completed it should be of a quality worthy of publication as a contribution from the department concerned.

The dissertation in its completed form, will be judged largely upon the ability of the author to review literature and reach definite deductions; to formulate a problem, plan a method of attack, and work out a solution; and to summarize his material and draw conclusions. Scholastic attainment in writing and presenting the results of the study will also be an important factor in the evaluation.

1. The professor within the department who is responsible for the direction of the student's research will be appointed the chairman of the student's Dissertation Committee. Only members of the Graduate Faculty may be appointed to a committee.

2. It is the responsibility of the chairman of the Dissertation Committee to arrange a conference with other members of the committee and the student for the purpose of discussing the research problem before approving the dissertation outline. This should be done as soon as possible after the appointment of the committee.

3. A copy of the student's dissertation outline is then to be signed by each member of the committee to indicate approval of the outline and to indicate the fact that a conference with the student has been held. The signed copy is then to be sent to the Dean of the Graduate School.

4. The Committee will have direct charge of all matters pertaining to the dissertation. The dissertation must have the unanimous approval of this committee and the approval of the major department before arrangements are made for the final examination for the degree.

5. Suitable copies will be supplied to the Graduate School. An unbound original and one bound copy are required. The student is responsible for the binding of the dissertation.

6. Because of the time required to give adequate consideration to the research conducted by the student, it is highly desirable that the dissertation be submitted to the committee not later than March 15, and deposited with the Dean of the Graduate School by May 28.

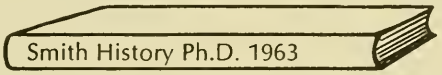
7. It is desirable to secure as much uniformity of style in dissertations as is practicable. However, different disciplines have worked out widely accepted distinctive research styles which should be mastered by the student whose life work is to be in the discipline. The following recommendations are intended to achieve as much uniformity as is practicable:

a. *The University of Chicago Manual of Style* shall be the Graduate School standard. However, any school, college or department may specify substitute standards agreed upon in that discipline.

b. The original of the Ph.D. dissertation is left unbound. The second (departmental) copy should be bound in black in a permanent waterproof buckram.

c. Lettering is required on the spine of bound dissertations. Lettering shall read down from the top in the following order: Author's last name, name of department, degree and year of degree. The name of the department may be abbreviated if necessary. No other lettering is necessary.

Example:



d. Weight of the paper shall be 20 pound bond. Size shall be 8½ by 11 inches. Margin to the left shall be 1½ inches; margin to the right, 1 inch.

e. Any method of reproducing duplicate copies is acceptable that produces the required number of clear, neat, and permanent copies.

f. The form of doctoral dissertations must conform to the "Suggestions for the Preparation of Dissertations for Microfilming" which may be obtained from the Graduate Office.

g. *Form of title page*. The title page should be arranged in this order:

1. Subject.
2. Name of author.
3. Degrees previously earned and names of institutions awarding them.
4. "Thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of—."
5. "University of Massachusetts, Amherst."
6. Date.

h. Following the granting of the doctorate, the Graduate School will have the dissertation microfilmed. The dissertation must be put into condition for publication on microfilm with as much care as if it were to appear in printed form and must have the approval of the student's doctoral committee. The student should supply to the Graduate School an unbound original and one bound copy of his dissertation. He should also provide an abstract, in triplicate, of fewer than 600 words.

The microfilm fee of approximately $35.00 covers microfilm publication of the dissertation by University Microfilms, Inc., and the publication of the abstract by them in *Dissertation Abstracts*. The microfilm fee also covers the cost of copyright in the author's name. The dissertation will be catalogued in the Library of Congress and in the University of Massachusetts Library. Microfilm copies may be purchased from University Microfilms, Inc., Ann Arbor, Michigan.

Publication by microfilm does not preclude the printing of the dissertation in whole or in part in a journal or as a monograph.

Requirements for Master's Degrees

Master of Arts, Master of Fine Arts, Master of Science, Master of Science in Accounting, Master of Science in Chemical Engineering, Master of Science in Civil Engineering, Master of Science in Electrical Engineering, Master of Science in Industrial Engineering, and Master of Science in Mechanical Engineering.

The basic requirements for the above degrees are:

1. Thirty graduate credits, of which not more than six of grade B or better may be transferred from other institutions. Twenty-one of the thirty credits must be in the major field. If a thesis is offered, six credits must be earned in 700-900 series courses; if a thesis is not offered, twelve credits must be earned in 700-900 series courses. Not more than ten credits may be earned by means of a thesis. No credit is valid after six years.

2. The thesis is optional with the school or department, but if there is one, it shall be under the supervision of a committee recommended by the major department. The thesis must be approved by the Thesis Committee and by the major department. Thesis committees for candidates for the Master's degree will consist of one or more members of the Graduate Faculty at the discretion of the head of the department. The candidate must pass a general oral examination (not limited to the thesis topic) to be conducted by an examining committee of at least three

members of the Graduate Faculty. This examination must be taken whether the student writes a thesis or not. The examination will cover the work of the student in preparing for the Master's degree. The recommendation of two of the three members of the examining committee shall be requisite to receiving the degree. If a student offers a thesis, problem courses shall be limited to six credits; if a thesis is not offered, the limit shall be nine credits.

3. Students who are candidates for the Ph.D. degree may apply for the Master's degree when they have fulfilled the residence and course requirements for the doctorate, have passed the language examinations, and have successfully completed preliminary comprehensive examinations for the Ph.D.

4. All foreign language requirements for the Master's degree are optional with the school or department.

5. All fees and expenses must be paid before the degree will be conferred.

Course credits used by any student for fulfilling the requirements for a Master's degree may not be used by the student for fulfilling the requirements for any other Master's degree at this University.

MASTER OF EDUCATION

The degree is conferred upon graduate students who have met the following requirements:

1. Thirty to thirty-three credits. If 30 credits are offered, no more than six may be transferred from other institutions; if 33 credits are offered, no more than nine credits may be transferred from other institutions. Fifteen of the total credits must be in Education, and of those twelve credits must be earned in 700-900 series courses. No credit is valid after six years. Work of less than B grade cannot be transferred.

2. The problem of practicum is optional but if it is not chosen the total credits must be thirty-four. Credits in workshop courses are limited to six.

3. In order to receive the Master of Education degree the candidate must have a cumulative quality point average of 3.0 at the completion of the required minimum number of credits (or within six semester hours beyond the minimum) for the program in which the candidate is enrolled. Otherwise the School of Education will recommend to the Graduate Council that the candidate be dropped from the School of Education as a graduate student.

4. All fees and expenses must be paid before the degree will be conferred.

MASTER OF ARTS IN TEACHING

This is a cooperative program between the various Colleges and Schools of the

University and the School of Education. The program for elementary and secondary school teaching is intended primarily for graduates of approved liberal arts institutions who have had little or no course work in professional education. The program for community college teaching is intended for graduates of approved liberal arts, engineering or business schools who have programs of concentration needed in community colleges. The student will register in the School of Education for one of the following programs:

1. *The Community College Program.* If the student has no professional education he will take Psychology 601 and four other professional courses to be determined by his committee. He will take a minimum of twenty-four semester hours in his teaching field and of these at least twelve will be in advanced graduate courses. An internship of one semester is required.

2. *The Secondary School Program.* Eighteen credit hours in the fundamental professional courses usually required for cetification; at least twelve credit hours in some field in Arts and Sciences in which the student has the necessary background. Of these twelve credit hours six must be in 700-900 series courses.

3. *The Elementary School Program.* Twenty-four credit hours in the fundamental professional courses usually required for certification; at least twelve credit hours in some field of Arts and Sciences of which six must be in 700-900 series courses.

4. In order to receive the Master of Arts in Teaching degree the candidate must have a cumulative quality point average of 3.0 at the completion of the required minimum number of credits (or within six semester hours beyond the minimum) for the program in which the candidate is enrolled. Otherwise the School of Education will recommend to the Graduate Council that the candidate be dropped from the School of Education as a graduate student.

5. All fees and expenses must be paid before the degree will be conferred.

MASTER OF BUSINESS ADMINISTRATION

1. Candidates for the degree of Master of Business Administration must satisfactorily complete thirty semester hours of approved graduate work providing such students have completed their undergraduate degree with a major in Business Administration.

2. For those students who have not presented the undergraduate degree in Business Administration the School shall determine what courses will constitute adequate preparation up to a maximum of thirty additional semester hours.

3. Permission to present a thesis may be granted to qualified candidates. For such students, an oral rather than a written general examination is required. The thesis

proposal must be approved by the end of the first semester. Nine credit hours in lieu of course credit is allowed for a thesis.

4. Non-thesis candidates shall be required to pass a written comprehensive examination.

5. Applicants for admission are required to take the Admission Test for Graduate Study in Business given each year by the Educational Testing Service of Princeton, New Jersey. Applicants should apply to the Testing Service for further information.

6. Twenty-four credit hours of the thirty advanced credits required for the M.B.A. degree must be in courses designed exclusively for graduate students.

7. Graduate Assistants register for a maximum of 12 credit hours each semester rather than the 15 hours permitted other students. Generally, Graduate Assistants complete their courses during a summer session period following a spring semester.

8. All expenses and fees must be paid before the degree will be conferred.

MASTER OF SCIENCE IN ACCOUNTING

The School of Business Administration offers a graduate program in Accounting. This is in line with an established policy of the American Association of Collegiate Schools of Business of which this School is an accredited member. The Master of Business Administration degree is a general rather than a specialized degree. Applicants for admission are required to take the Admission Test for graduate study in business.

MASTER OF FINE ARTS

This degree is particularly designed for those interested in the creative aspects of the arts. The degree may be obtained through the Department of Art for work in the visual arts, through the Department of English for work in creative writing, or through the Department of Speech for work in Dramatic Art.

The Basic Requirements for this Degree Are:

1. Sixty credits which must be at the graduate level. Not more than twelve credits may be transferred from other institutions *where the department considers it appropriate,* twelve hours should be taken in one or more of the art fields other than that of the major department. No more than eighteen credits may be earned with the thesis project. No credit is valid after eight years.

2. The exact nature of the thesis project will be determined by the student's major professor in conference with the student. It is to be understood that the project will be productive of a work of art. A written analysis of the work itself and of the

procedures used in producing it will be required. The candidate will be asked to pass an examination in his major field in addition to presenting his thesis project publicly.

The Master of Fine Arts Program is administered by an interdisciplinary committee appointed jointly by the Dean of the Graduate School and the Dean of the College of Arts and Sciences. Application for admission to the program should be made to the head of the department with which the student wishes to major.

MASTER OF LANDSCAPE ARCHITECTURE

The degree is conferred upon graduate students who have met the following requirements:

1. Work covering at least two years in residence, and a minimum of one-half year spent in practice. Specific requirements concerning the nature of such practice are determined by the department.

2. The earning of not fewer than forty-five credits of which thirty shall conform essentially to the "fifth year program" (see page 181.) the remainder to be selected from the 700-900 series on page 179, with minor deviations at the discretion of the department.

3. Preparation of a satisfactory thesis.

4. The passing of a final examination, written and/or oral.

5. All fees and expenses must be paid before the degree is conferred.

MASTER OF SCIENCE IN LABOR STUDIES

The graduate curriculum leading to the Master of Science in Labor Studies is an interdepartmental one, with responsibility for coordinating student's programs vested in the Interdisciplinary Committee recommended by the Advisory Council of the Center and approved by the Dean of the Graduate School.

Students in this program will be individually advised by members of the Interdisciplinary Committee.

Two years is considered the normal period for taking this degree.

Students who successfully complete the graduate curriculum in Labor Studies will be prepared primarily for academic work, labor union employment, and government service.

The basic requirements for the degree are:

1. Thirty-six graduate credits of which no more than nine may be transferred from other accredited institutions.

2. A thesis is optional.

3. Research projects (in the first year), an internship (in the summer), and an administrative assignment in the workers education extension teaching area (in the 2nd year) will be expected of each candidate.

4. All fees and expenses must be paid before the degree will be conferred.

THE UNIVERSITY RESEARCH COMPUTING CENTER

The University Research Computing Center has a Control Data Corporation 3600 high-speed computer and an IBM 1620 digital computer. Three Pace analog computers are available in the School of Engineering.

A graduate program leading to an M.S. in Computer Science is listed elsewhere in this catalog. Undergraduate courses are also offered.

Several graduate assistantships are available for students with prior knowledge of computer operations. Inquiries may be addressed to the Director of the Research Computing Center, Engineering Laboratory Building, University of Massachusetts, Amherst, Massachusetts.

LABOR RELATIONS RESEARCH CENTER

The Labor Relations Research Center was founded to carry on research in the labor field, to develop continuing education and consultation services, and to support a program of academic course work. An M.S. in Labor Studies is described elsewhere in this catalog. Inquiries should be addressed to the Director of the Labor Relations Research Center, The Graduate School, The University of Massachusetts, Amherst, Massachusetts.

WATER RESOURCES RESEARCH CENTER

The establishment of a Water Resources Research Center at the University has resulted in an expansion of training and research in many diverse aspects of water resources. Degrees in basic research can be obtained in geology and biology. In addition, the University is now offering courses that will lead to a degree in quantitative hydrology. The University is presently offering degrees in the following eight fields that train specialists in water: surface-water hydrology, ground water hydrology and geology, sanitary engineering, quality of water, limnology, microbiology, fishery biology, and watershed management.

DEPARTMENT OF AIR SCIENCE

The mission of the Department of Air Science is to develop in select students those qualities of leadership and other attributes essential to their progressive

advancement to positions of increasing responsibility as professional officers in the United States Air Force.

Graduate students interested in becoming commissioned officers in the USAF should consult with the Professor of Air Science.

MASTER'S THESIS

The requirements for the master's thesis are the same as those for the doctoral dissertation listed above (p. 24) with the following changes:

1. The Head of the Department submits to the Graduate Dean a recommendation for a student's Thesis Committee indicating which member is to be the Chairman. If there are three members on the committee four copies of the student's outline should be submitted. After approval of the committee, the Graduate Office will return a copy of the outline to each member of the committee with two copies to the Chairman. After the committee meets with the student and approves the outline, the extra copy should be signed by all members of the committee and returned to the Graduate Office to be placed in the student's file.

2. A bound original and two bound copies of the thesis are required. One copy is returned to the major department for its files. All copies are bound in red waterproof buckram.

3. Theses must be submitted to the committee not later than May 15 of the academic year in which the degree is to be conferred.

4. Microfilming is not required for master's theses.

General Regulations

1. Graduate credit will be allowed for grades A, B, and C. Not more than three credits of C will be allowed for a Master's degree. Not more than six credits of C will be allowed for the Doctor of Philosophy degree. Candidates registering for thesis credit (Thesis 800 or 900) will register for credits in multiples of three or more each semester up to the total number of credits recommended by the Guidance Committee. Registration beyond that total will be for zero credits. Grades for thesis credit will be S or NS except for the semester in which the thesis is completed when the grade will be either Pass or Fail as recommended by the Committee. No graduate credit will be given for courses numbered below 400.

2. Course numbering system at the University of Massachusetts:

001-099	Non-credit courses, non-quality point courses, entrance deficiencies, etc.
100-199	Undergraduate credit only: lower division.
200-399	Undergraduate credit only: upper division.
400-499	Professional courses which presume a bachelor's degree.
500-699	Graduate credit only: Parallel to 200-399.
700-999	For graduate students only.
700	Special Problems.
800	Master's Thesis.
900	Doctoral Dissertation.

3. Withdrawal regulations:

a.) To add, drop, or change a course, the student must obtain the written approval of the instructors concerned, his faculty advisor, and the Dean of the Graduate School. Signed cards are to be filed with the Graduate Office.

b.) Within a period of ten academic days from the beginning of a semester a student who has satisfied the requirement of (a) above may add, drop, or substitute courses without penalty. No courses may be added beyond this date.

c.) Within a period of six calendar weeks beyond the beginning of a semester a student may drop courses with a grade of W providing approval is obtained from the instructor and the student's major advisor. No courses may be dropped beyond this date except with a grade of WF unless special permission is obtained from the Dean of the Graduate School.

d.) During Periods 1 and 2 a student may withdraw from the University without academic penalty. Grades of *W* will be noted on his record. After six weeks, grades of *WF* or *WP* will be entered unless special permission is obtained from the Dean of the Graduate School.

4. Incompletes:

A student can obtain credit for an "incomplete" only by finishing the work of the course before the end of the next semester (whether or not he is enrolled). The initiative in arranging for the removal of an "incomplete" rests with the student.

5. Attendance at commencement:

Attendance of Master's candidates at the June Commencement is desirable but not required. Attendance of Ph.D. candidates at the June Commencement is required unless excused by the Dean of the Graduate School.

6. Four-college library use:

The libraries at Amherst College, Smith College and Mt. Holyoke College are normally off-limits to graduate students from the University of Massachusetts. These library facilities are developed by these institutions to serve the needs of their own students. The physical facilities and staff services are not adequate to the additional loads imposed by outside demands.

Graduate students who have been accepted for candidacy and are working on doctoral dissertations may use these libraries by obtaining special permission from the Dean of the Graduate School. Such requests must be initiated through the Chairman of the Student's guidance committee.

Students enrolled in Four-College Cooperative Ph.D. programs may use the various libraries providing the head of the department concerned has supplied the name of the student to the appropriate librarians with a carbon copy to the Graduate Office.

Students taking courses on a campus other than their own are entitled to the use of the library on that campus for purposes of that course only.

UNDERGRADUATES TAKING GRADUATE LEVEL COURSES

Permission for undergraduates to take graduate level courses will be restricted to seniors who have the permission of the instructor and the approval of their advisor. A memorandum signed by the advisor should be filed with the Graduate Office.

Special Services Available To Graduate Students

HOUSING

Information about housing may be obtained by writing to the Director of Housing. The University does not provide housing for graduate students.

GRADUATE COURSES DURING THE SUMMER

The University offers opportunities to pursue graduate courses during the summer in connection with the Summer School. Details regarding courses offered, facilities for study, etc., may be found in the Summer School Catalog, a copy of which is available upon request to the Provost of the University.

COUNSELING AND HEALTH SERVICES

The services of the Counseling Center are available to graduate students.

Complete health care, financed by the student health fee, is available without additional charge to *all* students. The Infirmary, furnishing both in-patient and out-patient care, is located immediately north of Brooks Dormitory.

Students will find services are most complete and readily available during regular out-patient hours: Weekdays 8 a.m.—5 p.m. Saturdays 8 a.m.—12 noon.

Emergency care is available at all times, day or night.

If you need to stay in the Infirmary, an attempt will be made to provide an opportunity for you to study if you feel able. Student visitors will be allowed during specific hours; parents may visit at any reasonable hour.

The resources of the Health Services are available to you so that illness and loss of valuable school time will be minimized. We should be able to help you before your needs are serious.

PLACEMENT AND FINANCIAL AID SERVICES

The services of the Placement and Financial Aid Offices are available to all degree candidates. Interest free, short term loans up to $100 are available.

HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Qualified scholars who may desire temporarily the privileges of the library and research facilities of the University, and who are not candidates for a degree may, upon recommendation of the Dean of the Graduate School and the approval of the President, be appointed Honorary Fellows without stipend.

DESCRIPTION of COURSES

Before consulting the course descriptions listed in this section, students should become thoroughly familiar with the General Regulations governing registration for courses in the Graduate School. The regulations (listed on Page 33) cover such matters as graduate credit, course numbering system, changing or dropping of courses, and requirements regarding incomplete work in a course. Students should also acquaint themselves with the requirements governing the particular degree for which they wish to take courses. These requirements are found under the appropriate degree headings beginning on Page 37.

AGRICULTURAL AND FOOD ECONOMICS

GRADUATE FACULTY

Ellsworth W. Bell, *Acting Head of Department and Extension Professor of Agricultural Economics,* B.S., Pennsylvania State, 1926; M.S., Vermont, 1928.

Bradford D. Crossmon, *Professor of Agricultural Economics,* B.S., Connecticut, 1937; M.S., 1943; D.P.A., Harvard, 1955.

John H. Foster, *Associate Professor of Agricultural Economics,* B.S., Cornell, 1950; M.S., Purdue, 1951; Ph.D., Cornell, 1957.

Elmar Jarvesoo, *Assistant Professor of Agriculture Economics,* M.S., Tartu University, Estonia, 1937; Dr. Agr. Sci., University of Berlin, 1939.

Theodore W. Leed, *Professor of Agricultural Economics,* B.S., Ohio State, 1950; M.S., 1957; Ph.D., 1957.

Sargent Russell, *Associate Professor of Agricultural Economics,* B.S., Maine, 1937; M.S., Cornell, 1939; Ph.D., Massachusetts, 1956.

David A. Storey, *Associate Professor of Agricultural Economics,* B.S., Massachusetts, 1954; M.S., Purdue, 1958; Ph.D., Purdue, 1960.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEMS IN AGRICULTURAL, FOOD AND RESOURCE ECONOMICS. Investigations of problems in agricultural and food economics and firm management. *Credit, 3.* The Staff.

702. AGRICULTURE IN THE NATIONAL ECONOMY.

The application of economic theory, particularly macro-economics and welfare economics, to the determination of agricultural prices and income. The interdependency of agriculture and other sectors of the economy. Effects on agriculture of national, fiscal, and monetary policy. *Credit, 3.* Mr. Fitzpatrick.

704. ADVANCED ANALYSIS OF FOOD MARKETING SYSTEMS.

Conceptual and normative analysis at both micro- and macro-levels of food and commodity marketing systems. Firm and group behavior, market structure, public policy implications. *Credit, 3.* Mr. Storey.

705. RESEARCH METHODS IN AGRICULTURAL, FOOD AND RESOURCE ECONOMICS.

Scientific method and its application. Selection, planning and conduct of research. Formulation of models and hypotheses. Interdisciplinary considerations. Techniques commonly used and promising new approaches. Evaluation of current research procedures. Research administration. *Credit, 1-3.* Mr. Jarvesoo.

721. NATURAL RESOURCE DEVELOPMENT ECONOMICS.
Modern economic theory in relation to resource development, economic models for resource use planning, applications of recent innovations in economic analysis to problems of evaluation of resource development plans.
Credit, 3. The Staff.

740. QUANTITATIVE METHODS.
Applications of micro-econometric techniques in agricultural, food and resource economics. Emphasis is put upon practical applications of modern methods of quantitative analysis to problems of the firm. *Credit, 3.* The Staff.

775. ADVANCED AGRICULTURAL AND FOOD ECONOMICS.
An intensive study of the theory of the firm as it applies to agricultural and food production, including: production functions, cost functions, programming, and decision-making principles; the nature of the aggregate supply functions in agriculture; applications of these principles to the agricultural firm and regional resource allocation, and to the distribution of income to and within agriculture. Prerequisite, permission of instructor. *Credit, 3.* Mr. Jarvesoo.

799. SEMINAR *Credit, 1-3.* Staff.

800. MASTER'S THESIS *Credit, 6.* Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

535. AGRICULTURAL MANAGEMENT ECONOMICS.
Basic decision-making principles, management tools, analytical methods and their application to management problems of commercial farms and other agricultural firms. *Credit, 3.* Mr. Lee.

546. ADVANCED MANAGEMENT OF AGRICULTURAL FIRMS.
Application of the theory of the firm and modern decision theory to management of typical agricultural businesses. Plans for alternative firm adjustments will be analyzed using budgeting and other methods. *Credit, 3.* The Staff.

558. AGRICULTURAL POLICY.
Analysis of public policy relating to agriculture. Local, state, national, international issues. Application of economic, social and political theory.
Credit, 3. Mr. Storey.

561. FOOD MARKETING SYSTEMS.

Structure of food marketing systems. Operating principles, significant product characteristics, role of specialized marketing firms, government programs and policies. *Credit, 3.* Mr. Fitzpatrick.

565. FOOD MERCHANDISING.

The principles of merchandising food products. Effects of store layout, product location, product mix, methods of display, turnover, pricing, ordering, inventory control, upon sales and profits. *Credit, 3.* Mr. Marion.

568. FOOD DISTRIBUTION ECONOMICS.

A critical analysis of the food industry, factors affecting sales, costs, profits. Application of economic principles to financing, site selection, and store management. *Credit, 3.* Mr. Leed.

571. PRICE THEORY AND ANALYSIS.

Elements of food and agricultural price making; demand and supply theory and methods of price analysis and forecasting; introduction to econometrics. *Credit, 3.* The Staff.

572. INTERNATIONAL AGRICULTURAL DEVELOPMENT.

Economic development of low income rural economies. Relation of agriculture to national economies. Exogenous and endogenous factors in development. *Credit, 3.* Mr. Foster.

580. RESOURCE AND CONSERVATION ECONOMICS.

Economic and institutional factors affecting land and water use. Land use planning, elements of conservation economics, recreation economics, water and watershed management. *Credit, 3.* Mr. Foster.

582. WATER QUALITY ECONOMICS.

Principles for selection of welfare maximizing plans from among alternative pollution control policies and measures. Market and administrative decision making processes for pollution control. *Credit, 3.* The Staff.

AGRICULTURAL ENGINEERING

GRADUATE FACULTY

Robert W. Kleis, *Head of Department of Agricultural Engineering and Professor of Agricultural Engineering,* B.S., Michigan State, 1949; M.S., 1951; Ph.D., Michigan State, 1957.

Joe T. Clayton, *Professor of Agricultural Engineering,* B.S., Tennessee, 1949; M.S., Illinois, 1951; Ph.D., Cornell, 1962.

Gerald A. Fitzgerald, *Professor of Agricultural Engineering,* B.S., Massachusetts Institute of Technology, 1923.

John S. Norton, *Associate Professor of Agricultural Engineering,* B.S., Pennsylvania State, 1948; M.S., Louisiana State, 1950.

Lester F. Whitney, *Associate Professor of Agricultural Engineering,* B.S., Maine, 1949; M.S., Michigan State, 1951; Ph.D., 1963.

John W. Zahradnik, *Associate Professor of Agricultural Engineering,* B.S., Pennsylvania State, 1950; M.S., Iowa State, 1951.

The department offers both the M.S. and the Ph.D. degrees. For the Ph.D., no additional requirements are imposed by the department other than those established by the Graduate School of the University. Programs are designed with flexibility to fit them to the candidate's needs and interests. A typical Ph.D. program includes approximately one-third major departmental offerings, one-third course work in one or more minor fields, and one-third dissertation.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 1-6.* The Staff.

760. PHYSICAL AND PHYSIOLOGICAL RELATIONSHIPS IN ANIMAL ENVIRONMENTS.

(In cooperation with Dept. of Vet. and An. Sciences)
Functional environment contrasted to the generalized environment. The action of the environment on the animal and the reaction of the animal on the environment in terms of several parameters: radiant energy, light, temperature, atmospheric composition, air flow, ambient pressure, etc. Modification of natural environments to vary physiological response.
Prerequisite, Permission of Instructor *Credit, 3.* Mr. Clayton and Mr. Mellen.

761. ADVANCED AGRICULTURAL STRUCTURES.

The application of structural theory in the development of high strength structures. The use of structural materials and fastenings for attaining diaphragms and prestressed components in the development of the structure.
Credit, 3. Mr. Clayton.

766. CONTROL OF HEAT AND VAPOR FLOW IN BUILDINGS AND PROCESSES.

Application of mass flow theory to heat and vapor transfer. Thermal and vapor interchange between environment and livestock controlling production rates of

metabolic heat and respiratory moisture. The application of instruments and controls.
Prerequisite, Mechanical Engineering 582 or equivalent. *Credit, 3.* Mr. Clayton.

776. ADVANCED AGRICULTURAL MACHINERY DESIGN.
Stress analyses, dynamic loading and the design of mechanisms of agricultural machines. Methods of analysis include finite difference, energy and graphical procedures as well as conventional machine design approaches. A complete design of a machine is required of each student.
Prerequisite, Mechanical Engineering 283 or equivalent.
Credit, 3 Mr. Whitney.

780. BIOPHYSICS IN AGRICULTURAL ENGINEERING.
A study of the properties of certain living systems in terms of the concepts of physics and engineering: includes the biophysical concept of the living cell; the theory of controlling regimes and biological rate processes; scalar problems pertaining to industrial applications; the instrumentation for kinetic studies involving heat and pressure in biological systems.
Prerequisite, Agricultural Engineering 781. *Credit, 4.* Mr. Zahradnik.

781. AGRICULTURAL PROCESS ENGINEERING.
A comparative engineering evaluation and analysis of agricultural product processes including: thermal processing, ionizing radiation processing, freeze drying, dehydration, fermentation and controlled atmospheres.
Credit, 3. Mr. Zahradnik.

786. ADVANCED PROCESS ENGINEERING.
Dimensional analysis and reaction kinetics as applied to pilot plant procedures and the scale-up of biological processes for system design.
Prerequisite, Agricultural Engineering 781 *Credit, 3.* Mr. Zahradnik.

791. SEMINAR.
Research methods in Agricultural Engineering. *Credit, 1.* Mr. Kleis.

792. SEMINAR.
Research accomplishments in Agricultural Engineering. *Credit, 1.* Mr. . Kleis.

891 a & b. PROFESSIONAL TOPICS IN AGRICULTURAL ENGINEERING.
Credit, 2 (1 each). Mr. Kleis.

892 a & b. TECHNICAL TOPICS IN AGRICULTURAL ENGINEERING.
Credit, 2 (1 each). Mr. Kleis.

800. THESIS RESEARCH — MASTER'S DEGREE. *Credit, 4-8.* The Staff.

900. DOCTORAL DISSERTATION. *Credit, 30.* Graduate Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

690. INSTRUMENTATION.

The study of instruments as applied to scientific research: recorders, indicators, controllers and transducers in general. Emphasis on transducers for ten or twelve common variables including temperatures, pressure, humidity and strain. Particular attention to applications and limitations.

Prerequisite, Physics 107 or equivalent. *Credit, 3.* Mr. Whitney.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Agricultural Engineering)

681. UNIT OPERATIONS IN FOOD ENGINEERING.

Study of the fundamental principles of unit operations and their application to food processing: including mixing, evaporation, distillation, dehydration, freeze drying, extraction and separation. *Credit, 3.* Mr. Fletcher.

686. ELEMENTS OF PROCESS ENGINEERING.

Engineering concepts related to the processing of materials with emphasis on heat transfer, fluid flow, psychrometry, rheology, strength and associated instrumentation. *Credit, 3.* Mr. Fletcher.

ANIMAL SCIENCE

GRADUATE FACULTY

Thomas W. Fox, *Head of Department of Veterinary and Animal Science and Professor of Animal Genetics,* B.S., Massachusetts, 1949; M.A., 1950; Ph.D., Purdue, 1952.

Donald L. Anderson, *Associate Professor of Animal Nutrition,* B.S., Massachusetts, 1950; M.S., Connecticut, 1952; Ph.D., Cornell, 1955.

Donald L. Black, *Associate Professor of Animal Physiology,* B.S., Maine, 1954; M.S., Cornell, 1957; Ph.D., 1959.

Wallace G. Black, *Professor of Animal Physiology,* B.S., Wisconsin, 1948; M.S., 1949; Ph.D., 1952.

Richard A. Damon, *Professor of Biometrics,* B.S., Massachusetts, 1947; M.S., Minnesota, 1949; Ph.D., 1951.

Heinrich Fenner, *Assistant Professor of Animal Nutrition,* B.S., Agricultural College of Stuttgart-Hohenheim, 1951; Ph.D., 1956.

Richard C. Foley, *Professor of Animal Physiology of Reproduction,* B.S., Massachusetts Agricultural College, 1927; M.S., Massachusetts State College, 1931; Ph.D., Rutgers, 1952.

Stanley M. Gaunt, *Professor of Animal Breeding,* B.S., Rutgers, 1938; Ph.D., North Carolina State College, 1955.

Sidney J. Lyford, Jr., *Assistant Professor of Animal Nutrition,* B.S., New Hampshire, 1958; M.S., North Carolina State College, 1960; Ph.D., 1964.

William J. Mellen, *Professor of Avian Physiology,* B.S., Massachusetts, 1949; M.S., Cornell, 1951; Ph.D., 1953.

Elwood F. Reber, *Professor of Animal Nutrition,* A.B., Berea College, 1944; M.S., Cornell, 1950; Ph.D., Oklahoma State, 1951.

Russell E. Smith, *Professor of Animal Diseases,* B.S., Massachusetts, 1938; V.M.D., Pennsylvania, 1942.

J. Robert Smyth, *Professor of Animal Genetics,* B.S., Maine, 1945; M.S., Purdue, 1947; Ph.D., 1949.

The graduate programs in the Animal Sciences include studies in mammalian and avian biology with options in (a) genetics, (b) physiology and (c) nutrition. Students planning to major in any one of these fields must have a strong background in biology and chemistry or mathematics, or must be prepared to remedy undergraduate deficiencies without graduate credit.

Requirements for both the M.S. and Ph.D. degrees include courses in the animal sciences offered by the department and courses in supporting areas offered by the departments of Zoology, Chemistry, Microbiology and Statistics. Available research material includes a number of domestic species.

COURSES OFFERED BY THE DEPARTMENT (Note: 500 series courses are open to both graduate and undergraduate students; 700 series are open to graduate students only. Where prerequisites are stated, equivalent courses taken at other institutions or permission of the instructor may be substituted.)

GENETICS

508. COMPARATIVE ANIMAL GENETICS.

The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation. Prerequisite, Zoology 540. *Credit, 3.* Mr. Fox.

704. AVIAN GENETICS.

Lectures covering the classical and physiological genetics of morphological traits of avian species. Particular emphasis is given to melanogenesis and characteristics involving epidermal structures.
Prerequisites, one year's training in biology and Zoology 540.
Credit, 3. Mr. Smyth.

705. GENETICS OF PRODUCTIVE TRAITS IN POULTRY.

Lectures and reports on the genetics of meat production and reproduction. Special emphasis is placed on the physiological genetics of fertility and embryogenesis. Prerequisites, one year's training in biology and Zoology 540.

Credit, 2. Mr. Smyth.

706. QUANTITATIVE INHERITANCE AND SELECTION.

The principles of population genetics and quantitative inheritance as applied to selection for traits of economic importance in poultry; theoretical and practical considerations of breeding systems.
Prerequisites, Animal Science 705, or Zoology 540, Statistics 551.

Credit, 3. Mr. Fox.

707. ADVANCED ANIMAL GENETICS.

Modern research in animal breeding with emphasis on the statistical approach. This includes the development of selection indexes for various farm animals, sire indexes, and breeding plans based on systems of mating and selection.
Prerequisite, Animal Science 508. *Credit, 3.* Mr. Gaunt.

PHYSIOLOGY

520. ANIMAL PHYSIOLOGY.

A comparative study of the physiology of mammals and birds, with emphasis on those aspects most pertinent to animal science.
Prerequisite, Zoology 135. *Credit, 4.* Mr. D. Black.

521. PHYSIOLOGY OF REPRODUCTION.

Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation. *Credit, 4.* Mr. W. Black.

724. ADVANCED AVIAN PHYSIOLOGY.

Lectures and reports on specific problems in avian physiology.
Prerequisites, Chemistry 520, Animal Science 520. *Credit, 3.* Mr. Mellen.

725. MAMMALIAN REPRODUCTION.

An advanced course emphasizing the comparative approach to problems of reproductive anatomy and endocrinology. Lectures, laboratory and seminar reports with theoretical and practical considerations of current research findings in laboratory and domestic animals, and in primates.
Prerequisites, Zoology 535 and 784. *Credit, 3.* Mr. D. L. Black.

726. FERTILITY AND FECUNDITY.

The role of heredity, nutrition, pathology and environment in the determination of fertility and fecundity in mammalian forms. Current research directed toward

control of reproductive function through experimental means is emphasized. Prerequisites, Animal Science 521 and Zoology 668 or Animal Science 725. *Credit, 3.* Mr. W. G. Black.

NUTRITION

530. PRINCIPLES OF NUTRITION.

Scientific principles of nutrition, emphasizing the basic biochemical and physiological concepts underlying the specific functions and interrelationships of the nutrients required for maintenance, production, and reproduction in both ruminants and non-ruminants. *Credit, 3.* Mr. Anderson.

734. ADVANCED AVIAN NUTRITION.

Lectures, reports and discussions of significant research developments and theories in avian nutrition.
Prerequisites, Chemistry 561, 562 and 520; and Animal Science 530. *Credit, 3.* Mr. Anderson.

735. RUMINANT NUTRITION.

An advanced course in ruminant digestion and metabolism. Special topics will be selected and discussed in the right of recent and current research.
Prerequisites, Animal Science 530, and Chemistry 520. *Credit, 3.* Mr. Lyford.

MISCELLANEOUS

700. SPECIAL PROBLEMS.

A specific problem in some aspect of animal or avian science not related to the candidate's thesis. *Credit, 3-6.* The Staff.

751, 752. SEMINAR — REVIEW OF LITERATURE.

Credit, 1 each semester. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE.

COURSES FOR MINOR CREDIT ONLY

172. GENERAL VETERINARY PATHOLOGY. *Credit, 3.* Mr. Smith.

ART

GRADUATE FACULTY

Paul F. Norton, *Head, Department of Art and Professor of Art,* B.A., Oberlin, 1938; M.F.A., Princeton, 1947; Ph.D., 1952.

Walter Kamys, *Associate Professor of Art,* Diploma, Museum School, Art Institute, Chicago.

Donald R. Matheson, *Associate Professor of Art,* B.S., U.S.M.A., West Point, N. Y., 1938; M.A., Michigan, 1951.

Lyle N. Perkins, *Professor of Art,* B.F.A., Alfred University, 1939; M.F.A., 1947; Ph.D., Ohio State, 1956.

The degree of Master of Fine Arts is offered for those interested in the creative aspects of the arts. The degree may be obtained through the Department of Art for work in the visual arts, or through the Department of English for work in creative writing. Requirements for the degree are listed on page 29.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 3-12.*

800. MASTER'S THESIS. *Credit, up to 18.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Creative Art:

500. WATER COLOR.

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein.
Six studio hours. *Credit, 3.*

502. WATER COLOR.

Continuation of Art 500.
Six studio hours. *Credit, 3.*

520. OIL PAINTING.

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition.
Six studio hours. *Credit, 3.*

522. OIL PAINTING.

Continuation of Art 520.
Six studio hours. *Credit, 3.*

530. FIGURE DRAWING.

Investigation and development of various techniques and media with special emphasis on figure drawing.
Six studio hours. *Credit, 3.*

540. PRINTMAKING, Relief.

An investigation of the techniques and aesthetic considerations of the woodblock print and related media. Emphasis placed on drawing and on understanding technical procedures.
Six studio hours. *Credit, 3.*

542. PRINTMAKING, Intaglio.

An investigation of the techniques and aesthetic considerations of etching, engraving, aquatint, and related media. Emphasis placed on drawing and on understanding technical procedures.
Six studio hours. *Credit, 3.*

544. PRINTMAKING, Lithography.

An investigation of the techniques and aesthetic considerations of making lithographs. Emphasis placed on drawing and on understanding technical procedures.
Six studio hours. *Credit, 3.*

560. SCULPTURE.

Experimentation with materials. Investigation into the nature of 3-dimensional order. Individual projects.
Six studio hours. *Credit, 3.*

562. SCULPTURE.

Continuation of Art 560.
Six studio hours. *Credit, 3.*

580. CERAMICS.

The designing and making of pottery with the potter's wheel and related tools. A student should have taken one or more basic courses in creative art before this course.
Six studio hours. *Credit, 3.*

582. CERAMICS.

Continuation of Art 580.
Prerequisite, Art 580. Six studio hours. *Credit, 3.*

History of Art:

505. ANCIENT ART AND ARCHAEOLOGY.

The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting. *Credit, 3.*

525. MEDIAEVAL ART.

Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West. *Credit, 3.*

545. RENAISSANCE ART.

Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory. *Credit, 3*

565. BAROQUE ART.

The art of the 17th and early 18th centuries in Italy, Spain, Germany, France and the Low Countries. *Credit, 3.*

585. MODERN PAINTING AND SCULPTURE.

Origin of modern movements in art, and an analysis of contemporary techniques and styles as they relate to society. *Credit, 3.*

591. MODERN ARCHITECTURE.

History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. *Credit, 3.*

595. AMERICAN ART.

Study of the earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary phases of abstract art. *Credit, 3.*

675, 677. MASTERS OF WESTERN ART.

An intensive study of the work of a master in the field of art.
Prerequisite, permission of the instructor.
1 or 2 class hours. *Credit, 1-2.*

BOTANY

GRADUATE FACULTY

Seymour Shapiro, *Head of Department and Professor of Botany,* B.S., Michigan, 1947; Ph.D., 1953.

Howard E. Bigelow, *Associate Professor Botany,* B.A., Oberlin, 1949; M.A., 1951; Ph.D., Michigan, 1956.

Margaret E. Bigelow, *Instructor in Botany,* B.A., University of British Columbia, 1950; M.A., 1952; Ph.D., Michigan, 1956.

Edward L. Davis, *Associate Professor of Botany,* B.A., Harvard, 1951; M.S., Massachusetts, 1953; Ph.D., Washington University, 1956.

Arthur C. Gentile, *Assistant Dean of the Graduate School and Professor of Botany,* B.S., City College of New York, 1948; M.S., Brown, 1951; Ph.D., Chicago, 1953.

Robert B. Livingston, *Professor of Botany,* A.B, Colorado College, 1938; M.A., Duke, 1941; Ph.D., 1947.

John R. Rowley, *Associate Professor of Botany,* A.B., California, Los Angeles, 1950; M.A., Oregon, 1953; Ph.D., Minnesota, 1957.

Rudolf M. Schuster, *Professor of Botany,* B.S., Cornell, 1945; M.S., 1946; Ph.D., Minnesota, 1948.

Otto L. Stein, *Associate Professor of Botany,* B.S., Minnesota, 1949; M.S., 1952; Ph.D., 1954.

Oswald Tippo, *Provost of the University and Professor of Botany,* B.S., Massachusetts, 1932; M.S., Harvard, 1933; Ph.D., 1937.

Robert T. Wilce, *Assistant Professor of Botany,* B.S., University of Scranton, 1950; M.S., Vermont, 1952; Ph.D., Michigan, 1957.

Candidates for the Degree of Master of Arts and for the Degree of Doctor of Philosophy are accepted for admission under the general regulations of the Graduate School. Admission to advanced courses does not imply admission to candidacy for an advanced degree. Only students whose knowledge of botany and related chemical and physical sciences is considered by the Department to be adequate will be accepted as candidates for advanced degrees. Research work leading to the thesis may be selected from the fields of anatomy, cytology, ecology, morphology, morphogenesis, physiology, and taxonomy.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Research not expected to terminate in a thesis; advanced study in special subjects.
Credit, 1-5 each semester. The Staff.

711, 712. ADVANCED PLANT PHYSIOLOGY.

Selected topics in plant physiology.
Lectures, laboratory, and individual conferences.
Prerequisites, Botany 511, 512 and one semester of Organic Chemistry.
Credit, 2-4 each semester. Mr. Gentile, Mr. Lockhart and Mr. Stern.

717. PLANT GROWTH REGULATORS.

A discussion of the more recent advances made in the field of plant growth regulators; including phytochrome, auxins, gibberellins, kinins and herbicides. The course will emphasize investigations designed to elucidate the mechanisms whereby these materials control plant growth and development. Possible experimental approaches to the problems will be considered.
Prerequisites, Botany 211, and one semester of biochemistry.
Credit, 3. Mr. Lockhart and Mr. Marsh.

721. ADVANCED PLANT ECOLOGY.
Lectures, conferences, critical reading and reports on advanced considerations of synecology and autecology.
Prerequisite, Botany 521. *Credit, 3.* Mr. Livingston and Mr. Schuster.

731. ADVANCED MYCOLOGY.
Systematics and ecology of the higher ascomycetes and basidiomycetes; problems in growth and nutrition of fungi.
Prerequisite, Botany 531.
Credit, 3. Mr. H. E. Bigelow and Mrs. M. E. Bigelow.

741. ADVANCED PHYCOLOGY.
Detailed study of marine and fresh-water algae with emphasis in phylogeny, life histories and ecology.
Prerequisite, Botany 541 or equivalent. *Credit, 3.* Mr. Wilce.

800. THESIS, MASTER'S DEGREE.

801. ADVANCED PLANT MORPHOGENESIS.
Lectures, discussions and reading on the development of the plant body.
Prerequisites, Botany 591 or 581, Botany 511 or equivalent.
Credit, 3. Mr. Shapiro and Mr. Stein.

821. FOSSIL TRACHEOPHYTES.
Detailed study of anatomy and reproductive histology of those fossil forms which best represent the phylogeny of vascular plants. *Credit, 3.* Mr. Putala.

825. PALYNOLOGY.
Development and comparative morphology of contemporary pollen grains and spores. Description and/or identification of modern and fossil pollen and spores with attendant laboratory and field techniques. Consideration is given to application of palynology in research, industry, and public health.
Credit, 3. Mr. Rowley.

850. SEMINAR. *Credit, 1 each semester. Maximum credit, 6.* The Staff.

900. THESIS, Ph.D. DEGREE.
Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

511. INTRODUCTORY PLANT PHYSIOLOGY.
Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration.
Prerequisite, 1 semester Organic Chemistry.
Credit, 4. Mr. Gentile and Mr. Stern.

512. PLANT METABOLISM.

A study of the chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants.
Prerequisite, Botany 511. *Credit, 4.* Mr. Stern.

515. PLANT GROWTH.

Internal and environmental factors influencing plant growth with emphasis on the role of hormonal regulation.
Prerequisite, Botany 511. *Credit, 3.* Mr. Lockhart.

521. PLANT ECOLOGY.

Interrelationships between plants and their environment, with special emphasis on the structure and development of plant communities.
Credit, 3. Mr. Livingston.

522. AUTECOLOGY.

Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants.
Prerequisites, Botany 511 and 521. *Credit, 3.* Mr. Livingston.

526. PLANT GEOGRAPHY.

Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America.
Prerequisite, Botany 521. *Credit, 3.* Mr. Livingston and Mr. Schuster.

531. GENERAL MYCOLOGY.

Survey of the various fungi, their life history and distribution, their significance in disease, their utilization by man. *Credit, 3.* Mr. Bigelow.

541. PHYCHOLOGY.

Designed to give insight into the phylogeny, taxonomy, morphology and ecology of the major groups of the marine and fresh water algae. To include field work in both marine and fresh water environments. *Credit, 3.* Mr. Wilce.

551. THE ARCHEGONIATES.

The morphology, evolution and systematics of bryophytes, ferns and their allies.
Credit, 3. Mr. Schuster.

581. THE ANGIOSPERMS.

The evolution and systematics of flowering plants, emphasizing families and their relationships. *Credit, 3.* Mr. Schuster.

591. PLANT ANATOMY AND HISTOLOGICAL METHODS.
Study of origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies.
Credit, 4. Mr. Putala and Mr. Shapiro.

601. MORPHOGENESIS.
Development of form and structure at the level of cellular differentiation.
Credit, 3. Mr. Davis and Mr. Shapiro.

611. DEVELOPMENTAL PLANT CYTOLOGY.
Emphasis on development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures.
Credit, 3. Mr. Rowley and Mr. Stein.

BUSINESS ADMINISTRATION

GRADUATE FACULTY

Himy B. Kirshen, *Dean of the School of Business Administration and Professor of Business Administration,* B.S., Whitman College, 1926; M.A., Columbia, 1929; Ph.D., Wisconsin, 1937.

Harry T. Allan, *Associate Professor of Business Law,* B.A., Washington & Jefferson, 1953; B.S., Massachusetts Institute of Technology, 1953; J.D., Chicago, 1956.

John W. Anderson, *Chairman of the Department of Accounting and Professor of Accounting,* B.S., Indiana, 1949; M.B.A., 1953; C.P.A., Maine, 1952; C.P.A., Massachusetts, 1959.

Pao L. Cheng, *Professor of Finance,* B.S., National Chiao-tung, China, 1944; M.A., Missouri, 1949; Ph.D., Wisconsin, 1956.

Sidney J. Claunch, *Chairman of the Department of Management and Professor of Management,* A.B., Ohio, 1949; M.B.A., Wisconsin, 1951; Ph.D., 1958.

John T. Conlon, *Assistant Dean and Associate Professor of Management,* B.B.A., Massachusetts, 1949; M.A., Connecticut, 1951; Ph.D., Michigan State, 1960.

Harold E. Hardy, *Chairman of the Department of Marketing and Professor of Marketing,* A.B., Pomona College, 1925; Ph.D., Minnesota, 1948.

Robert W. Lentilhon, *Associate Professor of Accounting,* B.S., Rhode Island, 1949; C.P.A., Massachusetts, M.B.A., Boston University.

James B. Ludtke, *Chairman of the Department of General Business and Finance and Professor of Business Finance,* B.A., State University of Iowa, 1947; M.A., 1948; Ph.D., 1951.

Walter G. O'Donnell, *Professor of Management,* LL.B., John Marshall Law School, 1930; B.A., Western Reserve, 1932; M.A., 1943; Ph.D., Columbia, 1959.

Robert L. Rivers, *Associate Professor of Transportation and Finance,* A.B., Clark University, 1943; M.S., Illinois, 1947; Ph.D., 1957.

Frank A. Singer, *Professor of Accounting,* B.S., Indiana, 1948; M.B.A., 1949; D.B.A., 1955.

George Schwartz, *Associate Professor of Marketing,* B.A., Brooklyn College, 1943; Ph.D., Pennsylvania, 1960.

Jack C. Wolf, *Associate Professor of Marketing,* B.A., Coe College, 1949; M.B.A., Wharton, 1950; Ph.D., State University of Iowa, 1957.

Stanley Young, *Professor of Management,* B.A., Washington University, 1949; M.B.A., Pennsylvania, 1951; Ph.D., 1956.

The program of graduate courses in Business Administration is designed to prepare for positions of responsibility in business, in organizations that serve business, in government, and in related fields of teaching.
The School of Business Administration is an accredited member of the American Association of Collegiate Schools of Business.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

Courses B.A. 706, B.A. 711, B.A. 722, B.A. 742, B.A. 751, B.A. 756, and B.A. 799 are required of all students who expect to receive the M.B.A. degree.

REQUIRED COURSES FOR M.S. IN ACCOUNTING

Accounting 703, Accounting 704, Accounting 705, and B.A. 756.
One elective from: Accounting 701, Accounting 702 or B.A. 711.
One elective from: Economics 601, Economics 532, Economics 604.
One elective from: B.A. 706, B.A. 751, or B.A. 799.
One course in Computer Science.
A minimum of 21 credit hours is required in "700" series courses.

M.B.A. COURSES

700. PROBLEMS IN BUSINESS ADMINISTRATION.

Independent study and research on selected problems in Business Administration. Permission of the instructor and the dean required.
Credit, 1-3 each semester. The Staff.

706. FINANCIAL MANAGEMENT.

A case approach to business problems from the point of view of the financial manager. *Credit, 3.* Mr. Cheng and Mr. Ludtke.

707. MICRO THEORY OF FINANCE.

Study of optimum financial policies and decisions of non-financial firms. Theory of competition and optimum asset management of financial firms.
Prerequisite, twelve hours in finance and economics. *Credit, 3.* Mr. Cheng.

711. ACCOUNTING IN MANAGEMENT.

The production and use of accounting and other quantitative data for decision-making related to planning and control.
Credit, 3. Mr. Lentilhon, Mr. Singer or Mr. Dennler.

716. FINANCIAL INTERMEDIARIES AND MARKETS.

Study of financial intermediaries and financial markets and the development of a theory of financial intermediation as it relates to growth, employment, and price levels. *Credit, 3.* Mr. Ludtke.

722. MARKETING MANAGEMENT.

The broad aspects of product planning and choice of channels of distribution; promotional problems; the interrelations between research, planning, execution and control of marketing activities. *Credit, 3.* Mr. Wolf.

742. ORGANIZING FOR PRODUCTION.

Situations which confront executives in charge of manufacturing operations and the direction of people at work. Designed to develop skill in analyzing production processes and to determine specific adaptations of production and personnel techniques to the requirements of differing processes. *Credit, 3.* Mr. Claunch.

751. PRINCIPLES AND POLICIES OF ADMINISTRATION.

An advanced course in the Theory of Business Administration, including the generic functions of management, organization theory, and systematic corporate decision making. *Credit, 3.* Mr. O'Donnell.

752. ADMINISTRATIVE PRACTICES.

The application of principles of management to the analysis and the solution of actual integrative cases, with practice in policy formulation and managerial decision making. *Credit, 3.* Mr. O'Donnell.

756. QUANTITATIVE METHODS IN BUSINESS ADMINISTRATION.

The application of symbolic logic, sets, probability theories (discrete) and Markov process to managerial decision-making in organization, marketing, personnel, production, transportation, finance, accounting and other functional areas.
Credit, 3. Mr. Cheng, Mr. Ludtke or Mr. Theilman.

757. QUANTITATIVE METHODS IN BUSINESS ADMINISTRATION.

The application of probability theory (discrete and continuous), stochastic process, linear, quadratic and dynamic programming, waiting lines, sequencing and computer simulation models to selected problems in management science.

Credit, 3. Mr. Cheng or Mr. Ludtke.

760. WORK STANDARDS AND JOB CLASSIFICATION.

A survey of the principles and basic requirements involved in evaluating and classifying job positions, in establishing and applying production standards, and in work simplification.

Prerequisite: Personnel Management. *Credit, 3.*

761. SEMINAR IN PERSONNEL MANAGEMENT.

The study and analysis of current practices and major problems of personnel administration through use of the case method and role playing techniques.

Prerequisite: Personnel Management. *Credit, 3*

762. MANAGEMENT OF INDUSTRIAL RELATIONS.

Organization and administration of the industrial relations function within business firms, with special emphasis on alternative approaches to management rights and responsibilities in labor relations.

Prerequisite: Management- Union Relations I. *Credit, 3.*

763. SEMINAR IN INDUSTRIAL RELATIONS.

Analysis of the major current problems encountered by business management in the negotiation and administration of labor relations agreements. A major research study is required of all students.

Prerequisite: Management- Union Relations I. *Credit, 3*

764. FINANCIAL MANAGEMENT OF UNIONS.

The organization and analysis of financial management in union activity including health and welfare funds, pension plans, budgets and financial controls.

Prerequisite: Accounting and Labor Economics. *Credit, 3.*

799. SEMINAR IN BUSINESS ADMINISTRATION.

The relationship of business and management to the environment in which they operate. *Credit, 3.* Mr. Kyler.

800. THESIS, MASTER'S DEGREE. *Credit, 9.*

M.S. IN ACCOUNTING COURSES

ACCOUNTING 701. C.P.A. PREPARATION.
A study of areas covered in the uniform C.P.A. examinations with emphasis placed upon techniques of problem solving. Designed for those persons preparing to take the C.P.A. examination. *Credit, 3.* Mr. Lentilhon.

ACCOUNTING 702. ACCOUNTING SYSTEMS.
A study of the problems involved in design, installation and operation of appropriate systems of accounts, records and reports for different types of business, and the preparation of flow charts procedures and control reports.
Credit, 3. Mr. Krzystofik.

ACCOUNTING 703. ACCOUNTING THEORY.
The study of literature with agreed and controversial criteria for collecting and reporting financial information. *Credit, 3.* Mr. Singer.

ACCOUNTING 704. CONTEMPORARY ACCOUNTING ISSUES.
Investigation and analysis of selected contemporary issues in accounting with presentation of individual findings through discussion and reports.
Credit 3. Mr. Mullins.

ACCOUNTING 705. SEMINAR IN ACCOUNTING.
Special problems of the Public Accounting profession, the history of Public Accounting, accounting organizations and publications. The course would stress written and oral communication and might include, for example, the preparation of an audit report. *Credit, 3.* The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Accounting

562. ADVANCED ACCOUNTING.
A continuation of Accounting 261, concerned with the valuation of assets and liabilities, accounting for net worth, statements of application of funds and liabilities, accounting for net worth, statements of application of funds and the analysis of financial statements. *Credit, 3.* Mr. Fitzgerald.

564. ADVANCED COST ACCOUNTING.
A continuation of the theory and practice of cost accounting with emphasis on standard, estimated, and distribution costs. *Credit, 3.* Mr. Lentilhon.

574. C.P.A. PROBLEMS.

Extensive practice in solution of problems from C.P.A. examinations. Topics covered include governmental and institutional accounting, estates, trusts, receiverships, liquidations and consolidations. *Credit, 3.* Mr. Anderson.

577. AUDITING.

The verification of accounting records dealing with audit theory and procedure. *Credit, 3.* Mr. Krzystofik.

578. ADVANCED FEDERAL TAX PROCEDURES.

Advanced phases of Federal taxation with particular attention to inventories, depreciation, and accounting methods. Study and preparation of returns for partnerships, corporations, estates and trusts; Federal estate and Federal gift taxes. Prerequisite, Accounting 273. *Credit, 3.* Mr. Anderson.

General Business and Finance

502. PROBLEMS IN BUSINESS FINANCE I.

Short- and intermediate-term financing; estimating requirements for funds and the major types of loan arrangements.
(Not open to M.B.A. candidates) *Credit, 3.* Mr. Tessier.

503. PROBLEMS IN BUSINESS FINANCE II.

Long-term financing; capital budgeting; leasing; reserves and dividend policy; pensions; company expansion; mergers and acquisitions and reorganizations.
(Not open to M.B.A. candidates) *Credit, 3.* Mr. Tessier.

520. INVESTMENTS.

The principles and techniques that are useful for the analysis and selection of investment media; investment policies of individuals and institutions.
Credit, 3. Mr. Ludtke.

521. SECURITY ANALYSIS.

An examination of the factors effecting investment values of securities and the methods used in their analysis. Students are required to select one industrial group for intensive investigation. *Credit, 3.* Mr. Ludtke.

541. TRAFFIC MANAGEMENT.

The relationships and responsibilities among carriers, regulatory authorities and users of transportation services. *Credit, 3.* Mr. Rivers.

542. PUBLIC UTILITIES.

The nature, organization and administration of regulated industries; aspects of public regulation at Federal, State, and Local levels as they affect service operaitons.
Credits, 3. Mr. Rivers.

550. ADMINISTRATIVE STATISTICS.

Probability and statistical distributions applied to business management problems; application of Bay's theorem to sampling for business decision making under uncertainty. *Credit, 3.* Mr. Cheng or Mr. Theilman.

561. BUSINESS LAW II.

The law of F.T.C. law and negotiable instruments. *Credit, 3.* Mr. Hartzler.

563. BUSINESS LAW III.

The law of agency; partnerships and corporations. *Credit, 3.* Mr. Hartzler.

Management

531. MANAGEMENT DECISION SIMULATION.

A course involving participation in the management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market positions. *Credit, 2.* Mr. Elkins.

564. WAGE AND SALARY ADMINISTRATION.

A study of the objectives, procedures and problems involved in the establishment and administration of operative and excutive compensation plans.
Credit, 3. Mr. Johnson.

565. MANAGEMENT AND UNION RELATIONS I.

A comparison of union-management objectives, functions and structures including the scope and impact of union penetration into areas of management authority.
Credit, 3. Mr. Young.

566. MANAGEMENT AND UNION RELATIONS II.

A study of the human relations problems encountered in the interpretation and administration of collective bargaining agreements.
Prerequisite, Management 565. *Credit, 3.* Mr. Young.

Marketing

576. PURCHASING.

Purchasing by industrial establishments, with emphasis on case problems in purchasing organization and practices. *Credit, 3.* Mr. Zane.

579. WHOLESALING.

The field of wholesaling, types and classes or organization including newer developments. The performance of purchasing and selling functions by wholesalers and manufacturers are considered in case problems.
Prerequisite, Marketing 253. *Credit, 3.* Mr. Seely.

580. PROBLEMS IN MARKETING.

Cases in Marketing Management; analysis, in depth, of questions concerning the interrelations of marketing functions including merchandising, distribution channels, pricing, and marketing research applied to specific companies and products. Prerequisite, Marketing 253. *Credit, 3.* Mr. Drew-Bear.

582. PROBLEMS IN RETAILING.

Case analysis and decisions covering pricing; merchandise management; buying and selling policies; store systems; personnel; accounting control and plant operation.
Prerequisite, Marketing 253. *Credit, 3.* Mr. Drew-Bear.

584. PROBLEMS IN ADVERTISING.

The applications of procedures for planning campaigns including marketing research appropriations, choice of media, scheduling, preparation of copy and layout.
Prerequisites, Marketing 253 and 273. *Credit, 3.* Mr. Hardy

CHEMICAL ENGINEERING

GRADUATE FACULTY

John W. Eldridge, *Head of Department of Chemical Engineering and Professor of Chemical Engineering,* B.S., Maine, 1942; M.S., Syracuse University, 1946; Ph.D., Minnesota, 1949.

Kenneth D. Cashin, *Professor of Chemical Engineering,* B.S., W.P.I., 1947; M.S., 1948; Ph.D., Rensselaer Polytechnic Institute, 1955.

David Chappelear, *Visiting Lecturer of Chemical Engineering,* B.E., Yale, 1953; Ph.D., Princeton, 1960.

Hans C. Duus, *Associate Professor of Chemical Engineering,* B.S., Carleton College, 1918; Ph.D., Harvard, 1925.

E. Ernest Lindsey, *Acting Dean of Engineering,* B.S., Georgia Institute of Technology, 1936; Ph.D., Yale, 1940.

Thomas J. McAvoy, *Assistant Professor of Chemical Engineering,* B.S., Brooklyn Polytechnic Institute, 1961; Ph.D., Princeton, 1964.

Robert J. Novak, *Assistant Professor of Chemical Engineering,* B.S., Washington University, 1956; Ph.D., 1965.

Leland H. S. Roblee, Jr., *Associate Professor of Chemical Engineering,* B.S., Purdue, 1949; M.S., Purdue, 1956; Ph.D., 1958.

The graduate program in Chemical Engineering is designed to emphasize advanced study in engineering fundamentals rather than specific technological applications.

To be admitted to full graduate status in this field either of the following requirements should be met:

1. Applicant must have a Bachelor's degree in Chemical Engineering from a recognized school, or

2. Applicant must show satisfactory academic training or demonstrate proficiency in these subjects as a minimum:

Mathematics: through Calculus.
Chemistry: through Organic and Physical.
Engineering Mechanics: Statics, Strength of Materials, Dynamics.
Chemical Engineering: Stoichiometry, Unit Operations, Thermodynamics (including thermodynamics of chemical change).
Electrical Engineering: Elements of Circuits and Machines.

REQUIREMENTS FOR M.S. DEGREE

1. Ch.E. 800. Thesis, maximum 10 credits.

2. At least four Ch.E. 700 series courses.

3. Additional graduate credit courses, chosen according to the student's interests from the fields of engineering, science, mathematics and the humanities, to constitute the total requirement of 30 credits for M.S. degree.

4. University-wide requirements as described on p. 26

REQUIREMENTS FOR Ph.D. DEGREE

The department imposes no additional requirements beyond those established by the University and the Graduate School as described on p. 18

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 1-3.*

701. CHEMICAL ENGINEERING THERMODYNAMICS I.
A review of the fundamental laws of thermodynamics, P-V-T relations of fluids, thermodynamic functions, fluid flow, compression and expansion of gases, liquefaction and separation of gases.
Prerequisite, Chemical Engineering 581 or equivalent.
Credit, 3. Mr. Eldridge.

702. CHEMICAL ENGINEERING THERMODYNAMICS II.

Phase equilibria and chemical reaction equilibria and their applications in chemical processing.
Prerequisites, Chemistry 586 and Chemical Engineering 582.

Credit, 3. Mr. Eldridge.

703. ADVANCED CHEMICAL ENGINEERING CALCULATIONS I.

Application of advanced mathematical techniques to chemical engineering problems with emphasis on mechanics of solution and interpretation of the results. Topics covered include: vector analysis; method of characteristics; linear transformations; matrices; orthogonal functions; least square analysis.
Prerequisite, Chemical Engineering 361 or equivalent.

Credit, 3. Mr. McAvoy.

704. ADVANCED CHEMICAL ENGINEERING CALCULATIONS II.

A continuation of course 703. In relation to chemical engineering problems the topics covered include: complex variables, Laplace and Fourier transformations, partial differential equations.
Prerequisite, Chemical Engineering 703 or equivalent.

Credit, 3. Mr. McAvoy.

705. CHEMICAL REACTOR DESIGN.

Study of the principles of chemical reaction kinetics and their application to industrial chemical processes. Systems homogeneous and heterogenous, batch and flow, catalyzed and uncatalyzed, isothermal and adiabatic are discussed.
Prerequisites, Chemistry 586, Math 186 or 541 or equivalent.

Credit, 3. Mr. Chappelear.

706. ADVANCED KINETICS AND REACTOR DESIGN.

A study of topics from the recent literature including reactions in gradients, catalysis and optimization of chemical reactors by methods of dynamic programming.
Prerequisites, Chemical Engineering 705 and Chemical Engineering 361 or equivalent. *Credit, 3.* Mr. Chappelear.

707. ADVANCED PROCESS CONTROL.

A study of the theory of closed loop control. Use of LaPlace transforms and transfer functions; stability analysis, root-locus, Bode diagrams; frequency response and time response in controller design.
Prerequisite, Chemical Engineering 376 or equivalent.

Credit, 3. Mr. Novak.

708. PROCESS DYNAMICS.

Translating process performance into mathematical form-application to control system design. Topics include fluid systems, thermal systems, mass transfer systems (distillation, drying); reaction kinetics.
Prerequisite, Chemical Engineering 707. *Credit, 3.* Mr. Novak.

709. OPTIMIZATION TECHNIQUES.

Fundamental ideas and application of optimization techniques in design and control. Topics include: extrema of functions of several variables, LaGrange multipliers, multi-stage allocation problems, (i.e., dynamic programming), functionals, calculus of variations.
Prerequisite, Chemical Engineering 361. *Credit, 3.* Mr. Novak.

711. ADVANCED CHEMICAL ENGINEERING.

Introduction to advanced work in chemical engineering which applies the transport of momentum, energy, and material. Background for fluid flow, heat transfer and mass transfer. Topics covered include: viscosity, thermal conductivity and diffusivity, momentum and energy balances, friction, turbulence, fluid friction, the motion of suspended solids in fluids, and non-Newtonian fluids.
Prerequisite, Chemical Engineering 256. *Credit, 3.* Mr. Roblee.

712. ADVANCED CHEMICAL ENGINEERING II.

A continuation of course 711. Topics covered include: thermal conductivity and mass diffusivity, energy balances, analytical solutions for steady and unsteady state energy and mass transfer, radiation and convection, interphase transfer and over-all balances. Emphasis on problem solutions.
Prerequisite, Chemical Engineering 711. *Credit, 3.* Mr. Roblee.

722. ADVANCE HEAT TRANSFER II.

This course is designed for those graduate students who wish to continue the study of heat transfer beyond that presently offered in M.E. 221. The work load is evenly divided between theory and design. Subjects covered include natural and forced convection, heating and cooling both inside and outside of tubes, condensing vapors, boiling liquids, fluidized systems, and radiation.
Prerequisite, Mechanical Engineering 578 or Chemical Engineering 678.
Credit, 3. Mr. Cashin.

731. MASS TRANSFER I.

Theories of diffusion leading to unified treatment of mass-transfer unit operations; molecular and eddy diffusion, mass-, heat-, and momentum transfer analogies, two film theory, diffusion in turbulent flow and related topics. The last third of the course deals with applications of these principles to general gas-liquid operations.
Prerequisite, Chemical Engineering 256. *Credit, 3.* Mr. Roblee.

732. MASS TRANSFER II.

A continuation of course 731. Application of principles to design factors in distillation, gas absorption, adsorption and ion exchange and liquid-liquid extraction. Other unit operations may be substituted for the above depending on the interests of the class.
Prerequisite, Chemical Engineering 731. *Credit, 3.* Mr. Cashin.

781. NUCLEAR CHEMICAL ENGINEERING.

Application of chemical engineering to the preparation of nuclear fuels: the recovery and reprocessing of reactor fuels, the preparation of moderator materials, and the disposal of radioactive wastes.
Prerequisite, Chemical Engineering 663. *Credit, 3.* Mr. Lindsey.

800. THESIS, MASTER'S DEGREE.

A theoretical or experimental study of some chemical engineering problem. Credit will be determined by the work done, and by agreement with the Department and the Graduate Thesis Committee. *Credit, 6-10.*

900. THESIS, Ph.D. DEGREE.

A theoretical or experimental study of some chemical engineering problem. Credit will be determined by the work done, and by agreement with the Department and the Graduate Thesis Committee. *Credit,* 26-30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

661. CHEMICAL ENGINEERING ANALYSIS.

Application of mathematical techniques to chemical engineering problems. The emphasis is on analysis of problems and the devising of satisfactory mathematical models. A part of the course is devoted to study of machine computation with digital and analog devices.
Prerequisites, Chemical Engineering 256 and Math 256.
Credit, 3. Mr. Roblee.

676. AUTOMATIC PROCESS CONTROL.

A study of the theoretical and practical factors governing automatic control of industrial processes. Topics include control systems, measurement devices, control modes, mathematical relationships and laboratory work.
Prerequisites, Chemical Engineering 256 and Math 256.
Credit, 3. Mr. Novak.

678. ADVANCED UNIT OPERATIONS.

A more detailed study of certain unit operations, especially heat transfer.
Prerequisite, Chemical Engineering 256. *Credit, 2.* Mr. Cashin.

663, 664. SURVEY OF NUCLEAR ENGINEERING I, II.

An introduction to the principles of nuclear physics and a survey of problems involved in the design and operation of nuclear reactors. Heat transfer, shielding, metallurgy, controls, waste disposal and health physics.
Two lectures, one laboratory period per week each semester.
Prerequisites, two semesters of physics and mathematics through integral calculus.
Credit, 3 each semester. Mr. Marcus.

667. PROCESS EQUIPMENT DESIGN.

The design of process equipment for the chemical industries: riveted pressure vessels, welded pressure vessels, piping, attachments and closures, etc.
Prerequisites, Chemical Engineering 256 and Civil Engineering 140.
Credit, 2. Mr. Lindsey.

684. PLANT DESIGN.

A study of the application of the principles of stoichiometry, unit operations, thermodynamics and cost estimation to the design of chemical plants. The economic factors influencing the design are stressed. Lecture and laboratory.
Prerequisites, Chemical Engineering 256 and Chemical Engineering 381 or equivalent. *Credit, 3.* Mr. Cashin.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Chemical Engineering)

555. UNIT OPERATIONS I.

The fundamental principles underlying the unit operations of fluid flow, heat transfer, and evaporation; the thermodynamic properties of matter.
Four class hours, one 2-hour computation period.
Prerequisites, Mathematics 184 or 185 and Chemistry 208.
Credit, 5. Mr. Cashin.

556. UNIT OPERATIONS II.

A continuation of course 555 concerning distillation, gas absorption, liquid-liquid extraction, filtration and, if time permits, size reduction and separation. Three class hours, one 3-hour computation period.
Prerequisite, Chemical Engineering 555. *Credit, 4.* Mr. Cashin.

558. ORGANIC CHEMICAL TECHNOLOGY.

Some unit processes involved in the manufacture of organic chemicals: e.g., nitration, amination, halogenation, oxidation.
Prerequisite, Chemistry 561. *Credit, 3.* Mr. Duus.

577. ELEMENTS OF UNIT OPERATION.

Primarily for engineering science students. Emphasis is on the scientific principles of the Unit Operations. Molecular and turbulent transport of heat, mass and momentum are considered in detail.
Prerequisite, Engineering Science option or permission of instructor.
Credit, 3. Mr. Roblee.

581. HEAT-ENERGY RELATIONS.

Energy relations in chemical processes, types of energy, energy balances, second law, thermodynamic functions, including: P-V-T relations of fluids, compression and expansion processes.
Prerequisite, Chemistry 586. *Credit, 3.* Mr. Duus.

582. INDUSTRIAL EQUILIBRIA.

Phase and chemical equilibria and rates of reaction in chemical processes from the industrial point of view.
Prerequisites, Chemistry 586 and Chemical Engineering 581.
Credit, 3. Mr. Duus.

588. CHEMICAL ENGINEERING LABORATORY.

A quantitative study of pilot plant size equipment illustrating some unit opertions with special emphasis on the securing of accurate data, correct operating technique, and report writing. Field trips when possible.
Prerequisite, Chemical Engineering 556. *Credit, 3.* The Staff.

CHEMISTRY

GRADUATE FACULTY

William E. McEwen, *Head of Department of Chemistry and Professor of Chemistry,* B.A., Columbia, 1944; M.A., 1945; Ph.D., 1947.

John F. Brandts, *Assistant Professor of Chemistry,* B.A., Miami, 1956; Ph.D., Minnesota, 1961.

George W. Cannon, *Professor of Chemistry,* B.A., Dakota Wesleyan University, 1939; M.A., Illinois, 1941; Ph.D., 1943.

Louis A. Carpino, *Associate Professor of Chemistry,* B.S., Iowa State College, 1950; M.S., Illinois, 1951; Ph.D., 1953.

John A. Chandler, *Assistant Professor of Chemistry,* B.S., Ohio, 1955; M.S., Illinois, 1958; Ph.D., 1959.

David J. Curran, *Assistant Professor of Chemistry,* B.A., Massachusetts, 1953; M.A., Boston College, 1958; Ph.D., Illinois, 1961.

Anthony M. Gawienowski, *Associate Professor of Chemistry,* B.A., Villanova College, 1948; M.A., Missouri, 1953; Ph.D., 1956.

John W. George, *Associate Professor of Chemistry,* A.B., Princeton, 1948; M.A., North Carolina, 1950; Ph.D., M.I.T., 1958.

I. Moyer Hunsberger, *Professor of Chemistry,* B.S., Lehigh, 1943; M.S., 1946; Ph.D., 1948.

Clifford P. Lillya, *Assistant Professor of Chemistry,* A.B., Kalamazoo College, 1959; Ph.D., Harvard, 1964.

Henry N. Little, *Professor of Chemistry,* B.S., Cornell, 1942; M.S., Wisconsin, 1946; Ph.D., 1948.

Earl J. McWhorter, *Assistant Professor of Chemistry,* B.S., Rensselaer Poly. Tech. Institute, 1950; Ph.D., Cornell, 1955.

Earl M. Mortensen, *Assistant Professor of Chemistry,* B.A., Utah, 1955; Ph.D., 1959.

John W. Olver, *Assistant Professor of Chemistry,* B.S., Rensselaer Poly. Institute, 1955; M.S., Tufts, 1956; Ph.D., Massachusetts Institute of Technology, 1961.

John L. Ragle, *Associate Professor of Chemistry,* B.S., California (Berkeley), 1954; Ph.D., State College of Washington, 1957.

Marvin D. Rausch, *Associate Professor of Chemistry,* B.S., Kansas, 1952; Ph.D., 1955.

John E. Roberts, *Professor of Chemistry,* B.S., New Hampshire, 1942; M.S., 1944; Ph.D., Cornell, 1947.

Trevor Robinson, *Associate Professor of Chemistry,* A.B., Harvard, 1950; A.M., 1951; M.S., Massachusetts, 1953; Ph.D., Cornell, 1956.

Robert L. Rowell, *Assistant Professor of Chemistry,* B.S., State Teachers College at Bridgewater, Mass., 1954; M.S., Boston College, 1956; Ph.D., Indiana, 1960.

J. Harold Smith, *Professor of Chemistry,* B.S., Utah, 1936; M.S., 1938; Ph.D., Wisconsin, 1941.

Richard S. Stein, *Professor of Chemistry,* B.S., Brooklyn Polytechnic, 1945; M.S., Princeton, 1948; Ph.D., 1949.

Thomas R. Stengle, *Assistant Professor of Chemistry,* B.S., Franklin & Marshall College, 1951; M.S., Michigan, 1953; Ph.D., 1961.

Howard D. Stidham, *Assistant Professor of Chemistry,* B.S., Trinity College, 1950; Ph.D., Massachusetts Institute of Technology, 1955.

Robert M. Williams, *Assistant Professor of Chemistry,* B.A., Dartmouth, 1951; M.S., New Hampshire, 1953; Ph.D., Iowa State, 1958.

Oliver T. Zajicek, *Assistant Professor of Chemistry,* B.S., Baldwin-Wallace, 1950; M.S., Wayne State University, 1958; Ph.D., 1961.

The Department of Chemistry provides facilities for students intending to complete the requirements for the Master's degree and the Doctor's degree. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those who have not fulfilled these requirements may be admitted as special students until the deficiencies have been removed.

First year graduate students will take placement examinations during the first week of residence. These examinations are for the purpose of evaluating the background of the student, and to assist in the selection of a course of study. Students are admitted to candidacy for a degree only after the completion of qualifying requirements. A research problem is carried out in one of the following fields of chemistry: physical, organic, inorganic, analytical, and bio-chemical.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

701. ADVANCED ANALYTICAL CHEMISTRY.

Laboratory consisting of special work to meet the needs of the individual students. Prerequisite, Chemistry 513 or equivalent.

Credit, 1-5. Mr. Roberts, Mr. Olver and Mr. Curran.

703. INTRODUCTION TO MICRO-CHEMISTRY.

Laboratory.—The applications of micro technique to synthesis, analysis, and characterization; the microscopic work may include the optics of the microscope, micrometry, the microscopic study of fibers, crystals, and physiochemical phenomena and an introduction to microscopical qualitative analysis; the quantitative work may include the determination of carbon, hydrogen, nitrogen, and halogens in organic materials and selected inorganic determinations.
Prerequisite, Chemistry 513 or equivalent. *Credit, 3-5.* Mr. Roberts.

710. ELECTROANALYTICAL CHEMISTRY.

Principles of electrochemistry and their relation to the newer electroanalytical methods.
Prerequisite, Chemistry 513 or equivalent; corequisite, Chemistry 701 or permission of instructor. *Credit, 3.* Mr. Curran and Mr. Oliver.

724. SPECIAL TOPICS IN BIOCHEMISTRY.

One to three topics of current interest, which may include hormones, enzymes, and plant biochemistry. A maximum of six credits may be taken.
Prerequisite, Chemistry 524. *Credit, 3-6.* Biochemistry Staff.

725. ADVANCED BIOCHEMICAL TECHNIQUES.

A laboratory course to provide experience in the isolation, identification, and analysis of biochemical compounds.
Prerequisite, Chemistry 524. *Credit 2.5.* Biochemistry Staff.

726. EXPERIMENTAL ENZYMOLOGY.

A course designed to give experience in the preparation and assay of enzymes.
Prerequisite, Chemistry 524. *Credit, 2.* Mr. Robinson.

727. BIOCOLLOIDS.

The fundamental principles of colloidal behavior and some applications to industry, agriculture, and biology.
Prerequisite, Chemistry 562 or equivalent. *Credit, 3.* Biochemistry Staff.

728. BIOCHEMISTRY OF PROTEINS.

A discussion of the chemical, physical and biological properties of proteins.
Prerequisites, Chemistry 524 and 586. *Credit, 3.* Mr. Little.

741. INORGANIC PREPARATIONS.

Laboratory.—The preparation and testing of various types of inorganic substances, to teach important techniques and give familiarity with the reactions and properties of inorganic materials. *Credit, 3-5.* Inorganic Staff.

742. INORGANIC CHEMISTRY OF THE LESS FAMILIAR ELEMENTS.

Lectures and collateral reading on the descriptive chemistry of some of the less familiar elements such as boron, gallium, indium, thallium, the lanthanides, fluorine, titanium, vanadium, tantalum, tungsten, and uranium, with correlations between structure or spatial configurations and chemical properties.
Credit, 3. Mr. Roberts.

756. TOPICS IN INORGANIC CHEMISTRY.

Topics such as coordination chemistry, non-aquenous solvents, less familiar oxidation states, acid base theories, reaction mechanisms, etc. will be offered.
Prerequisite, Chemistry 546 or equivalent.
Credit, 2 each semester. Maximum Credit 6. The Staff.

760, 761. THEORETICAL ORGANIC CHEMISTRY.

Lectures on special topics such as stereochemistry, bond formation, resonance, ionic reactions, free radical reactions, transition state theory, reaction mechanisms, molecular rearrangements, etc.
Prerequisite, Chemistry 571 or permission of instructor.
Credit, 3 each semester. The Staff.

765. ADVANCED ORGANIC CHEMISTRY.

Laboratory.—More difficult synthesis of organic compounds, frequently those desired as starting materials for research, will be assigned to the individual student. Their preparation will require the use of the original literature.
Prerequisite, a year course in Organic Chemistry. *Credit, 3-5.* The Staff.

770. HETEROCYCLIC CHEMISTRY.

The chemistry of the common organic heterocyclic compounds containing nitrogen, oxygen, and sulfur. Consideration of mechanisms of the reactions discussed.
Prerequisite, Chemistry 571 or equivalent. *Credit, 3.* The Staff.

771. ORGANOMETALLIC CHEMISTRY.

The chemistry of compounds containing carbon-metal and carbon-metalloid bonds. Preparation, structure, physical properties, chemical reactions, and synthetic applications of organometallic derivatives. Topics of current interest will be stressed.
Prerequisite, Chemistry 571 or equivalent. *Credit, 3.* Mr. Rausch.

772. CHEMISTRY OF NATURAL PRODUCTS.

Natural products of current interest, primarily from the steroid, terpene, and alkaloid groups, with emphasis on structural proofs, stereochemistry, synthesis, and biogenetic relationships.
Prerequisite, Chemistry 571 or permission of instructor. *Credit, 3.* The Staff.

775. SPECIAL TOPICS IN ORGANIC CHEMISTRY.

One to three topics of current interest will be discussed in detail. Recent development of theoretical and/or synthetic importance to organic chemistry will be covered. A maximum of six credits may be taken.
Prerequisite, Chemistry 571 or permission of instructors.
Three class hours. *Credit, 3.* The Staff.

776. ORGANIC CHEMISTRY.

An intensive survey of certain reactions of organic chemistry with emphasis on their scope and limitations, recent developments, and mechanisms.
Prerequisite, Chemistry 571. *Credit, 3.* The Staff.

783. PHYSICAL CHEMICAL MEASUREMENTS.

Laboratory.—Experiments selected from standard texts and from the literature in Physical Chemistry to meet the needs and background of the individual student.
Prerequisite, Chemistry 586 or equivalent. *Credit, 3-5.* The Staff.

785. CHEMICAL THERMODYNAMICS.

Introduction to Statistical Thermodynamics. Applications of Microcanonical, Canonical, Grand Canonical and Generalized Ensembles to chemical systems. Calculation of thermodynamic functions from spectroscopic data, fluctuations, imperfect gases, nearest neighbor lattice statistics and other special topics of current interest.

Prerequisite, Chemistry 595 or equivalent. *Credit, 3.* Mr. Stidham.

787. CHEMICAL SPECTROSCOPY, TECHNIQUE AND APPLICATIONS.

Contains an introduction to the elementary theory, experimental techniques and interpretation of data obtained in applications of infrared, Raman, visible, ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy to the solution of chemical problems.

Prerequisite, Chemistry 586 or equivalent.

Credit, 3. Mr. Stengle and Mr. Stidham.

788. CHEMICAL SPECTROSCOPY.—THEORY.

Contains an introduction to the theory of infrared, Raman, visible and ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy.

Prerequisites, Chemistry 787 and permission of the instructors.

Credit, 3. Mr. Stidham and Mr. Stengle.

790. TECHNIQUES OF POLYMER CHARACTERIZATION.

A study of experimental techniques for characterization of isolated polymer molecules and polymeric solids, including x-ray diffraction, birefringence, infrared dichroism, NMR, dynamic and static mechanical studies, microscopy, light scattering, solution techniques.

Prerequisites, Chemistry 586, and Chemistry 798 and 799 (may be taken concurrently).

One lecture per week. *Credit, 1.* Mr. Stein and guest lecturers.

791, 792. QUANTUM CHEMISTRY.

Quantum mechanics and its application to chemical problems. A discussion of the exact theory of structure of simple atoms, the application of approximate methods for complex atoms and molecules, the chemical bond, resonance, the interaction of radiation and matter, group theory.

Prerequisite, Chemistry 546 or equivalent.

Credit, 3 each semester. Mr. Stein, Mr. Stengle and Mr. Stidham.

795. TOPICS IN PHYSICAL CHEMISTRY.

Prerequisites, Chemistry 595 and 546 or equivalent.

Credit, 2 each semester. Maximum Credit, 6. The Staff.

797. ORGANIC POLYMERIZATION REACTIONS.

A study of mechanisms, kinetics, and thermodynamics of principal types of polymerization reactions and relationship to the properties or resulting polymers. Prerequisites, Chemistry 166, 586. *Credit, 3.* Guest Lecturer.

798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Structure of solid polymers, determination of molecular weights, sizes and shapes, mechanical properties of solid polymers, colligative properties of polymer solutions, polyelectrolytes, and physical chemistry of proteins.
Prerequisite, Chemistry 785 or equivalent. *Credit, 3 each semester.* Mr. Stein.

891. SEMINAR.

Conferences, reports or lectures.
Credit, 1 each semester. Maximum credit, 2. Mr. Olver and Mr. Williams.

895. RESEARCH PROBLEM.

The student will prepare two proposals for research problems not directly related to his thesis topic if the latter has been selected. The problems will involve primarily library research. Required of all candidates for the Ph.D. in Chemistry and must be completed before the candidate's preliminary examination for the degree.
Credit, 4. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

513. INSTRUMENTAL ANALYSIS.

The theory and techniques of special methods of analysis such as colorimetry, potentiometry, microscopy, ion exchange, electro-deposition and other recently developed methods of analysis.
Two class hours, one 4-hour laboratory period.
Prerequisites, Chemistry 210 and 586.
Credit, 3. Mr. Roberts, Mr. Olver, and Mr. Curran.

515. THEORY OF ANALYTICAL PROCESSES.

A detailed consideration of analytical topics having general applicability in chemical investigations. Among the areas included are chemical equilibrium, precipitate formation, chelating agents, multistage separation, and quantitative methods for organic functional groups. Additional topics may be selected from the current

literature. A one credit-hour laboratory will be available on an individual and optional basis.
Pre- or co-requisites, Chemistry 166 and 586.
Three class hours. *Credit, 3.*
One afternoon laboratory period (optional). *Credit, 1*
Mr. Roberts, Mr. Olver, and Mr. Curran.

519. ELECTRONICS INSTRUMENTATION FOR SCIENTISTS.

Laboratory oriented course designed for scientists which begins with electronic principles and leads through servo-systems, operational amplifiers, digital circuits, and other measurement devices.
Prerequisites, one year of physics and permission of instructor.
One class hour, one 4-hour laboratory period. *Credit, 3.* Mr. Curran.

523, 524. GENERAL BIOCHEMISTRY.

A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field.
Three class hours, one 3-hour laboratory period.
Prerequisites, Chemistry 166 or equivalent.
Credit, 4 each semester. Biochemistry Staff.

544. RADIOCHEMISTRY.

The character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radionuclides.
Two class hours, one 3-hour laboratory period.
Prerequisite, Chemistry 210 or 127 or permission of instructor.
Credit, 3. Mr. Richason.

546. THEORETICAL INORGANIC CHEMISTRY.

A survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aquenous systems, and reaction mechanisms.
Prerequisite, Chemistry 585. *Credit, 3.* Mr. George and Mr. Smith.

547. INORGANIC CHEMISTRY OF THE COMMON ELEMENTS.

A systematic consideration of the chemistry of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices.
Three class hours (6 lab hours optional).
Prerequisite, Chemistry 546 or permission of the instructor.
Credit, 3 (5). Mr. Zajicek and Mr. Chandler.

571. ORGANIC CHEMISTRY.
An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments.
Three class hours.
Prerequisites, one year of Organic Chemistry and permission of instructor.
Credit, 3. The Staff.

572. QUALITATIVE ORGANIC CHEMISTRY.
Identification of unknowns, both single and mixtures of organic compounds, by physical properties, reactions and preparation of derivatives.
Two class hours, two 3-hour laboratory periods.
Prerequisites, one year of Organic Chemistry and permission of instructor.
Credit, 4. The Staff.

585. CHEMICAL LITERATURE.
Intended to give facility in the location of information of a chemical nature.
One class hour.
Prerequisites, Chemistry 166 and 586 and a reading knowledge of German or permission of instructor. *Credit, 1.* Mr. Oberlander.

590. ADVANCED PHYSICAL CHEMISTRY.
A survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas.
Prerequisite, Chemistry 586. *Credit, 3.* The Staff.

595. ADVANCED PHYSICAL CHEMISTRY.
Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids.
Three class hours.
Prerequisite, Chemistry 586. *Credit, 3.* Mr. Stengle and Mr. Stidham

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Chemistry)

520. ELEMENTARY BIOCHEMISTRY.
The more important facts relating to biological materials and processes. Designed primarily for students not eligible for courses 523 or 524.
Not open to chemistry majors.
Three class hours, one 3-hour laboratory period. *Credit, 4.* Mr. Robinson.

561, 562. ORGANIC CHEMISTRY.
Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity.
Prerequisite, Chemistry 112. *Credit, 3 each semester.* Organic Staff.

563, 564. ORGANIC CHEMISTRY. LABORATORY.

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds.
One 3-hour laboratory period.
Prerequisites, concurrent enrollment in Chemistry 561 and 562.
Credit, 1 each semester. Organic Staff.

581. ELEMENTARY PHYSICAL CHEMISTRY.

A study of the basic principles of physical chemistry designed for students with a limited mathematical background. Not open to chemistry majors.
Prerequisites, Chemistry 112; Physics 104; Mathematics 124.
Three class hours. *Credit, 3.* Physical Staff.

582. ELEMENTARY PHYSICAL CHEMISTRY.

A continuation of Chemistry 581.
Two class hours, one 3-hour laboratory period. *Credit, 3.* Physical Staff.

585, 586. PHYSICAL CHEMISTRY.

A study of the fundamental theories and laws of physical chemistry.
Prerequisites, Mathematics 174 and Physics 104.
Corequisite, Chemistry 210. *Credit, 3 each semester.* Physical Staff.

587, 588. PHYSICAL CHEMISTRY LABORATORY.

Experience in modern physicochemical techniques.
Concurrent enrollment in Chemistry 585, 586 required.
Credit, 2 each semester. Mr. Stengle and Physical Staff.

CIVIL ENGINEERING

GRADUATE FACULTY

Merit P. White, *Head of Department and Professor of Civil Engineering,* A.B., Dartmouth, 1930; C.E., 1931; M.S.C.E., California Institute of Technology, 1932; Ph.D., 1935.

William W. Boyer, *Associate Professor of Civil Engineering,* B.S.C.E., North Carolina State, 1947; M.S.C.E., 1950.

Charles E. Carver, Jr., *Professor of Civil Engineering,* B.S.C.E., Vermont, 1947; M.S.C.E., Massachusetts Institute of Technology, 1949; Sc.D., 1955.

Alexander Chajes, *Assistant Professor of Civil Engineering,* B.S.C.E., Cooper Union, 1952; M.S.C.E., Polytechnical Institute, 1955; Ph.D., Cornell, 1964.

Tsuan H. Feng, *Professor of Civil Engineering, B.S.C.E.,* Pei-yang University, China, 1940; M.S.C.E., Wisconsin, 1946; Ph.D., 1950.

Denton B. Harris, *Assistant Professor of Civil Engineering,* B.S.C.E., Massachusetts, 1952; M.S.C.E., 1953.

Karl N. Hendrickson, *Professor of Civil Engineering,* B.S.G.E., Maine, 1938; B.S.C.E., 1939; M.S.C.E., 1941.

George R. Higgins, *Associate Professor of Civil Engineering,* B.S.C.E., New Hampshire, 1948; M.S., Massachusetts Institute of Technology, 1951.

Melton M. Miller, Jr., *Assistant Professor of Civil Engineering,* B.S.C.E., Vermont, 1955; M.S.C.E., Purdue, 1958; Ph.D., 1964.

Elmer C. Osgood, *Professor of Civil Engineering,* B.S.C.E., Rennsselaer Polytechnic Institute, 1928; D.Eng., 1931.

Fred D. Stockton, *Associate Professor of Civil Engineering,* B.S.C.E., Alabama, 1942; M.S., Brown, 1949; Ph.D., 1953.

The Department offers both the Ph.D. and the M.S. degree. For the Ph.D. degree no additional requirements are imposed by the Department other than the general requirements established by the Graduate School of the University. For the M.S. degree, in addition to the general University requirements for admission to the Graduate School, each candidate in Civil Engineering must indicate his major field of interest (fluid mechanics, soil mechanics, structures, transportation engineering, sanitary engineering, etc.).

Three options are offered in the department: *(1) Mechanics and Structures, (2) Transportation Engineering, (3) Sanitary Engineering.* Students must satisfy one of the following core curricula:

CORE CURRICULUM FOR MECHANICS AND STRUCTURES OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Strength of Materials II—C.E. 540.
3. Introduction to Hydrodynamics—C.E. 556.
4. Dynamics of Machinery—M.E. 585.
5. Advanced Engineering Mathematics—Math 585
6. Thesis.

CORE CURRICULUM FOR TRANSPORTATION ENGINEERING OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Open Channel Flow—C.E. 561.
3. Theoretical Soil Mechanics—C.E. 720.
4. Principles of Engineering Statistics—I.E. 572.
5. Municipal Government—Govt. 519.
6. Thesis.

CORE CURRICULUM FOR SANITARY ENGINEERING OPTION

1. Seminar—one hour, no credit, each semester of residence.
2. Hydraulic Engineering—C.E. 562.
3. General Applied Bacteriology—Public Health 581.
4. Principles of Engineering Statistics—I.E. 572.
5. Municipal Administration—Govt. 575.
6. Water and Waste Water Analysis—C.E. 572.
7. Thesis.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS. *Credit, 3-6.* The Staff.

710. TRANSPORTATION ANALYSIS AND PLANNING.

The analysis of traffic and transportation engineering problems in highways, railroads and airports and the planning related to those facilities.
Prerequisite, Civil Engineering 511. *Credit, 3.* Mr. Boyer.

720. THEORETICAL SOIL MECHANICS.

The phenomena in soil masses subjected to such forces as seepage, frost and imposed loads. *Credit, 3.* Mr. Hendrickson.

721. APPLIED SOIL MECHANICS.

The solution of case problems applying the principles of soil mechanics to the design of embankments, retaining walls, footings, raft foundations, and pile structures.
Prerequisite, Civil Engineering 720. *Credit, 3.* Mr. Hendrickson.

722. SEEPAGE ANALYSIS.

An analytical study of groundwater and seepage problems related to earth structures.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Hendrickson.

723. SHEAR STRENGTH OF CLAY.

A survey of current theory and research into the strength characteristics of clay. *Credit, 3.* Mr. Bemben.

730. ADVANCED STRUCTURAL THEORY.

Plastic analysis and design of steel frames.
Prerequisites, Civil Engineering 331 and 532. *Credit, 3.* Mr. Osgood.

731. SPECIAL STRUCTURES.

The analysis and design of two-hinged and hingeless arches and of folded plate and shell roofs.
Prerequisites, Civil Engineering 331, 532 and 333. *Credit, 3.* Mr. Osgood.

733. ADVANCED TOPICS IN CONCRETE.

Prestressed concrete theory. Methods of analysis applicable to various types of reinforced concrete building frames; elastic theory and ultimate strength procedures. Consideration of beam and girder, flat slab, slab-band, flat plate, lift slab, and rigid frame construction. Design of columns subject to bending and direct stress. *Credit, 3.* Mr.. Osgood.

734. NUMERICAL METHODS IN STRUCTURAL MECHANICS.

The application of numerical methods to the solutions of problems of structural mechanics. The method of finite differences as well as Holtzer's method, Vianello-Stodola method and other appropriate methods are presented.
Prerequisites, Mathematics 585 (Concurrently), Computer Science 151 or permission of instructor. *Credit, 3.* Mr. Miller, Mr. Stockton.

735. MATRIX ANALYSIS OF STRUCTURES.

The application of matrices in the solution of linear structural problems. The use of influence coefficients and energy theorems in the matrix formulation and solution of statically determinate and indeterminate structures.
Prerequisite, Civil Engineering 232. *Credit, 3.* Mr. Chajes.

741. STRUCTURAL DYNAMICS.

The behavior of linear and non-linear mechanical systems subjected to periodic forces, to non-periodic forces and to shock loads.
Prerequisites, Civil Engineering 141 and 242. *Credit, 3.* Mr. White.

742. EXPERIMENTAL STRESS ANALYSIS.

Experimental procedures for determination of stresses and strains due to static and dynamic loads.
Prerequisite, Civil Engineering 142. *Credit, 3.* Mr. Harris.

743. ELASTICITY.

General equations of the mathematical theory of elasticity in space. Plane strain and plane stress in cartesian, polar and general orthogonal co-ordinates.
Credit, 3. Mr. Dzialo.

744. THEORY OF PLATES.

A presentation of the classical theory of plates as well as modern developments. Relationship of the general theory of elasticity to plate theory.
Credit, 3. Mr. Miller.

745. STRUCTURAL STABILITY.

A study of the elastic stability of engineering structures. Bending of bars, buckling of thin plates and shells; dynamic stability of bars and plates.
Credit, 3. Mr. Dzialo and Mr. Chajes.

757. ADVANCED FLUID MECHANICS.

Hydraulic similitude, dimensional analysis, methods of obtaining dynamic similarity in hydraulic models in actual practice, analysis of typical hydraulic models.
Prerequisite, Civil Engineering 275. *Credit, 3.* Mr. Carver and Mr. Higgins.

770. ADVANCED SANITARY ENGINEERING.

Hydraulic and chemical problems encountered in the design and operation of water and sewage works, stream sanitation and the latest trends of practice and research in sanitary engineering.
Prerequisites, Civil Engineering 260 and 270. *Credit, 3.* Mr. Feng.

771. UNIT PROCESSES OF SANITARY ENGINEERING.

Principles and application of the following biological and chemical processes, commonly termed as unit processes in water and wastewater treatment: aerobic and anaerobic biological oxidation, photosynthesis, composting, chemical precipitation, coagulation, electrodialysis, disinfection, and dry and wet combustion.
Prerequisite: C.E. 270 or C.E. 186. *Credit, 3.* Mr. Feng.

772. UNIT OPERATIONS OF SANITARY ENGINEERING.

Principles and application of the following physical processes, commonly termed as unit operations in water and wastewater treatment: sedimentation and flotation, flow through filters, gas transfer, adsorption and leaching, and evaporation and drying.
Prerequisite, C.E. 270 or 573. *Credit, 3.* Mr. Feng.

780. FUNDAMENTAL MECHANICS OF MATERIALS.

Mechanical and physical properties of materials related to crystal structure and symmetry. *Credit, 3.* Mr. Harris.

800. THESIS, MASTER'S DEGREE.
Required of all candidates. *Credit, 6.*

900. THESIS, Ph.D. DEGREE.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

505. SURVEYING III.

Elements of astronomical, geodetic and photogrammetric surveying, co-ordinate systems and map projections.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 102. *Credit, 3.* Mr. Boyer.

511. ADVANCED TRANSPORTATION ENGINEERING.

Analysis of the engineering aspects of traffic problems such as traffic signal design, street capacities, parking and channelization.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 210. *Credit, 3.* Mr. Boyer.

522. SOIL TESTING.

Sampling and testing of soils for engineering purposes.
One class hour, two 3-hour laboratory periods.
Prerequisite, Civil Engineering 220 or equivalent. *Credit, 3.* Mr. Hendrickson.

532. THEORY OF STRUCTURES II.

The analysis of statically indeterminate structures by several appropriate methods.
Two class hours, one 3-hour laboratory period.
Prerequisite, Civil Engineering 230. *Credit, 3.* Mr. Osgood.

534. THEORY OF STRUCTURES III.

The analysis and design of complex or special structures in metal, concrete or wood.
Prerequisites, Civil Engineering 331, 532, 333 concurrently.
Credit, 3. Mr. Osgood.

540. STRENGTH OF MATERIALS II.

Determination of stresses and stains in elements of machines and structures.
Prerequisite, Civil Engineering 242. *Credit, 3.* Mr. White.

541. DYNAMICS II.

A continuation of the first course in dynamics, using vector methods. Dynamics of a system of particles, kinematics and kinetics of a rigid body in space, top motion, simple gyroscopes.
Prerequisite, Civil Engineering 141. *Credit, 3.* The Staff.

556. INTRODUCTION TO HYDRODYNAMICS.

A mathematical treatment of the basic theorems of classical hydrodynamics—potential flow, conformal mapping, wave and vortex motion.
Prerequisite, Mathematics 186. *Credit, 3.* Mr. Carver.

550. FLUID MECHANICS OF THE OCEANS.

An introduction to physical oceanography covering tides and waves, characteristics of sea water, advective and convective processes in the ocean and atmosphere, oceanographic measurements, planetary models of the oceans.
Prerequisites, Physics 105 or equivalent and Mathematics 186.
Credit, 3. Mr. Carver and Mr. Higgins.

560. HYDROLOGY.

A study of the hydrologic cycle including precipitation, runoff, groundwater, hydrographs, flood routing, sedimentation, frequency analysis, and application of hydrologic techniques to water resources engineering.
Prerequisites, Civil Engineering 257 or permission of Instructor.
Credit, 3. Mr. Higgins.

561. OPEN CHANNEL FLOW.

A study of steady flow in open channels including backwater curves in natural and artificial channels, hydraulic jump, channel bends and transitions, sediment transport, surges and waves, breakwaters and hydraulic structures.
Prerequisite, Civil Engineering 257. *Credit, 3.* Mr. Higgins.

562. HYDRAULIC ENGINEERING.

The analysis and design of hydraulic structures such as storage reservoirs, spillways, dams, levees, shore protection and channel works.
Prerequisite, Civil Engineering 257. *Credit, 3.* Mr. Higgins.

572. WATER AND WASTE WATER ANALYSIS.

Analysis of water relative to its quality for various domestic and industrial uses and analysis of waste water relative to its potentiality of pollution.
Two class hours, one 3-hour laboratory period.
Prerequisites, Chemistry 112, Civil Engineering 270. *Credit, 3.* Mr. Feng.

573. SANITARY ENGINEERING III.

The hydraulics and chemistry of water and sewage treatment; layout and design of water and sewage treatment plants.
Prerequisites, Civil Engineering 260 and 270. *Credit, 3.* Mr. Feng.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Civil Engineering)

520. SOIL MECHANICS.

Properties of soil and its behavior as an engineering material. Principles of classification, permeability, shear strength and compressibility and applications to simple field problems.
Two class hours, one 3-hour laboratory period.
Prerequisite, Geology 280. *Credit, 3.* Mr. Hendrickson.

571. PRINCIPLES OF SANITARY ENGINEERING.

For students in the Department of Public Health. Covers phases of Civil Engineering 260 and 270 with consideration of the non-engineering background of the student. *Credit, 3.* Mr. Feng.

COMPUTER SCIENCE

GRADUATE FACULTY

John A. N. Lee, *Head of Program and Associate Professor of Computer Science,* B.S., University of Nottingham, 1955; Ph.D., 1958.

Caxton C. Foster, *Director of the Research Computing Center and Associate Professor of Computer Science,* B.S., Massachusetts Institute of Technology, 1950; M.S., Michigan, 1957; Ph.D. 1965.

Earl M. Mortensen, *Assistant Professor of Chemistry,* B.A., Utah, 1955; Ph.D., 1959.
Jerome L. Myers, *Associate Professor of Psychology,* B.A., Syracuse, 1953; M.A., Wisconsin, 1955; Ph.D., 1957.

Gail B. Oakland, *Professor of Statistics,* B.A., University of Saskatchewan, 1933; M.A., Minnesota, 1939; Ph.D., University of Aberdeen, Scotland, 1956.

Peter Park, *Assistant Professor of Sociology,* B.A., Columbia College, 1953; M.A., Yale, 1955; Ph.D., 1958.

G. Dale Sheckels, *Head of Department of Electrical Engineering and Professor of Electrical Engineering,* B.S., Washington, 1938; M.S., Massachusetts Institute of Technology, 1940; Ph.D., Iowa State, 1955.

Fred D. Stockton, *Assistant Professor of Civil Engineering,* B.S., Alabama, 1942; M.S., Brown, 1949; Ph.D., 1953.

Wayman L. Strother, *Head of the Department of Mathematics and Professor of Mathematics,* B.S., Alabama State, 1943; M.S., University of Chicago, 1949; Ph.D., Tulane, 1951.

Joe W. Swanson, *Associate Professor of Philosophy,* B.A., Southern Methodist University, 1948; M.A., 1954; M.A., Harvard 1955; Ph.D. 1959.

Candidates must complete 32 graduate credits of which no more than six may be transferred from another institution. Of this total, at least six must be in 500 series courses and six in a thesis.

Candidates will be individually advised by members of the Inter-departmental Committee.

Graduates will be prepared for computer applications work by a program which, while offering Computer Science courses in the four fields of numerical analysis, statistics, logic and mechanical languages, will also require the student to advance his knowledge of his own major or relevant subject.

Candidates for the degree will devote six credits to a thesis, twelve credits to Computer Science courses and twelve credits to electives in fields, such as Engineering, Statistics or Logic. A two-credit seminar in Computer Science is required in the second semester. All candidates will be required to submit themselves to a comprehensive examination.

First Semester

CS 425.	TOOLS OF RESEARCH COMPUTER LANGUAGE	*Credit, 0*
CS 531.	INTRODUCTION TO DATA PROCESSING	" *3*
CS 551.	CALCULUS OF FINITE DIFFERENCES	" *3*
CS 570.	BOOLEAN ALGEBRA AND SWITCHING THEORY	" *3*
CS 700.	SPECIAL PROBLEMS	" *1-3*
CS 753.	SUBROUTINES AND PROCEDURES	" *3*
CS 790.	SEMINAR	" *2*

Second Semester

CS 425.	TOOLS OF RESEARCH COMPUTER LANGUAGE	" *0*
CS 531.	INTRODUCTION TO DATA PROCESSING	" *3*
CS 552.	TOPICS IN NUMERICAL METHODS	" *3*
CS 700.	SPECIAL PROBLEMS	" *1-3*
CS 710.	MECHANICAL LANGUAGES	" *3*
CS 790.	SEMINAR	" *2*

COURSES OPEN TO GRADUATE STUDENTS ONLY

425. TOOLS OF RESEARCH COMPUTER LANGUAGE.

A basic course in ASA standard FORTRAN in depth for post graduate students who will subsequently write the Tools of Research Examination Computer Language.
No prerequisite. *Credit, 0.* The Staff.

700. SPECIAL PROBLEMS.

A study of recent advances and current problems in a specialized field of computer science.
Prerequisite, consent of the instructor. *Credit, 1-3.* The Staff.

710. MECHANICAL LANGUAGES.

The technique of language definitions, translation with particular reference to symbolic assemblers and algebraic compilers.
Prerequisites, CS 570. *Credit, 3.* The Staff.

753. SUBROUTINE AND PROCEDURES.

The techniques of performing arithmetic functions by subroutines. Special emphasis or anticipation systems and speed-up techniques.
Prerequisite, CS 551 and 552. *Credit, 3.* The Staff.

790. SEMINAR. *Credit, 2.* The Staff.

800. MASTER'S THESIS. *Credit, 6*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

531. INTRODUCTION TO DATA PROCESSING.

An elementary course in the design of digital computers and the languages used therein. History of computers and number representation, storage devices, arithmetic units, input, output, simple switchery circuits, computer languages.
Credit, 3. J. A. N. Lee.

551. CALCULUS OF FINITE DIFFERENCES.

An introduction to difference tables and finite differences leading to the procedures of interpolation and extrapolation theory tablet techniques and to the solution of differential equations.
Prerequisite, CS 221, CS 231, or equivalent and Calculus.
Credit, 3. J. A. N. Lee.

552. TOPICS IN NUMERICAL METHODS.

A computer oriented course in numerical analysis including linear algebra, solution of simultaneous equations, homogerous equations, eigervalues, solution of differential equations, solution of algebraic and transandental equations and functional representations.
Prerequisite, Philosophy 575. *Credit, 3.* The Staff.

570. BOOLEAN ALGEBRA AND SWITCHING THEORY.

An introduction to Boolean algebra, its application to switches, relays, and combinatorial circuits. Boolean rings, conical forms and related theorems. Dynamic systems.
Prerequisite, Philosophy 575. *Credit, 3.* The Staff.

ECONOMICS

GRADUATE FACULTY

Bruce R. Morris, *Acting Head of Department of Economics and Professor of Economics,* A.B., Western Reserve University, 1931; M.A., Ohio State, 1932; Ph.D., Illinois, 1937.

John L. Blackman, Jr., *Associate Professor of Economics,* B.A., Haverford College, 1930; A.M., Harvard, 1948; Ph.D., Harvard, 1957.

Philip L. Gamble, *Professor of Economics,* B.S., Wesleyan College, 1928; M.A., 1929; Ph.D., Cornell, 1935.

Marshall C. Howard, *Professor of Economics,* A.B., Princeton, 1941; Ph.D., Cornell, 1951.

Sidney Schoeffler, *Professor of Economics,* B.S., New York University, 1945; A.M., Pennsylvania, 1946; Ph.D., New School for Soc. Res., 1952.

Kenneth P. Wickman, *Assistant Professor of Economics,* B.A., Massachusetts, 1952; M.A., Michigan, 1955; Ph.D., Syracuse, 1962.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

Candidates for admission should have been in the upper half of their graduating class, should have at least one year of elementary study in Economics and an additional year and one-half of study (total 15 credits) in Economics, related fields, or equivalent experience, and shall submit Graduate Record Examination scores. Prerequisites shall have been fulfilled within the prior five years, unless waived by the Department. Students are required to give proof of proficiency in English before beginning course work. Deficiencies in the above requirements may be waived but must be removed during the first year after admission.

700. SPECIAL STUDIES IN ECONOMICS.

Credit, 2-9 each semester. The Staff.

701, 702. MICRO-ECONOMIC THEORY.

A systematic development of the theory of the consumer, the firm, the industry, and their interactions.

Prerequisite, Economics 201.

Credit, 3 each semester. Mr. Schoeffler and Mr. Martin.

705, 706. MACRO-ECONOMIC THEORY.

Nature, construction and use of social accounting systems. A systematic development of static and dynamic theories of aggregative economic behavior and their applications.

Prerequisite, Economics 212 or 214 or equivalent. *Credit, 3 each semester.*

711. MONETARY POLICY.

The organization, problems, and policies of the major central banks. Given as required.

Prerequisites, Economics 211, 212 or equivalent. *Credit, 3.* Mr. Gamble.

731. MONOPOLY AND PUBLIC UTILITY PROBLEMS.

The problem of social control of monopolies and industries affected with a public interest. Given as required. *Credit, 3.* Mr. Howard.

741. COLLECTIVE BARGAINING.

The legal background of collective bargaining, the process, subject matter, and problems involved. Individual case problems.

Prerequisite, Economics 241. *Credit, 3.* Mr. Blackman.

751. MATHEMATICAL ECONOMICS AND ECONOMIC MODEL-BUILDING.

The various modern applications of mathematics to economic analysis. Both static and dynamic processes will be examined. Given as required. Admission by consent of instructor.

Prerequisites, Economics 301, 251, or the equivalent and one year of college mathematics. *Credit, 3.* Mr. Schoeffler.

752. ECONOMETRICS.

The application of modern statistical methods to macro- and micro-economic theory that has been formulated in mathematical terms.

Prerequisites, Economics 252 and one year of college mathematics or consent of the instructor. *Credit, 3.*

761, 762. GENERAL ECONOMIC HISTORY.

Topics in the history of economic activity in the western world.

Prerequisite, Economics 261. *Credit, 3.* Mr. Gelfand.

771. PLANNING ECONOMIC DEVELOPMENT.

The problems and techniques of inducing development in underdeveloped countries. Case studies of individual countries.

Prerequisite, Economics 266. *Credit, 3.* Mr. Morris.

773. THEORIES OF ECONOMIC SYSTEMS.

Examination of the theory of alternative economic systems, of national economic planning, and of resource allocation under different systems.
Prerequisites, Economics 272, 773. *Credit, 3.* Mr. Holesovsky.

774. SELECTED TOPICS IN SOVIET AND EAST EUROPEAN ECONOMIES.

Application of advanced economic theory to selected major problems of planned economies of the Soviet type.
Prerequisite, Economics 272, 773. *Credit, 3.* Mr. Holesovsky.

801. HISTORY OF ECONOMIC THOUGHT.

Treatment in depth of various topics within the history of economic thought. Given as required.
Prerequisite, Economics 306 or consent of instructor. *Credit, 3.* Mr. Martin.

811. TAXATION.

The assessment and administration of taxes with particular attention to the economic and social effects of individual taxes and tax systems.
Prerequisite, Economics 312. *Credit, 3.*

812. FISCAL POLICY.

The theory and practices of government finance with special reference to the United States. Given as required.
Prerequisites, Economics 211, 312. *Credit, 3.*

891, 892. SEMINAR ON ECONOMIC POLICY.

Selection and application of the tools of economic analysis to major problems of public policy. *Credit, 1-3 each semester.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Added work required of graduates: *(a) extra reading on same or additional assignments, (b) term paper, (c) special problem or project.*

501. INTERMEDIATE MICROECONOMIC THEORY.

Microeconomic analysis of consumers, firms, industries, and markets; rational decision making under conditions of certainty; balancing forces in a free-enterprise economy.
Prerequisites, Economics 125. *Credit, 3.* Mr. Martin.

511. MONEY, BANKING AND CREDIT.

The development and operation of the monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. *Credit, 3.* Mr. Gamble.

512. MONEY, INCOME AND MONETARY POLICY.

The relationships among money, income and monetary policy. An examination of the relationships among individuals, banks, money markets, governments and central banks.
Prerequisites, Economics 211 or consent of the instructor.
Credit, 3 Mr. Gamble.

514. MACROECONOMIC THEORY AND BUSINESS CYCLES.

Formulation and empirical testing of static and dynamic theories of aggregative income, employment, and prices, with special reference to the business cycle and economic forecasting.
Prerequisites, Economics 125, 126. *Credit, 3.*

521. THE INTERNATIONAL ECONOMY.

An historical and analytical introduction to the study of international economic institutions, trade, finance, and policy. *Credit, 3.* Mr. Aiken.

522. INTERNATIONAL TRADE AND ECONOMIC POLICY.

Intermediate theory of international trade including the analysis of the balance of payments mechanism, pure non-monetary theory and its application to the problems of commercial policy.
Prerequisites, Economics 521 or consent of instructor. *Credit, 3.* Mr. Aitken.

531. SOCIAL CONTROL OF BUSINESS.

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation or public enterprises for competition. *Credit, 3.* Mr. Howard.

532. THE STRUCTURE OF AMERICAN INDUSTRY.

Business enterprise, market competition, and economic development in American industries. The social effectiveness of industries analyzed through measures of industrial structure and market performance. *Credit, 3.* Mr. Howard.

541. LABOR PROBLEMS.

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them. *Credit, 3.* Mr. Blackman.

542. LABOR LAW AND LEGISLATION.

Economic effects and historical survey of Federal and state laws and an analysis of important court decisions.
Prerequisite, Economics 241. *Credit, 3.* Mr. Blackman.

548. ECONOMICS OF CONSUMPTION AND PERSONAL FINANCE.

Patterns of consumption, standards of living and the sources and expenditure of individual and family incomes. *Credit, 3.* Mr. Morris.

551. MATHEMATICAL METHODS IN ECONOMICS.

The application of various mathematical concepts and techniques in macro-economic and micro-economic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economical phenomena.
Prerequisites, One year of college mathematics, or consent of instructor.
Credit, 3.

522. ECONOMETRICS.

The application of mathematical and statistical methods to economic theory. Special emphasis is placed on the application to both micro- and macro-economic policy issues.
Prerequisites, Statistics 121, or Statistics 355 and Economics 251, or permission of the instructor. *Credit, 3.*

561. EUROPEAN ECONOMIC EVOLUTION.

Evolution of agriculture, manufacturing, banking, and other sectors of the European economy. *Credit, 3.* Mr. Gelfand.

562. AMERICAN ECONOMIC HISTORY.

An analytical approach to structural change, economic growth and the development of market institutions in the United States from colonial times to the present.
Prerequisites: Economics 125 or 126 or permission of the instructor.
Credit, 3. Mr. Gelfand.

566. ECONOMIC DEVELOPMENT.

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. *Credit, 3.* Mr. Morris.

571. COMPARATIVE ECONOMIC SYSTEMS.

The structure, operation, and underlying ideology of the major contemporary forms of social-economic organization. Emphasis on the Soviet Union and the United States. *Credit, 3.* Mr. Holesovsky.

572. THE SOVIET ECONOMY.

An analytical study of the Soviet economic system with emphasis on the ideological background, economic institutions, and economic development.

Credit, 3. Mr. Holesovsky.

581. REGIONAL ECONOMICS.

Examination of the U. S. distressed economic areas problem; application of location theory and basic techniques of regional analysis; empirical studies of industrial location.

Prerequisites, Economics 232 or permission of instructor.

Credit, 3. Mr. Wickman.

582. URBAN ECONOMICS.

Theory and method in metropolitan analysis; case studies of urban economic growth; economics of urban transportation planning, urban renewal, and financing of urban services.

Prerequisite, Economics 125. *Credit, 3.* Mr. Wickman.

601. DECISION THEORY IN ECONOMICS.

The modern theory of rational decision under conditions of uncertainty, risk, and conflict. Applications to the theory of the firm and the theory of oligopoly.

Prerequisites, Economics 125 or 126; one year of college mathematics, or permission of the instructor. *Credit, 3.* Mr. Schoeffler.

604. FINANCIAL ASPECTS OF ECONOMICS.

The application of modern flow-of-funds analysis to the financial behavior of the various sectors of the economy. Special emphasis is placed on the financial aspects of business units and the business sector.

Prerequisites, Accounting 125 or permission of instructor.

Credit, 3. Mr. Martin.

606. DOCTRINAL BACKGROUNDS OF CONTEMPORARY THEORY.

Foundations of classical theory from physiocracy through Mill; neoclassicism and its chief variants, the Lausanne, Austrian and English Schools; dissenters Marx, German historical school, Veblen. *Credit, 3.* Mr. Martin.

612. PUBLIC FINANCE.

Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment, economic growth and price stability. *Credit, 3.*

691, 692. SEMINAR. *Credit, 1-3 each semester.* The Staff.

EDUCATION

GRADUATE FACULTY

Albert W. Purvis, *Dean of the School of Education and Professor of Education,* B.A., University of New Brunswick, 1931; M.Ed., Harvard, 1935; D.Ed., 1937.

Albert S. Anthony, *Professor of Education,* B.S., Trinity, 1937; M.A.T., Harvard, 1941; Ed.D., 1955.

Ambrose A. Clegg, Jr., *Assistant Professor of Education,* B.A., St. John's University, 1950; M.A., Columbia, 1951; Ph.D., North Carolina, 1963.

William E. Griffiths, *Assistant Professor of Education,* A.B., Pennsylvania State, 1949; M.Ed., 1950; Ed.Dd., University of Pennsylvania, 1963.

Clifford V. Jones, *Professor of Education,* B.S., Edinboro State, 1936; M.Ed., University of Pittsburgh, 1951; Ed.D., T.C. Columbia, 1954.

Robert C. Jones, *Assistant Professor of Education,* B.S., Maine, 1937; M.S., Massachusetts, 1953; Ed.D., Cornell, 1960.

William G. Kornegay, *Associate Professor of Education,* B.A., North Carolina, 1949; M.Ed., 1957; Ph.D., 1959.

Ralph R. Pippert, *Assistant Dean and Associate Professor of Education,* B.A., Mission House, 1944; M.S., Wisconsin, 1950; Ph.D., 1959.

Leverne Thelen, *Associate Professor of Education,* B.S., Nebraska State Teachers College at Wayne, 1949; M.A., Nebraska, 1956; Ed.D., 1961.

Robert R. Wellman, *Assistant Professor of Education,* A.B., Dartmouth, 1954; M.A., Western Reserve University, 1959; Ph.D., Ohio State, 1962.

Raymond Wyman, *Professor of Education,* B.S., Massachusetts, 1937; M.Ed., Boston University, 1947; D.Ed., 1956.

The School of Education offers a Master's degree, a Certificate of Advanced Graduate Study, and a Doctorate. Students accepted for graduate study are expected to have a minimum of eighteen semester hours of course work in education and the usual requirements for a Bachelor's degree.

Specialized programs in the Master's degree are offered in the following areas: educational media, elementary and secondary teaching, administration, guidance, reading, junior college teaching, and related fields such as 4-H, home agents etc.

Doctoral programs are offered in guidance and educational administration.

The following programs leading to the Certificate of Advanced Graduate Study are offered. Each program requires a minimum of sixty credits beyond the Bachelor's degree and the specific program of each candidate must be approved by the candidate's Advisory Committee.

(1) Reading Specialist. Prerequisites, teacher certification and two years of approved teaching. Recommended program: Education 420, 449, 653, 677, 701 or 705, 715, 783, 784, 785, 991 and electives; 21-30 hours in such related graduate courses as abnormal psychology, exceptional child, phonetics, audiology, psychological tests, diagnosis and treatment of behavior problems.

(2) School Guidance Specialist. Prerequisites, teacher certification and one year of approved teaching. Recommended program: Education 449, 677, 701, 705, 715, 912, 913, 915, 917, 991 and electives; 21-30 hours in such related graduate courses as psychological and individual testing, exceptional child, abnormal psychology, theories of personality, sociology, and counseling techniques.

(3) School Principals and Supervisors. Prerequisites, teacher certification and three years of approved teaching and/or administrative experience. Recommended program: Education 410, 449, 653, 677, 700 or 701, 766, 816, 951, 952 or 953, 955, 956, 991 and electives; 21-30 hours in related graduate courses in such fields as government, business administration, economics, sociology and psychology.

(4) Specialists in Audiovisual Education. Prerequisites, teacher certification and two years of approved teaching, including one year's experience in the audiovisual field. Recommended program: Education 420, 421, 422, 423, 511, 560, 666, 700 or 701, 850, 852, 951, 955, 991 and electives; 21-30 hours in related graduate courses in such fields as engineering, psychology, physics, and statistics.

Before being admitted to candidacy for the Master of Education degree,[1] the student must have, in addition to minimum Graduate School requirements:

(1) For programs in secondary education eighteen semester credits of such fundamental professional courses as Education 251, 253, 352, 353, 372, 375, 385, etc. Also a major (24 semester credits) and a minor (15 semester credits) in the subject matter fields to be taught.

(2) For programs in elementary education twenty-four semester credits of such fundamental professional courses as Education 251, 260, 261, 262, 264, 385, etc., a broad general education including a minor (15 semester credits) in Arts and Sciences.

(3) For programs in either field experience in teaching is required. Students entering without teaching experience must arrange for student teaching (without graduate credit) as soon as possible.

[1]For a description of the Master of Arts in Teaching see page 27.

COURSES OPEN TO GRADUATE STUDENTS ONLY

410. EVALUATION IN ELEMENTARY SCHOOLS.

Standardized and teacher made tests, rating scales, report cards, growth charts, readiness measures, and diagnosis of educational deficiency in elementary pupils. (To be taken instead of Education 653 by those training for elementary teaching.)
Credit, 3. Miss McManamy.

420. CONSTRUCTION OF AUDIOVISUAL AIDS.

Designed to help teachers and audiovisual specialists to prepare audiovisual materials for use in an educational program. Students will prepare sldies, graphics, recordings, still pictures, motion pictures.
Prerequisite, Education 666. *Credit, 3.* Mr. Tilley.

421. TEACHING WITH TELEVISION AND RADIO.

Provides the classroom teacher with an understanding of television and radio so that he can participate in the preparation, utilization, and evaluation of educational programs using these media.
Prerequisite, Education 666. *Credit, 3.* Mr. Hulsen.

422. PHOTOGRAPHY IN EDUCATION.

Theory and practice of taking and processing photographs for use in educational activities.
Prerequisites, Education 420 and 666. *Credit, 3.* Mr. Tilley.

423. AUDIOVISUAL TECHNOLOGY.

Applications of acoustics, electricity, magnetism, mechanics and optics to audiovisual equipment and techniques.
Prerequisite, Education 666. *Credit, 3.* Mr. Wyman.

430. ELEMENTARY SCHOOL SCIENCE.

Methods and materials of instruction. *Credit, 3.* Mr. King.

431. ELEMENTARY SCHOOL SOCIAL STUDIES.

Recent findings in research in terms of their implications for the elementary school social studies program. *Credit, 3.* Mr. Clegg.

445. THE SCHOOL ADJUSTMENT COUNSELOR.

Principles and practices of school adjustment counseling.
Credit, 3. Mr. Zimmer.

449. DATA PROCESSING FOR SCHOOLS.

Theory and practice in the use of simple types of data processing equipment in scheduling, record keeping, and registers.
Prerequisites, Education 653 or 991. *Credit, 3.*
(For either major or minor credit)

700. PROBLEM.

A critical study of some problem in the educational field. Two bound copies of the written report must be provided for the School of Education by the student.
Prerequisite, Education 991 or its equivalent. *Credit, 1-4.* The Staff.

701. PRACTICUM.

Practice in the application of educational theory and technique in the public schools in such fields as supervision, administration, audiovisual organization, and guidance. The student will prepare a comprehensive written report of his practice, experience and problems. A student cannot offer both Education 700 and 701 for the Master's degree.
Prerequisites, Education 991 and teaching experience. *Credit, 1-4.* The Staff.

702. INDEPENDENT STUDY. *Credit, 1-6.* The Staff.

705. SEMINAR IN EDUCATION.

An intensive analytical study of some phases of education.
Credit, 2-6. The Staff.

706. SEMINAR IN GUIDANCE. (Master's Degree Section)
Credit, 3. Mr. Pippert.

707. SEMINAR IN GUIDANCE. (Doctoral Section) *Credit, 3.* Mr. Pippert.

708. SEMINAR IN GIFTED STUDENTS. *Credit, 3.*

709. SEMINAR IN READING. *Credit, 3.*

710. SEMINAR IN MATHEMATICS EDUCATION. *Credit, 3.* Mr. Hall.

715. WORKSHOP IN EDUCATION.[1]

Group study of practical problems in curriculum, instruction, and administration for school personnel in service. *Credit, 2-6.* The Staff.

716. WORKSHOP IN REMEDIAL READING. *Credit, 3.*

717. WORKSHOP IN GIFTED STUDENTS. *Credit, 3.*

718. WORKSHOP IN EDUCATIONAL TELVEISION. *Credit, 3.* Mr. Hulsen

[1]No more than six credits can be taken in Education 715.

719. WORKSHOP IN KINDERGARTEN. *Credit, 3.*

720. WORKSHOP IN GUIDANCE. *Credit, 3.* Mr. Fredrickson.

721. WORKSHOP IN LANGUAGE ARTS. *Credit, 3.* Miss O'Leary.

722. WORKSHOP IN EDUCATIONAL ADMINISTRATION. (Principals)
Credit, 3. Mr. C. Jones.

723. WORKSHOP IN EDUCATIONAL ADMINISTRATION. (Administrators)
Credit, 3. Mr. C. Jones.

730. MEASUREMENT FOR GUIDANCE.

Analysis of measurement devices in school guidance, including sociometrics, value scales, inventories and other tests.
Prerequisites, Psychology 611 or consent of instructor. *Credit, 3.*

766. CURRICULUM DEVELOPMENT: THEORY AND RESEARCH.

Curriculum design and theory, the dynamics of change, current research studies and experimental programs, and theories of teaching and learning as they affect curriculum design.
Prerequisites, Education 511 or 560. *Credit, 3.* Mr. Clegg.

767. DEVELOPMENTS IN ELEMENTARY SCHOOL MATHEMATICS.

A critical evaluation of the current literature, research and studies in the curriculum and teaching of elementary school mathematics.
Prerequisite, Ed. 562. *Credit, 3.* Mr. Hall.

768. IMPLEMENTING THE ELEMENTARY SCHOOL PROGRAM.

Curriculum design and classroom organization, including practices in planning, presenting, and evaluating programs involving integration of skills and activities for the various grade levels.
Prerequisite, Education 560 and teaching experience.
Credit, 3. Mr. Fiorino.

781. TEACHING OF READING ON THE SECONDARY AND ADULT LEVELS.

Principles, methods and materials for the teaching of developmental, remedial, and accelerated reading programs. The course is designed for teachers of students at the junior and senior high school levels, and for leaders of adult and college reading programs.
Prerequisite, Ed. 561. *Credit, 3.*

782. CHILDREN'S LITERATURE.

The basic types and foremost works in the literature for children. Attention to different interest and vocabulary levels and to the criteria for selection of lists for individual children.
Prerequisite, Education 561. *Credit, 3.* The Staff.

783. DIAGNOSIS OF READING DIFFICULTIES.

Theory and interpretation of diagnostic procedures to develop a background of information in the diagnosis and treatment of reading difficulties.
Prerequisite, Education 561. *Credit, 3.* Mr. Zaeske.

784. INDIVIDUAL CASE STUDIES OF READING PROBLEMS.

Practical experience in the gathering and summation of information to form a case study of a child in order to determine the seriousness of the reading problem and the underlying causes and to make recommendations for their correction or remediation.
Prerequisite, Education 783. *Credit, 3.* Mr. Zaeske.

785. TECHNIQUES IN REMEDIAL READING.

Methods and materials in diagnosis and remedial instruction.
Prerequisite, Education 561. *Credit, 3.* Miss O'Leary.

810. THE LANGUAGE AND LOGIC OF TEACHING.

Study of the limits and resources of language including consideration of logic, definitions, and rhetoric as they apply to teaching. *Credit, 3.* Mr. Ulin.

811. DEVELOPMENTS IN SECONDARY SCHOOL SCIENCE.

A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school science.
Prerequisite, Education 510 and teaching experience. *Credit, 3.* Mr. Thelen.

812. DEVELOPMENTS IN SECONDARY SCHOOL ENGLISH.

A critical evaluation of the current literature, yearbooks, research, and experiments in the curriculum and teaching of English.
Prerequisite, Education 510 and teaching experience. *Credit, 3.* Mr. Ulin.

813. DEVELOPMENTS IN SECONDARY SCHOOL SOCIAL STUDIES.

A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school social studies.
Prerequisite, Education 510 and teaching experience. *Credit, 3.* Mr. Anthony.

814. DEVELOPMENTS IN SECONDARY SCHOOL MATHEMATICS.

A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school mathematics.
Prerequisite, Education 510 and teaching experience. *Credit, 3.* Mr. Hillman.

815. COMPREHENSIVE HIGH SCHOOL.

Critical study of the historical development, objectives, course offerings, and crucial issues confronting the all-purpose high school. Critical analysis of various suggestions for improvement. *Credit, 3.* Mr. Thelen.

816. THE JUNIOR HIGH SCHOOL.

The history of the Junior High School movement; the philosophy, aims and functions of a Junior High School, the instructional program, the role of the basic skills, guidance, organization, extra-curricular activities, and current trends.

Credit, 3. Mr. Kornegay.

850. AUTO-INSTRUCTIONAL DEVICES AND PROGRAMED LEARNING.

Theory and practice of programed learning for typical school subjects. Each student will set up objectives and construct a program for a unit of work. Implications for future use in education will be considered.

Prerequisite, Education 666. *Credit, 3.* Mr. Wyman.

852. ADMINISTRATION OF AUDIOVISUAL SERVICES.

To prepare audiovisual coordinators, directors and supervisors in the operation of an audiovisual service. Teacher training, selection of materials and equipment, storage, cataloging, distribution, maintenance, and financial support.

Prerequisites, Education 666 and teaching experience. *Credit, 3.* Mr. Wyman.

854. NEWER MEDIA IN EDUCATION.

To acquaint school administrators, supervisors, and experienced classroom teachers with the characteristics, applications and implications of the newer media in education such as language laboratories, motion pictures, closed circuit television and teaching machines.

Prerequisite, Education 666 or consent of instructor. *Credit, 3.* Mr. Wyman.

880. CONTEMPORARY PROBLEMS IN EDUCATION.

An intensive examination of several major issues confronting American education. Evaluation, and criticism of proposals being offered for their solution.

Credit, 3. Mr. Eddy.

881. COMPARATIVE EDUCATION.

Objectives of descriptive, analytical and comparative educational methods; detailed description of selected foreign educational systems and an analysis of characteristics practices; relevance of the analysis to the problem of education for international understanding.

Prerequisite, Education 551. *Credit, 3.* Mr. Wellman.

884. EDUCATIONAL SOCIOLOGY.

Consideration of sociological and anthropological concepts and current studies in terms of their application to the American school system and its problems.

Prerequisite, Sociology 101 or consent of the instructor.

Credit, 3. Mr. Anthony.

887. HISTORY OF AMERICAN EDUCATION.

The development of American education in the context of American intellectual thought. *Credit, 3.* Mr. Angus.

890. HISTORY OF WESTERN EDUCATIONAL THOUGHT THROUGH THE RENAISSANCE.

A study of representative educational thinkers from ancient times through the Renaissance.
Prerequisite, Education 551 or consent of the instructor.
Credit, 3. Mr. Wellman.

891. HISTORY OF WESTERN EDUCATIONAL THOUGHT SINCE THE RENAISSANCE.

A study of representative educational thinkers from the Renaissance to the present.
Prerequisite, Education 551 or consent of the instructor. *Credit, 3.* Mr. Eddy.

900. THESIS, Ed.D. DEGREE. *Credit, 15-30.* The Staff.

910. SCHOOL COUNSELING THEORY.

Counseling theory and research evaluation. Study of methodology, philosophies, ethics, problems, and issues of school counseling.
Prerequisite, Education 677. *Credit, 3.*

911. SCHOOL COUNSELING PROCEDURES.

Instruments and techniques used in guidance work such as observation, methods of individual appraisal, record keeping, and school-community liaison practices.
Prerequisites, Education 910, Psych. 611, or Ed. 730. *Credit, 3.* Mr. Winder.

912. OCCUPATIONS AND PLACEMENT IN SCHOOL GUIDANCE.

The collection, evaluation and use of occupational, educational, and placement information with individuals and groups of students in school guidance.
Prerequisites, Education 677, teaching experience and permission of the instructor.
Credit, 3. Mr. Fredrickson.

913. ADMINISTRATION OF SCHOOL GUIDANCE SERVICES.

Operative framework of guidance programs in terms of personnel, functions, physical facilities, institutional integration, finance and laws.
Prerequisites, Education 677, teaching experience and permission of the instructor.
Credit, 3.

914. STUDENT PERSONNEL SERVICES IN HIGHER EDUCATION.

Origin, growth, and operation of student personnel services in American colleges and universities. Research and methods of evaluation. Specific personnel services such as selection and admission of students, orientation to college life; student financial aid, student activities, and discipline.
Prerequisites, Education 677 and consent of instructor.
Credit, 3. Mr. Burkhardt.

915. GROUP ACTIVITIES IN GUIDANCE.

A guidance study of school groups. Attention will be given to group dynamics, discussion techniques, group counseling, sociometric methods, and other school group activities.
Prerequisite, Education 677, Psychology 665, and background in Psychology.
Credit, 3. Mr. Winder.

916. CLINICAL STUDIES IN SCHOOL GUIDANCE.

Intensive case studies of youth.
Prerequisites, Education 911 and Psych. 611. *Credit, 3.* Mr. Fredrickson.

917. ELEMENTARY SCHOOL GUIDANCE.

A study of skills, techniques, and objectives of guidance in the elementary school, emphasizing those aspects of guidance of particular interest to the elementary school teacher or guidance person.
Prerequisites, Education 677, Psychology 665, and background in Psychology.
Credit, 3. Mr. Zimmer.

928. INTERNSHIP IN SCHOOL GUIDANCE AND COUNSELING.

Supervised on-the-job counseling experience. Work includes direct counseling, individual supervisory conferences, writing of case reports, and the analysis of taped counseling sessions.
Prerequisite, Consent of instructor. *Credit,* 3-6. The Staff.

929. ADJUSTMENT COUNSELING CASEWORK.

Supervised experience with children having special adjustment problems. (To be taken in place of Education 928.) *Credit, 2-6.* Mr. Zimmer.

950. FUNDAMENTALS OF EDUCATIONAL ADMINISTRATION.

Introductory course in general school administration, the relation of public education to the cultural pattern, organization, and practices in school administration.
Credit, 3. Mr. C. V. Jones.

951. PRINCIPLES OF SUPERVISION.

Principles and problems of supervision and the exercise of educational leadership in the improvement of instruction in the elementary curriculum and the secondary school content fields. *Credit, 3.* The Staff.

952. ADMINISTERING ELEMENTARY SCHOOLS.

The principal's responsibilities, organization of the school office, scheduling, use of school facilities, curriculum organization, staff relationships, and the place of the school in the community.
Prerequisite, teaching experience. *Credit, 3.* The Staff.

953. ADMINISTERING SECONDARY SCHOOLS.

Housing, finance, schedule, the library, guidance, cafeteria, public relations, etc.
Prerequisite, teaching experience. *Credit, 3.* Mr. Griffiths.

954. ADMINISTERING EXTRA-CURRICULAR ACTIVITIES.

Scheduling, financing, sponsorship, regulation of pupil participation.
Prerequisite, teaching experience. *Credit, 3.* Mr. Stolle.

955. COMMUNITY RELATIONS FOR SCHOOL PERSONNEL.

The development of good public relations policies and the techniques of assisting lay people in interpreting school activities, policies, and objectives.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Stolle.

956. SCHOOL LAWS OF MASSACHUSETTS.

A review of the legal relations of school personnel covering experiences in school and community, presented in a series of selected cases. *Credit, 3.* Mr. Purvis.

957. PRINCIPLES OF SCHOOL LAW.

The legal basis of school operation, cases in school law, the role of the attorney general and school solicitor in school law interpretation, and school operation in relation to federal, state, and local environment.
Prerequisite, Education 950. *Credit, 3.* Mr. Griffiths.

958. SCHOOL PERSONNEL ADMINISTRATION.

The leadership role in staff performance and duties, planning and promotion of continuous programs of inservice training, recruitment and development of personnel, internal organization and administration.
Prerequisite, Education 950. *Credit, 3.*

959. SCHOOL BUSINESS AND FISCAL AFFAIRS.

The theory and practice of school finance, taxation, and educational cost operation, budget planning and accounting, federal, state, and local aspects of school finance.

Prerequisite, Education 950. *Credit, 3.*

960. SCHOOL PLANT PLANNING.

Comprehensive study of school plant needs, site selection, bonding, building, planning and standards, architectural service, and furniture and equipment selection practices.

Prerequisite, Education 950. *Credit, 3.* Mr. C. V. Jones.

961. CASE STUDIES IN EDUCATIONAL ADMINISTRATION.

A series of situations involving the role of the school administrator in a democracy.

Prerequisites, Education 950, 958. *Credit, 3.* Mr. C. V. Jones.

962. EDUCATIONAL PLANNING AND EVALUATION.

Participation in school survey to give advanced graduate students practical field experience in inspection, evaluation and recommendations for future action in the educational operation.

Prerequisites, Education 950 and Education 959, 960 and instructor approval. Two consecutive semesters. *Credit, 6.* The Staff.

963. INTERNSHIP IN EDUCATIONAL ADMINISTRATION.

Advanced graduate students in educational administration, as a part of advanced professional preparation, are placed on assignment in actual school administration positions on the basis of cooperative school system university selection, assignment and supervision.

Prerequisites, 18 semester hours in Educational Administration and permission of the instructor. *Credit, 6-12.* The Staff.

964. ADMINISTRATION OF ADULT EDUCATION.

Role of the public schools in continuing community service, planning and directing programs in adult education, adult needs in preparation for job procurement, retraining, job advancement and community service.

Prerequisite, Education 950. *Credit, 3.* Mr. Burkhardt.

991. RESEARCH METHODOLOGY AND MATERIALS.

The methods of research pertinent to education, with consideration of influential factors. Principles involved in selecting and preparing research materials. Statistics are studied chiefly from the standpoint of reporting and understanding the results of research. *Credit, 3.* Mr. Schweiker.

994. RESEARCH DESIGN AND ANALYSIS.
Theory and techniques involved in analysis of various experimental designs pertinent to education, employing analysis of variance and covariance methods. Prerequisite, Education 991. *Credit, 3.* Mr. Schweiker.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

510. PRINCIPLES AND METHODS OF TEACHING.
Credit, 3. Staff, Secondary Education.

511. SECONDARY SCHOOL CURRICULUM. *Credit, 3.* Mr. Kornegay.

551. HISTORY OF EDUCATION.
Credit, 3. Mr. Angus, Mr. Eddy, Mr. Wellman.

560. ELEMENTARY SCHOOL CURRICULUM.
Credit, 3. Mr. Clegg, Mr. Fiorino.

561. ELEMENTARY READING AND LANGUAGE ARTS.
Credit, 3. Miss O'Leary.

562. ELEMENTARY ARITHMETIC. *Credit, 3.* Mr. Hall.

564. PRINCIPLES OF ELEMENTARY EDUCATION.
Credit, 3. Miss McManamy.

572. VOCATIONAL EDUCATION IN AGRICULTURE. *Credit, 3.*

573. APPRENTICE TEACHING IN AGRICULTURE. *Credit, 6.*

575. TECHNIQUE OF TEACHING VOCATIONAL AGRICULTURE. *Credit, 3.*

653. EDUCATIONAL TESTS AND MEASUREMENTS. *Credit, 3.*

666. PREPARATION AND USE OF AUDIOVISUAL AIDS.
Credit, 3. Mr. Wyman.

677. PRINCIPLES OF SCHOOL GUIDANCE. *Credit, 3.* Mr. Winder.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Education except M.A.T. candidates)

685. OBSERVATION AND PRACTICE TEACHING. *Credit, 6.* The Staff.

ELECTRICAL ENGINEERING

GRADUATE FACULTY

G. Dale Sheckels, *Head of Department of Electrical Engineering and Professor of Electrical Engineering,* B.S., Washington, 1938; M.S., Massachusetts Institute of Technology, 1940; Ph.D., Iowa State, 1955.

Gilbert W. Bett, *Associate Professor of Electrical Engineering,* B.S., Massachusetts Institute of Technology, 1952; M.S., 1952.

Herbert A. Herchenreder, *Assistant Professor of Electrical Engineering,* B.S., Missouri, 1951; M.S., Connecticut, 1957.

Joseph W. Langford, *Professor of Electrical Engineering,* B.S., New Hampshire, 1929; M.S., Massachusetts Institute of Technology, 1933.

John W. Mohn, *Associate Professor of Electrical Engineering,* B.S., Worcester Poly. Tech., 1947; M.S., Stanford University, 1952.

Carl S. Roys, *Professor of Electrical Engineering,* B.S., Worcester Polytechnic Institute, 1923; M.S., Purdue, 1929; Ph.D., 1933.

Donald E. Scott, *Assistant Professor of Electrical Engineering,* B.S., Connecticut, 1957; M.S., 1959.

Requirements for the Master of Science degree in Electrical Engineering, in addition to those listed on page 26 are as follows:

1. Four required courses totaling 12 credits.

2. Four courses totaling a minimum of 12 credits selected from one of the three areas of interest: power systems, feedback control systems, or information processing. One minor elective course may be substituted for one of the four major courses. A maximum of eight credits of 500 series courses, and three credits of EE 700, may be included in the selection.

3. A minimum of six credits of research with an acceptable thesis.

4. No foreign language is required.

5. Supporting courses will be required for those students lacking the prerequisites specified on the following pages.

First Semester

EE 705. ANALYSIS OF LINEAR SYSTEMS.	*Credit, 3.*
PHYSICS 585. MODERN PHYSICS.	*Credit, 3.*
MATH 585. ADVANCED ENGINEERING MATHEMATICS.	*Credit, 3.*
EE 800. RESEACH (PROPOSAL).	*Credit, 0.*

Second Semester

EE 706. ELECTROMAGNETIC FIELD THEORY. *Credit, 3.*
EE 800. RESEARCH. *Credit, 6.*

Two courses each semester from one of the following three groups:

POWER SYSTEMS GROUP

First Semester

EE 677. PRINCIPLES OF SWITCHING CIRCUITS I. *Credit, 4.*
EE 686. POWER SYSTEM NETWORKS. *Credit, 4.*
EE 711. POWER TRANSMISSION AND RELAYING. *Credit, 3.*
EE 713. LIGHTNING PROTECTION AND GROUNDING. *Credit, 3.*
EE 700. SPECIAL PROBLEMS. *Credit, 3.*

Second Semester

EE 678. PRINCIPLES OF SWITCHING CIRCUITS II. *Credit, 4.*
EE 681. ADVANCED ELECTRIC MACHINERY. *Credit, 4.*
EE 690. FEEDBACK CONTROL SYSTEMS. *Credit, 4.*
EE 712. SYMMETRICAL COMPONENTS AND SYSTEM STABILITY. *Credit, 3.*
EE 700. SPECIAL PROBLEMS. *Credit, 3.*

FEEDBACK CONTROL SYSTEM GROUP

First Semester

EE 731. LINEAR FEEDBACK SYSTEMS. *Credit, 3.*
EE 745. RANDOM SIGNALS AND NOISE. *Credit, 3.*
EE 747. TRANSISTOR CIRCUITS. *Credit, 3.*
EE 700. SPECIAL PROBLEMS. *Credit, 3.*

Second Semester

EE 681. ADVANCED ELECTROMECHANICAL ENERGY CONVERSION. *Credit, 4.*
EE 688. PULSE CIRCUITS. *Credit, 4.*
EE 732. NON-LINEAR FEEDBACK SYSTEMS. *Credit, 3.*
EE 700. SPECIAL PROBLEMS. *Credit, 3.*

INFORMATION PROCESSING GROUP

First Semester

EE 707. ADVANCED MICROWAVE ENGINEERING. *Credit, 4.*
EE 745. RANDOM SIGNALS AND NOISE. *Credit, 3.*
EE 747. TRANSISTOR CIRCUITS. *Credit, 3.*
EE 700. SPECIAL PROBLEMS. *Credit, 3.*

Second Semester

EE 690. FEEDBACK CONTROL SYSTEMS. *Credit, 4.*

EE 694. MICROWAVE ENGINEERING. *Credit, 4.*

EE 688. PULSE CIRCUITS. *Credit, 4.*

EE 748. NETWORK ANALYSIS AND SYNTHESIS. *Credit, 3.*

EE 700. SPECIAL PROBLEMS. *Credit, 3.*

MINOR ELECTIVE GROUP

MATH 521. VECTOR ANALYSIS. *Credit, 3.*

MATH 551. NUMERICAL ANALYSIS. *Credit, 3.*

MATH 586. ADVANCED ENGINEERING MATHEMATICS. *Credit, 3.*

MATH 621. COMPLEX ANALYSIS. *Credit, 3.*

MATH 641. FOURIER SERIES AND ORTHOGONAL FUNCTIONS. *Credit, 3.*

PHYSICS 571, 572. STATISTICAL PHYSICS. *Credit, 3.*

PHYSICS 586. MODERN PHYSICS. *Credit, 3.*

PHYSICS 588. SOLID STATE PHYSICS. *Credit, 3.*

In exceptional cases, the above programs may be modified at the suggestion or with the approval of the major adviser. Additional courses in each of the three areas of interest may be offered upon sufficient demand.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

A study of recent advances and current problems in a specialized field of electrical engineering. Limited to three credits for degree candidates.
Prerequisite, consent of instructor. *Credit, 3.* The Staff.

705. ANALYSIS OF LINEAR SYSTEMS.

Transient behavior of recurrent and distributed electrical, mechanical, acoustical, and heat-flow systems. Modern principles and methods of analysis basic to system synthesis.
Prerequisites, Electrical Engineering 252 or equivalent.
Credit, 3. Mr. Fitzgerald and Mr. Roys.

706. ELECTROMAGNETIC FIELD THEORY.

Microscopic and macroscopic properties of magnetic and insulating materials; gyromagnetism and the permeability tensor; reflection and refraction; skin effect; antenna analysis; relativistic electrodynamics.
Prerequisite, Electrical Engineering 257 or equivalent.
Credit, 3. Mr. Mohn and Mr. Roys.

707. ADVANCED MICROWAVE ENGINEERING.

Analysis of waveguides, gyrators, antennas and other microwave circuit elements; electron ballistics; ionospheric reflection and refraction, and the permittivity tensor; microwave generators; masers and lasers.
Three class hours; one 3-hour laboratory period.
Prerequisites, Electrical Engineering 294 and 706 or equivalent.
Credit, 4. Mr. Mohn and Mr. Roys.

711. POWER TRANSMISSION AND RELAYING.

Electrical characteristics and equivalent circuits for transmission lines and cables. Protective relaying for transmission and distribution systems.
Prerequisite, Electrical Engineering 254 or equivalent.
Credit, 3. Mr. Longley and Mr.Edwards.

712. SYMMETRICAL COMPONENTS AND SYSTEM STABILITY.

The use of symmetrical components for the study of steady state and transient stability of transmission systems. Determination of stability by the step-by-step solution of the non-linear differential equations.
Prerequisite, Electrical Engineering 686 or equivalent.
Credit, 3. Mr. Edwards and Mr. Longley.

713. LIGHTNING PROTECTION AND GROUNDING.

Electrical characteristics of lightning discharges, switching surges, lightning arresters, and insulating materials, and traveling waves on transmission systems. Methods of grounding and protection for overhead lines, cables, substation equipment and generating stations.
Prerequisite, Electrical Engineering 254 or equivalent.
Credit, 3. Mr. Edwards and Mr. Longley.

731. LINEAR FEEDBACK SYSTEMS.

Analysis of linear feedback systems by Root-Locus, Nyquist and Nichols plots. Performance and stability of feedback systems in time and frequency domain by analytical and graphical methods.
Prerequisite, Electrical Engineering 290 or equivalent.
Credit, 3. Mr. Bett, Mr. Herchenreder and Mr. Scott.

732. NON-LINEAR FEEDBACK SYSTEMS.

Analysis and synthesis of non-linear systems and systems with small nonlinearities by Z-plane transforms, first harmonic approximations, phase-plane and Tsypkia loci for on-off controllers.
Prerequisite, Electrical Engineering 731 or equivalent.

Credit, 3. Mr. Bett, Mr. Herchenreder and Mr. Scott.

745. RANDOM SIGNALS AND NOISE.

Fundamental concepts of discrete and continuous probability theory. Averages, sampling, correlation coefficients and functions. Description of randomly varying signals in terms of their statistical properties. Statistical analysis of linear systems. Optimum filter synthesis.
Prerequisite, Electrical Engineering 252 or equivalent.

Credit, 3. Mr. Herchenreder and Mr. Scott.

747. TRANSISTOR CIRCUITS.

Physical principles, characteristics, equivalent circuits and stability limitations. Performance criteria determined with respect to temperature, time, frequency, circuit configuration, signal amplitude and wave-form.
Prerequisite, Electrical Engineering 256 or equivalent.

Credit, 3. Mr. Langford and Mr. Mohn.

748. NETWORK ANALYSIS AND SYNTHESIS.

Modern circuit theory with emphasis on synthesis. Brune, Darlington and other realization techniques. The approximation problem in time and frequency domains.
Prerequisite, Electrical Engineering 705.

Credit, 3. Mr. Langford and Mr. Scott.

800. RESEARCH.

An individual theoretical and/or experimental investigation or a design problem terminating with an acceptable thesis. The research proposal is to be approved at least five months before graduation. The research credit may be spread over several semesters.

Credit, 6. Mr. Bett, Mr. Langford, Mr. Roys, Mr. Sheckels, Mr. Herchenreder, Mr. Mohn and Mr. Scott.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major and minor credit)

677. PRINCIPLES OF SWITCHING CIRCUITS.

Logical design of switching circuits with emphasis on the scientific methods

available; the analysis and synthesis of switching systems using electromagnetic, electronic and solid state devices.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256. *Credit, 4.* Mr. Edwards.

678. PRINCIPLES OF SWITCHING CIRCUITS II.

Multiterminal and iterative circuits; circuit reliability; switching codes; alternative methods of sequential circuit design with emphasis on synchronous pulse circuits; trends in switching.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 677. *Credit, 4.* Mr. Edwards.

585. ELECTRICAL MEASUREMENTS.

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices.
Two class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 142. *Credit, 3.* Mr. Laestadius.

681. ADVANCED ELECTROMECHANICAL ENERGY CONVERSION.

Modern methods of analysis; Hamilton's Principle and Lagrange's Equations; matrices, dyadics and tensors; two reaction theory and symmetrical components; the generalized and special machines.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 254. *Credit, 4.* Mr. Edwards and Mr. Roys.

686. POWER SYSTEM NETWORKS.

Power transfer diagrams, voltage studies, system stability criteria, short-circuit calculations and protective methods.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 252.
Credit, 4. Mr. Edwards and Mr. Sheckels.

688. PULSE CIRCUITS.

Generation, transmission and processing of information by means of pulses, with applications to computers, communication, radar and television.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256. *Credit, 4.* Mr. Langford.

690. FEEDBACK CONTROL SYSTEMS I.

Analysis and design of error-sensitive control systems. Analytical and graphical determination of steady state and transient performance; applications to electrical, mechanical, and hydraulic systems.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 252.
Credit, 4. Mr. Bett and Mr. Herchenreder.

694. MICROWAVE ENGINEERING.

The fundamental principles of communications and electromagnetism and their application to the special problems of the generation, transmission, propagation and reception of microwaves.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 257. *Credit, 4.* Mr. Roys and Mr. Mohn.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Electrical Engineering)

579. COMMUNICATION CIRCUITS.

Theory of lumped circuits and lines including matrices, positive real functions, and synthesis methods of Foster and Cauer.
Three class hours, one 3-hour laboratory period.
Prerequisite, EE 252. *Credit, 4.* Mr. Langford and Mr. Scott.

580. ELECTRONICS III.

Active circuits and communication theory covering tube and semiconductor circuitry with emphasis on aspects pertaining to information transmission.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 256.
Credit, 4. Mr. Langford and Mr. Mohn.

584. INDUSTRIAL ELECTRONICS AND CONTROL.

Industrial electronic devices and their characteristics; basic circuits and theory, application to commercial equipment.
Three class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 255 or 262. *Credit, 4.* Mr. Roys.

585. ELECTRICAL MEASUREMENTS.

Theory and practice of electric and magnetic measurements, accuracy, precision, maximum possible and probable errors, and limitations of measurements and devices.
Two class hours, one 3-hour laboratory period.
Prerequisite, Electrical Engineering 142. *Credit. 3.* Mr. Laestadius.

ENGLISH

GRADUATE FACULTY

Howard O. Brogan, *(Commonwealth) Head of Department of English and Professor of English,* B.A., Grinnell College, 1936; M.A., State University of Iowa, 1938; Ph.D., Yale, 1941.

Robert E. Bagg, *Assistant Professor of English,* B.A., Amherst College, 1957; M.A., Connecticut, 1961; Ph.D., Connecticut, 1965.

Normand Berlin, *Assistant Professor of English,* B.A., New York University, 1953; M.A., Columbia, 1956; Ph.D., California at Berkeley, 1964.

Marie Campbell, *Professor of English,* B.A., Southern Illinois, 1932; M.A., George Peabody College, 1937; Ph.D., Indiana, 1956.

Jules Chametzky, *Associate Professor of English,* B.A., Brooklyn College, 1950; M.A., Minnesota, 1952; Ph.D., 1958.

David R. Clark, *Professor of English,* B.A., Wesleyan University, 1947; M.A., Yale, 1950; Ph.D., 1955.

Thomas W. Copeland, *(Commonwealth) Professor of English,* B.A., Yale, 1928; Ph.D., 1933.

Audrey R. Duckert, *Associate Professor of English,* B.A., Wisconsin, 1948; M.A., 1949; Ph.D., Radcliffe College, 1959.

Everett H. Emerson, *Associate Professor of English,* B.A., Harvard, 1948; M.A., Duke, 1949; Ph.D., Louisiana State, 1955.

Morris Golden, *Professor of English,* B.A., City College of New York, 1948; M.A., New York University, 1949; Ph.D., 1953.

Martin Halpern, *Assistant Professor of English,* B.A., Rochester, 1950; M.A., 1953; Ph.D., Harvard, 1959.

Richard Haven, *Associate Professor of English,* B.A., Harvard, 1948; M.A., Princeton, 1952; Ph.D., 1958.

Vernon P. Helming, *Professor of English,* B.A., Carleton College, 1925; Ph.D., Yale, 1937.

John H. Hicks, *Associate Professor of English,* B.A., Middlebury College, 1941; M.A., Boston University, 1952; Ph.D., 1961.

Sidney Kaplan, *Professor of English,* B.A., College of the City of New York, 1942; M.A., Boston University, 1948; Ph.D., Harvard, 1959.

Richard E. Kim, *Assistant Professor of English,* M.A., Johns Hopkins, 1960; M.F.A., State University of Iowa, 1962; M.A., (Japanese), Harvard, 1963.

G. Stanley Koehler, *Professor of English,* B.A., Princeton, 1936; M.A., Harvard, 1937; M.A., Princeton, 1938; Ph.D., 1942.

Joseph Langland, *Professor of English,* B.A., State University of Iowa, 1940; M.A., 1941.

Harold T. McCarthy, *Associate Professor of English,* B.A., Massachusetts, 1941; M.A., Harvard, 1942; Ph.D., 1950.

Charles O. McDonald, *Associate Professor of English,* B.A., Wesleyan University, 1950; M.A., 1951; Ph.D., Yale, 1959.

William G. O'Donnell, *Professor of English,* B.S., Massachusetts, 1938; M.A., Yale, 1940; Ph.D., 1942.

Alex Page, *Associate Professor of English,* B.A., Vermont, 1948; M.A., Harvard, 1949; Ph.D., 1953.

Lili Rabel, *Assistant Professor of English,* B.A., Michigan, 1945; M.A., 1946; Ph.D., California at Berkeley, 1957.

Marc L. Ratner, *Assistant Professor of English,* B.S., Fordham, 1950; M.A., Pennsylvania, 1951; Ph.D., New York University, 1959.

Seymour Rudin, *Associate Professor of English,* B.A., City College of New York, 1941; M.S., 1943; Ph.D., Cornell, 1953.

Paul S. Sanders, *Assistant Professor of English,* B.A., Alabama, 1939; B.D., Emory University, 1942; S.T.M., Union Theological Seminary, 1947; T.H.D., 1954.

Arnold J. Silver, *Associate Professor of English,* B.A., New York University, 1947; M.A., Columbia, 1948; Ph.D., 1958.

Kenneth Spaulding, *Associate Professor of English,* B.A., Montana State, 1936; M.A., 1937; Ph.D., State University of Iowa, 1951.

Bernard Spivack, *Professor of English,* B.A., Alabama, 1931; M.A., Harvard, 1932; Ph.D., Columbia, 1952.

Robert G. Tucker, *Assistant Professor of English,* B.A., Amherst, 1949; M.A., Harvard, 1951; Ph.D., State University of Iowa, 1961.

H. Leland Varley, *Professor of English,* B.A., Wesleyan University, 1934; M.A., 1935; Ph.D., Wisconsin, 1953.

John C. Weston, Jr., *Associate Professor of English,* M.A., University of Chicago, 1950; Ph.D., North Carolina, 1956.

All graduate students should secure from the Department of English detailed information on requirements for the degrees.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS.

For students wishing to do special work not covered by courses listed in the curriculum. Permission must be secured from the head of the department and the instructor under whom the study will be done. The latter will supervise and evaluate the work. *Credit, 2-6.* The Department.

702. OLD ENGLISH.

Introduction to Old English. *Credit, 3.* Miss Duckert.

703. MIDDLE ENGLISH.

A study of the language and of documents representing the chief dialects. *Credit, 3.* Mr. Helming.

704. STRUCTURE OF ENGLISH.

Introduction to the methods of descriptive analysis of contemporary American English (sounds, forms, and syntax), with special emphasis on "standards of correctness." *Credit, 3.* Miss Rabel.

705. OLD ENGLISH LITERATURE.

Reading of various Old English works, but stressing *Béowulf.*
Prerequisite, English 702, or equivalent. *Credit, 3.* Miss Duckert.

706. MIDDLE ENGLISH LITERATURE.

Representative poems, verse plays, and selected prose, exclusive of Chaucer.
Prerequisite, English 703, or equivalent. *Credit, 3.* Mr. Helming.

721. THE DEVELOPMENT OF THE ENGLISH NOVEL.

Readings in the English novel to the late 19th century, from Richardson to Conrad, with special attention to some ten representative novels. *Credit, 3.* Mr. Page and Mr. Golden.

730. LITERATURE OF THE 16TH CENTURY.

Christian and Humanist ideals reflected in the poetry of Wyatt, Surrey, Sackville, Raleigh, Sidney, and Spenser, stressing *The Fairie Queene.* *Credit, 3.* Mr. Spivack.

734. ELIZABETHAN AND JACOBEAN DRAMA.

Representative plays by Shakespeare's contemporaries, 1580-1642; special emphasis on works by Marlowe, Jonson, Beaumont and Fletcher, and Ford. *Credit, 3.* Mr. McDonald and Mr. Bagg.

737. LITERATURE OF THE 17TH CENTURY.

Readings in 17th century prose from Hobbes to Bunyan, and in poetry from Donne to Milton; analysis of the more significant areas of thought and style.

Credit, 3. Mr. Koehler.

740. LITERATURE OF THE RESTORATION AND 18TH CENTURY.

Readings in English poetry and prose from Dryden to Burns, emphasizing the major writers and including representative plays. *Credit, 3.* Mr. Weston.

745. LITERATURE OF THE ROMANTIC PERIOD.

Readings in the major poetry, representative essays, and selected critical writings, including Blake, Coleridge, Wordsworth, Keats, Shelley, Byron, and Hazlitt.

Credit, 3. Mr. Haven and Mr. Brogan.

746. LITERATURE OF THE VICTORIAN AGE.

Readings in the chief poets and prophets of the Victorian age, with emphasis on Browning, Tennyson, Carlyle, Newman, Mill, Ruskin, Arnold, and Pater.

Credit, 3. Mr. Silver.

750. COLONIAL AMERICAN LITERATURE.

A study of the major writers and intellectual movements in America during the Colonial period. *Credit, 3.* Mr. Emerson.

753. AMERICAN ROMANTICISM.

The development of American romanticism, under European influence, stressing Cooper, Emerson, Thoreau, Poe, Hawthorne, Whitman, and Melville.

Credit, 3. Mr. Kaplan, Mr. McCarthy and Mr. Ratner.

755. AMERICAN REALISM.

The development of American realism from 1865 to 1914, stressing Twain, Henry James, Howells, and Henry Adams.

Credit, 3. Mr. O'Donnell, Mr. Spaulding and Mr. Halpern.

770. CONTEMPORARY DRAMA.

Representative English, Irish, and American dramas since the 1890's, stressing major trends from realism to the theatre of the absurd. *Credit, 3.* Mr. Rudin.

771. CONTEMPORARY FICTION.

Representative British and American novelists, emphasizing major trends, from Conrad to the present. *Credit, 3.* Mr. Chametzky and Mr. Hicks.

772. CONTEMPORARY POETRY.

The chief recent poets in English and their immediate forerunners, with brief attention to distinctive new voices and trends.

Credit, 3. Mr. Langland, Mr. Clark and Mr. Tucker.

780. IMAGINATIVE WRITING.

Writer's workshop, with emphasis upon poetry. May be repeated by candidates for the M.F.A. for a total of 6 credits. *Credit,* 3. Mr. Langland and Mr. Tucker.

781. IMAGINATIVE WRITING.

Writer's workshop, with emphasis upon fiction. May be repeated by M.F.A. candidates for a total of 6 credits. *Credit, 3.* Mr. Kim and Mr. Fetler.

785. COMPARATIVE LITERATURE. *Credit, 3.* The Staff.

790. FOLKLORE.

A study of folk narrative: tale, myth, and legend in relation to written literature.

Credit, 3. Miss Campbell.

800. THESIS, MASTER'S DEGREE.

(For the M.F.A. degree this course may be repeated for a total of 12 credits.)

Credit, 3-9.

870. SEMINAR IN ENGLISH LITERATURE. *Credit, 3.* The Staff.

871. SEMINAR IN THE ENGLISH LANGUAGE. *Credit, 3.* The Staff.

872. SEMINAR IN AMERICAN LITERATURE. *Credit, 3.* The Staff.

873. SEMINAR IN CRITICISM. *Credit, 3.* The Staff.

874. SEMINAR IN EDITING. *Credit, 3.* The Staff.

875. SEMINAR IN WRITING. *Credit, 3.* The Staff.

876. SEMINAR IN LINGUISTICS. *Credit, 3.* The Staff.

877. SEMINAR IN COMPARATIVE LITERATURE. *Credit, 3.* The Staff.

900. THESIS, DOCTORAL DEGREE. *Credit, 15-30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

503. THE ENGLISH BIBLE AS LITERATURE.

The several main genres of Biblical literature in their historical setting with attention to principles of interpretation; the literary influence of the Authorized Version.

Credit, 3. Mr. Sanders.

505. GREEK LITERATURE IN TRANSLATION.

Homer, lyric poetry, the major dramatists, selected dialogues of Plato, Thucydides, and their relations to the classical tradition in English literature.

Credit, 3. Mr. McDonald and Mr. Bagg.

521, 522. SHAKESPEARE.

Examination of Shakepeare's dramatic art and leading ideas through careful study of a dozen representative plays. *Credit, 3.* Mr. Spivack, Mr. O'Donnell, Mr. McDonald, Mr. Berlin, and Mr. Wolf.

525. DRAMATIC LITERATURE OF THE RESTORATION AND THE 18TH CENTURY.

A study of approximately twenty works illustrating themes and techniques of Restoration comedy, sentimental drama, and the heroic play, with emphasis on Dryden, Wycherley, Congreve, and Sheridan.

Credit, 3. Mr. Barron and Mrs. Hogan.

536. MILTON.

Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance, with emphasis on *Paradise Lost.*

Credit, 3. Mr. Koehler and Mr. Collins.

542. ENGLISH LITERATURE OF THE 18TH CENTURY.

The literature of the later 18th century with special emphasis on the Johnson Circle.

Credit, 3. Mr. Copeland, Mr. Golden, Mr. Page, and Mr. Weston.

563. MODERN BRITISH AND AMERICAN DRAMA.

A study of representative dramatists since the late 19th century, including Shaw, Fry, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art. *Credit, 3.* Mr. A. Williams and Mr. Rudin.

564. MODERN EUROPEAN DRAMA (IN TRANSLATION).

Major modern dramatists beginning with Ibsen, and including Chekhov, Pirandello, Strindberg, Giraudoux, Shaw, and others. Emphasis on comparative currents in various European nations.

Credit, 3. Mr. Rudin, Mrs. Hogan, and Mr. Halpern.

566. MODERN POETRY.

An analysis of twentieth-century poetry developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson to those of the present.

Credit, 3. Mr. Koehler, Mr. Clark, Mr. Langland, Mr. Barron, Miss Horrigan, and Mr. Tucker.

575. MAJOR AMERICAN WRITERS.

Selected major American writers of the 19th and 20th centuries, including Emerson, Hawthorne, Longfellow, Lowell, Henry James, Henry Adams, Fitzgerald, and Hemingway. *Credit, 3.* Mr. O'Donnell, Mr. Kaplan, Mr. A. Williams, Mr. McCarthy, Mr. Chametzky, Mr. Rudin, and Mr. Gozzi.

576. MAJOR AMERICAN WRITERS.

Selected major American writers of the 19th and 20th centuries, including Cooper, Poe, Melville, Thoreau, Whitman, Twain, Crane, Dreiser, Wolfe, and Faulkner. *Credit, 3.* Mr. Kaplan, Mr. O'Donnell, Mr. A. Williams, Mr. Halpern, Mr. McCarthy, and Mr. Gozzi.

580. INTRODUCTION TO FOLKLORE.

An exploration of the subject, beginning with the ballad as the nucleus of other folklore genres. *Credit, 3.* Miss Campbell.

585. LITERARY CRITICISM.

An introduction to literary criticism; chief emphasis on the major philosophical critics beginning with Plato and Aristotle. *Credit, 3.* Mr. Copeland, Mr. Clark, and Mr. R. Williams.

Comparative Literature

564. MODERN EUROPEAN DRAMA (in translation).

(See English 564 for description). *Credit, 3.* Mr. Rudin, Mrs. Hogan, and Mr. Halpern.

591. THE ENLIGHTENMENT.

Characteristic themes, ideas and attitudes in 18th Century European literature. The course will focus on major representatives of the Ages of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany.
Prerequisite, proficiency in French or German. *Credit, 3.* Mr. Heller and Mr. Page.

592. ROMANTICISM.

The Western Romantic movement as exemplified by its principal figures from the age of Rousseau to 1850.
Prerequisite, permission of the instructor. *Credit, 3.*

593. ANGLO-GERMAN LITERARY RELATIONSHIPS.

Credit, 3. Mr. Page and Mr. Wiegand.

595. SYMBOLISM.

The development of symbolism in the 19th and 20th century poetry of France (Baudelaire, Verlaine, Mallarmé, Rimbaud), Germany (George, Hofmannsthal, Rilke) and England (Yeats, Pound, Eliot). *Credit, 3.*

ENTOMOLOGY AND PLANT PATHOLOGY

GRADUATE FACULTY

Malcolm A. McKenzie, *Acting Head of Department and Director of Shade Tree Laboratory,* B.S., Brown, 1926; M.S., 1926; Ph.D., 1935.

Walter M. Banfield, *Associate Professor of Entomology and Plant Pathology,* B.S., Rutgers, 1925; Ph.D., Wisconsin, 1930.

William B. Becker, *Associate Professor of Entomology and Plant Pathology,* B.S., College of Forestry at Syracuse University, 1934; M.S., Massachusetts, 1937; Ph.D., 1945.

Constantine J. Gilgut, *Professor of Entomology and Plant Pathology,* B.S., Massachusetts, 1931; M.S., 1934; A.M., Harvard, 1937; Ph.D., 1942.

John F. Hanson, *Professor of Entomology and Plant Pathology,* B.S., Massachusetts, 1937; M.S., 1938; Ph.D., 1943.

Francis W. Holmes, *Associate Professor of Entomology and Plant Pathology,* B.A., Oberlin, 1950; Ph.D., Cornell, 1954.

John H. Lilly, *Professor of Entomology,* B.S., Wisconsin, 1931; Ph.D., 1935.

William D. McEnroe, *Assistant Professor of Entomology and Plant Pathology,* B.S., Connecticut, 1950; M.S., 1952; Ph.D., Rutgers, 1956.

John A. Naegele, *Professor of Entomology and Plant Pathology,* B.S., Cornell, 1949; M.S., 1952; Ph.D., 1952.

Richard A. Rohde, *Associate Professor of Entomology and Plant Pathology,* A.B., Drew University, 1951; M.S., Maryland, 1956; Ph.D., 1958.

Frank R. Shaw, *Professor of Entomology and Plant Pathology,* B.S., Massachusetts, 1931; Ph.D., Cornell, 1936.

Marion E. Smith, *Associate Professor of Entomology and Plant Pathology,* B.S., Massachusetts, 1935; M.S., 1936; Ph.D., Illinois, 1938.

Jean A. Snow, *Assistant Professor of Entomology and Plant Pathology,* B.S., DePauw University, 1954; Ph.D., Pennsylvania State, 1964.

Harvey L. Sweetman, *Professor of Entomology and Plant Pathology,* B.S., Colorado State, 1923; M.S., Iowa State College, 1925; Ph.D., Massachusetts, 1930.

William E. Tomlinson, Jr., *Professor of Entomology and Plant Pathology,* B.S., Tufts, 1936; M.S., Massachusetts, 1938.

William D. Tunis, *Professor of Entomology and Plant Pathology,* B.S., Massachusetts, 1949; M.S., Minnesota, 1951; Ph.D., Massachusetts, 1959.

Herbert E. Wave, *Assistant Professor of Entomology and Plant Pathology,* B.S., Maine, 1952; M.S., Rutgers, 1960; Ph.D., 1961.

Ellsworth H. Wheeler, *Professor of Entomology and Plant Pathology,* B.S., M.A.C., 1926; M.S., Cornell, 1937; Ph.D., 1946.

Bert M. Zuckerman, *Professor of Entomology and Plant Pathology,* B.S., North Carolina State, 1948; M.S., N. Y. State College of Forestry, 1949; Ph.D., Illinois, 1954.

ENTOMOLOGY

Requirements for the M.S. degree in Entomology include completion of a thesis and demonstration of a reading knowledge of one foreign language. Also each candidate must take or have had Entomology 150, 655, 656 and 657 or their equivalents, plus a minimum of eleven additional graduate credits in Entomology, including the six credits in graduate level courses that are required by the Graduate School.

Requirements for the Ph.D. degree include those established by the Graduate School, plus any additional ones specified by the student's Guidance Committee.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

(Most graduate level courses in the department are given on a rotating basis, subject to change on student demand.)

700. SPECIAL PROBLEMS.

Selected research problems in entomology. *Credit, 1-5.* The Staff

705. PRINCIPLES OF PLANT PROTECTION.

Fundamentals of insecticidal action, natural factors governing insect abundance and activity, infection and disease development, chemical control, cultural practices, quarantine and eradication, host resistance and pathogen variability and weed control. Offered only at the Waltham Field Station.

Credit, 3. The Staff.

745. HISTORICAL ENTOMOLOGY.

Lives and works of outstanding entomologists of the world; history of entomology. Prerequisite, permission of instructor. *Credit, 2.* Mr. Lilly.

770. RESEARCH METHODS.

An orientation course for incoming graduate students which stresses research principles, methods of anlysis, and presentation of results.

Credit, 3. Mr. Sweetman.

790. SEMINAR.

Reports on the current literature of entomology; special reports by resident and visiting speakers.
One class hour. (Maximum for M.S. Candidates, 2)
(Maximum for Ph.D. Candidates, 4)
Credit,1 each semester. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

803. INSECT EMBRYOLOGY.

The embryological development of a generalized type of insect, after which specific insects are considered. Lectures, assigned readings, laboratory work.
Prerequisite, Entomology 657. *Credit, 2.* Mr. Shaw.

811. INSECT BEHAVIOR.

The honey bee as a type for the study of behavior; interpretations of the reasons for the actions of this insect. Other species may be included for completeness.
Prerequisites, Entomology 126 and 566 or equivalent. *Credit, 3.* Mr. Shaw.

814. ADVANCED ANIMAL ECOLOGY.

Basic principles of terrestrial, limnological, and marine ecology, with special emphasis on the influence of causal factors, both physical and biotic, that regulate the activities of all organisms.
Prerequisite, Entomology 579 or equivalent. *Credit, 3.* Mr. Sweetman.

821. INSECT TOXICOLOGY.

The chemistry of insecticides and their physiological effects on insects, man and other animals.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Wave.

823. ADVANCED BIOLOGICAL CONTROL.

The basic fundamental principles, as well as practical application of biological control of insects. A section is devoted to control of pest weeds with insects.
Prerequisite, Entomology 680 or equivalent. *Credit, 3.* Mr. Sweetman.

842. ADVANCED ARTHROPOD TAXONOMY.

Classification of selected insects and insect allies, including latest methods in taxonomy and principles of classification.
Prerequisite, permission of instructor. Credit, 1-9. The Staff.

A. Culicidae MISS SMITH
B. Immature stages of insects MISS SMITH
C. Ticks MR. SHAW

D.	Siphonaptera	MR. SHAW
E.	Simuliidae	MR. SHAW
F.	Minor orders of insects	MR. HANSON
G.	Arthropods other than insects	MR. HANSON
H.	Other groups of insects	THE STAFF

848. PRINCIPALS OF SYSTEMATIC ENTOMOLOGY.

The species concept: type categories; the Zoological Code. The preparation of a taxonomic paper of publication quality, including drawing, required.
Prerequisites, Entomology 655, 656. *Credit, 3.* Mr. Hanson.

850. ADVANCED MEDICAL ENTOMOLOGY.

Detailed studies of insects as parasites of man and animals. Biology, vector-relationship, taxonomy and control.
Prerequisite, Entomology 674 or equivalent. *Credit, 3.* Mr. Shaw.

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

572. FOREST AND SHADE TREE INSECTS.

The principles and methods of controlling insects which attack shade trees, forests and forest products. A study of the more important species, their identification, biology, and specific control measures.
Two class hours, two 2-hour laboratory periods. *Credit, 4.* Mr. Hanson.

579. ANIMAL ECOLOGY.

The relation of animals to their environment, covering such physical factors as temperature, moisture, light, etc., and biotic factors as neighbors, competitors, predators, etc. Actual measurements of environmental factors and responses of animals in the field and laboratory.
Two class hours, one 2-hour laboratory period.
Prerequisite, Entomology 126 or a course in Zoology.
Credit, 3. Mr. Sweetman.

590. EVOLUTION.

A course in orientation. Lectures consider evolution of both organic and inorganic matter with attention to the evolution of human behavior and to the effect of evolutionary concepts on human philosophy. *Credit, 3.* Mr. Hanson.

655, 656. CLASSIFICATION OF INSECTS.

The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; second semester; other orders. Either semester may be elected independently.
Three 2-hour laboratory periods.
Prerequisite, Entomology 126; Entomology 657 recommended.
Credit, 3. Miss Smith.

657. INSECT MORPHOLOGY.

The external and internal anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology of insects.
One class hour, three 2-hour laboratory periods.
Prerequisite, Entomology 126. *Credit, 4.* Mr. Hanson.

674. MEDICAL AND VETERINARY ENTOMOLOGY.

Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests.
One class hour, two 2-hour laboratory periods.
Prerequisite, Entomology 126. *Credit, 3.* Mr. Shaw.

680. INSECT CONTROL.

The scientific basis of insect control, considered from the chemical, biological, ecological, mechanical, and legislative approaches. Special emphasis on the composition, manufacture, preparation, and reaction of insecticides, and the use of resistant hosts, microorganisms and the larger parasites and predators.
Prerequisites, Entomology 150, 655, and 657. *Credit, 3.* Mr. Sweetman.

682. INSECT PHYSIOLOGY.

Detailed consideration is given to the organ systems, showing the functions such as nutrition, respiration, and growth, and the relationship of physiology to behavior.
One class hour, two 2-hour laboratory periods.
Prerequisites, Entomology 126 and Introductory Physiology, Zoology 135.
Credit, 3. Mr. Wave.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Entomology)

560. STRUCTURAL PEST CONTROL.
Methods of combating insect and rodent pests, with emphasis on the control of those pests attacking buildings and other structures, foods, fabrics, and other stored products in homes or other establishments.
Two class hours, one 2-hour laboratory period.
Prerequisite, a course in Zoology; Entomology 126 desirable.
Credit, 3. Mr. Sweetman.

566. APICULTURE.
Honeybees and their relatives; structure and biology of bees; bee management, diseases, queen rearing, and honey production; history of apiculture.
Two class hours. One 2-hour laboratory period.
Prerequisite, Entomology 126 or a course in Zoology. *Credit, 3.* Mr. Shaw.

PLANT PATHOLOGY

Students accepted for graduate study are expected to have fulfilled the usual requirements for a Bachelor's degree in a related discipline. Requirements in addition to those of the Graduate School include a thesis based on original research and courses specified by the guidance committee. Major Advisers: Mr. Banfield; Mr. Rohde.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. SPECIAL PROBLEMS.
Selected research problems in plant pathology. Credit, 1-5. The Staff.

790. SEMINAR.
Reports and discussion on the current literature and research in plant pathology; special reports by resident and visiting speakers.
One class hour. *Credit, 1 each semester.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

804. FOREST PATHOLOGY.
The diseases of trees and the decay of forest products.
Prerequisites, Plant Pathology 551 and Mycology, Botany 531.
Credit, 3. Mr. Banfield.

805. ADVANCED PLANT PATHOLOGY — HOST-PARASITE RELATIONSHIPS.
The characteristics of diseased plants and the nature of host-parasite interactions. Reviews of current research will include student-led discussions.
Prerequisite, Plant Pathology 551. *Credit, 3.* Mr. Rohde.

806. ADVANCED PLANT PATHOLOGY — EPIDEMIOLOGY.
The interactions of host, parasite and environment in the rise and decline of devastating epiphytotics. The mechanisms that govern disease disposition, disease resistance and immunity.
Prerequisites, Botany 531 and Plant Pathology 551. *Credit, 3.* Mr. Banfield.

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

551. PLANT PATHOLOGY.
The nature, causes and control of plant diseases.
Prerequisite, a course in Botany. *Credit, 3.* Mr. Agrios.

569. FOREST AND SHADE TREE PATHOLOGY.
The nature, cause and control of the principal types of disease in trees including decay of forest products, standing and structual timber.
Credit, 3. Mr. Banfield.

575. METHODS IN PLANT PATHOLOGY.
General techniques and specialized methods used in the investigation of plant diseases.
Prerequisite, one semester of Plant Pathology. *Credit, 3.* The Staff.

678. NEMATOLOGY.
Anatomy, morphology and classification of plant-parasitic and other soil-inhabiting nematodes. Parasitic relationships with plants and current control measures will be stressed.
Prerequisite, a year of biological science. *Credit, 3.* Mr. Rohde.

690. INSECT TRANSMISSION OF PLANT DISEASES.
Lectures on intricate interrelationships of insects, plants, and microorganisms, with particular emphasis on the basic role played by insects in inception, distribution and perpetuation of plant diseases. *Credit, 3.* Mr. Banfield.

FOOD SCIENCE AND TECHNOLOGY

GRADUATE FACULTY

William B. Esselen, *Head of Department of Food Science and Technology, and Professor of Food Technology,* B.S., Massachusetts, 1934; M.S., 1935; Ph.D., 1938.

Irving S. Fagerson, *Professor of Food Science and Technology,* B.S., Massachusetts Institute of Technology, 1942; M.S., Massachusetts, 1948; Ph.D., 1950.

Frederick J. Francis, *Professor of Food Science and Technology,* B.A., University of Toronto, 1946; M.A., 1948; Ph.D., Massachusetts, 1954.

Denzel J. Hankinson, *Professor of Food Science and Technology,* B.S., Michigan State, 1937; M.S., Connecticut, 1939; Ph.D., Pennsylvania State, 1942.

Kirby M. Hayes, *Professor of Food Science and Technology,* B.S., Massachusetts, 1947; M.S., 1948.

Herbert O. Hultin, *Associate Professor of Food Science and Technology,* B.S., Massachusetts Institute of Technology, 1956; M.S., 1956; Ph.D., 1959.

Ward M. Hunting, *Assistant Professor of Food Science and Technology,* B.S., Houghton College, 1947; M.S., Massachusetts, 1949; Ph.D., 1963.

Robert E. Levin, *Assistant Professor of Food Science and Technology,* B.S., Los Angeles State College, 1952; M.S., Southern California, 1954; Ph.D., California, 1963.

Arthur S. Levine, *Professor of Food Science and Technology,* B.S., Massachusetts, 1935; M.S., 1936; Ph.D., 1939.

Donald E. Lundberg, *Professor of Food Science and Technology,* B.S., Iowa State Teachers College, 1941; M.S., Duke, 1942; Ph.D., Cornell, 1946.

Wassef W. Nawar, *Associate Professor of Food Science and Technology,* B.S., University of Cairo, 1947; M.S., 1950; Ph.D., Illinois, 1960.

Frank E. Potter, *Associate Professor of Food Science and Technology,* B.S., Maine, 1942; M.S., Maryland, 1948; Ph.D., Pennsylvania State, 1955.

F. Miles Sawyer, *Associate Professor of Food Science and Technology,* B.S., Massachusetts Institute of Technology, 1948; M.S., California, 1951; Ph.D., 1958.

Charles R. Stumbo, *Associate Professor of Food Science and Technology,* B.S., Kansas State, 1936; M.S., 1937; Ph.D., 1941.

INSTITUTE OF AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY

Warren Litsky, *Director and Commonwealth Professor of Agricultural and Industrial Microbiology,* B.A., Clark University, 1945; M.S., Massachusetts, 1948; Ph.D., Michigan State, 1951.

Haim B. Gunner, *Assistant Professor of Agricultural and Industrial Microbiology,* B.S., University of Toronto, 1946; M.S., University of Manitoba, 1948; Ph.D., Cornell, 1962.

William S. Mueller, *Associate Professor of Agricultural and Industrial Microbiology,* B.S., Illinois, 1927; M.S., Rutgers, 1928; Ph.D., Massachusetts, 1939.

Robert W. Walker, *Research Instructor of Agricultural and Industrial Microbiology,* B.S., Massachusetts, 1955; M.S., 1959; Ph.D., Michigan State, 1963.

Graduate students who wish to major in Food Science and Technology may not be admitted to candidacy for an advanced degree until such time as the undergraduate requirements in basic sciences and department courses have been met substantially. Work in the area of Dairy Technology is included in the offerings of the Department of Food Science and Technology.

Industrial Microbiology is offered as an area of concentration for the Ph.D. degree in the Department of Food Science and Technology in cooperation with the Institute of Agricultural and Industrial Microbiology.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. RESEARCH PROBLEM.

Mainly for candidates for the Master of Science degree who do not write a thesis. Original research expected. Two bound copies of a written report of the study are required by the department. *Credit, 3-6.* The Staff.

703. RESEARCH PROJECT.

Research on problems not related to the thesis. For Ph.D. candidates only. *Credit,* 1-4. The Staff.

802. ADVANCED DAIRY CHEMISTRY.

The physical, colloidal, and chemical properties of dairy products and the role of milk fat, salts, proteins, carbohydrates, and enzyme systems.
Two class hours, one 3-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Potter.

809. MICROBIOLOGY AND FOOD PROCESSING. I.

Relationship of yeasts, molds, and bacteria to foods. Invasion of plant tissue by microorganisms. Microbiology of frozen and refrigerated foods. Ionizing radiation preservation. Alcohol and lactic acid fermentations and vinegar production.
Two class hours, one 3-hour laboratory period.
Prerequisites, Food processing, basic biochemistry and microbiology and consent of instructor. *Credit, 3.* Mr. Levin.

810. THERMOBACTERIOLOGY AND FOOD PROCESSING. II.

Bacteria of importance in spoilage of canned foods. Bacterial contamination and its control. Thermal resistance of bacteria. Heat transfer in thermally processed foods. Calculation and evaluation of sterilization processes.
Three class hours.
Prerequisites, Food Science and Technology 809 and calculus.
Credit, 3. Mr. Stumbo.

816. FOOD PACKAGING.

Characteristics of packaging materials and how they meet the package requirements of various food products. Methods of testing for structural quality and performance including moisture and gas transmission. Consideration of adhesives, lacquers and closures. Plant visits in non-scheduled hours.
One or more class hours, one 4-hour laboratory period.
Prerequisites, Food Science and Technology 662. *Credit, 3.* Mr. Levine.

821. LIPID CHEMISTRY.

Composition and chemical properties of edible fats and oils. Physical characteristics — plasticity, polymorphism, melting, solidification. Technology of industrial fats — extraction, refining, hydrogenation, interesterification. Deteriorative reactions — oxidation, thermal degradation. Biological significance. New methods of analysis. Review of current literature.
Two class hours, one 2-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Nawar.

841. ADVANCED FOOD ANALYSIS.

Physical and chemical means of expressing quality of a product. Application of analytical instrumental methods including paper and gas chromatography, infrared spectrophotometry, radioactive tracer techniques, etc.
One class hour, one conference.
Prerequisites, Food Science and Technology 672 and 684.
Credit, 3. Mr. Fagerson.

850. FOOD COLORIMETRY.

Physics of color measurement and theories of vision. Interpretation of reflection and transmission colorimetric data in terms of Munsell, C. I. E., Hunter, Adams and other color solids, color tolerances, and small color differences. Interpretation of color changes in terms of the properties of food pigments and colorants and their importance in food science.
Two class hours, one 3-hour laboratory period.
Prerequisite, consent of instructor. *Credit, 3.* Mr. Francis.

871, 872. SEMINAR.

Review of current literature and research. Visiting lecturers.
One class hour. Maximum credit, 6. *Credit, 1.* The Staff.

895. BIOLOGICAL AND TOXICOLOGICAL ASSAY OF FOODS.

Laboratory training in making biological assays of food constituents important in human and animal nutrition. Added chemicals in foods.
Prerequisites, Chemistry 684 and Food Science and Technology 672.
Credit, 2-5. Mr. Sawyer.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

658. ANIMAL PRODUCTS.

Preparation, processing, packaging and marketing of animal products.
One class hour, one 4-hour laboratory period.
Credit, 3. Mr. Buck, Mr. Denison.

661, 662. INDUSTRIAL TECHNOLOGY.

A survey of commercial principles in the manufacture and preservation of food products. Includes individual research projects.
One class hour, one 4-hour laboratory period.
Prerequisites, Food Science and Technology 551.
Credit, 3 each semester. Mr. Levine.

665. UNIT OPERATIONS.

Technical principles involved in the handling and processing of milk and dairy products.
Two class hours, one 4-hour laboratory period. *Credit, 4.* Mr. Potter.

666. QUALITY CONTROL AND STANDARDS.

Relationship of composition, handling, processing, storage and market regulations to the bacteriological and chemical quality of milk and its products.
Two class hours, two 2-hour laboratory periods. *Credit, 4.* Mr. Evans.

671, 672. ANALYSIS OF FOOD PRODUCTS.

Physical, chemical, microbiological and microscopical methods will be employed. Federal and State food regulations are considered.
Two class hours, one 4-hour laboratory period.
Prerequisites, Chemistry 210 and Food Science and Technology 551 or 575.
Credit, 3 each semester. Mr. Hunting.

684. SENSORY EVALUATION METHODS.

An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretation; taste, odor, color, and texture measurements.
One class hour, one 2-hour laboratory period. *Credit, 2.* Mr. Sawyer.

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Food Science and Technology)

551. INTRODUCTORY FOOD SCIENCE.

A basic course, primarily for department majors, covering food manufacture, processing, distribution and spoilage problems.
Two class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Esselen.

552. FOOD CHEMISTRY.

Composition of food products. Changes that occur in the chemistry of foods during storage and processing. Enzymes in the food industry.
Two class hours, one 4-hour laboratory period alternate weeks.
Prerequisites, Food Science and Technology 551. *Credit, 3.* Mr. Hultin.

575. PRINCIPLES OF FOOD TECHNOLOGY.

Intended only for those who desire a survey of the field. Not open to Food Science and Technology majors.
Two class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Esselen.

FORESTRY AND WOOD TECHNOLOGY

GRADUATE FACULTY

Arnold D. Rhodes, *Head of Department and Professor of Forestry,* B.S., New Hampshire ,1934; M.F., Yale, 1937.

Herschel G. Abbott, *Associate Professor of Silviculture,* B.S., Maine, 1943; M.F., Harvard, 1952; M.A., 1959.

Emmett Bennett, *Professor of Biochemistry,* B.S., Ohio State, 1929; M.S., Massachusetts, 1934; Ph.D., Pennsylvania State, 1950.

Harold B. Gatslick, *Professor of Wood Technology,* B.S., State University College of Forestry, Syracuse, 1944; M.S., 1948; Ph.D., 1954.

R. Bruce Hoadley, *Assistant Professor of Wood Technology,* B.S., Connecticut, 1955; M.F., Yale, 1957; D.F., 1962.

William P. MacConnell, *Professor of Forestry,* B.S., Massachusetts, 1943; M.F., Yale, 1948.

Donald L. Mader, *Associate Professor of Forest Soils,* B.S., New York State College of Forestry, Syracuse, 1950; M.S., Wisconsin, 1954; Ph.D., 1956.

Andrew J. W. Scheffey, *Associate Professor of Forestry,* B.A., Haverford College, 1950; M.S., Michigan, 1951; Ph.D., 1958.

Applicants for admission who plan to major in forestry or wood technology customarily should have completed an undergraduate major in one of these fields. An exception may be made in the case of individuals having a strong background in a related discipline, economics, or the basic sciences. Candidates for a Master's degree majoring in forestry or wood technology ordinarily must complete a thesis; exceptions will be made in unusual circumstances. Emphasis may be in the area of forest soils, forest ecology, silviculture, resource management, resource economics, forest products marketing or wood technology.

Facilities for instruction and research include the newly constructed and well equipped Holdsworth Natural Resources Center, a sawmill, dry kiln, and several thousand acres of University-owned and other available forest land within ten miles of the campus.

Although the Department does not offer the Ph.D. degree, it is possible by cooperative arrangement with other departments such as Botany or Plant and Soil Science for the student to receive his doctorate in one of these departments based on a thesis project carried out in some phase of forestry or wood science and technology.

FORESTRY

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROJECT.

Selected research problem in forestry not related to the candidate's thesis.
Credit, 2-4. The Staff.

701. ADVANCED FOREST SOILS.

The relation of soils to tree growth and other environmental factors with particular emphasis on research methods, site evaluation, water relationships, and fertility; laboratory and field exercises.
Prerequisite, Forestry 524 or equivalent. *Credit, 3.* Mr. Mader.

702. AERIAL PHOTO-INTERPRETATION.

Advanced aerial photo-interpretation emphasizing the analysis of natural vegetation, especially forest vegetation; a wide selection of aerial photographs is available for interpretive study and and cartography.
Prerequisite, Forestry 531 or equivalent. *Credit, 3.* Mr. MacConnell.

703. ADVANCED FOREST ECOLOGY.

Research methods and instrumentation in forest ecology; forest influences with special emphasis on the effect of micro-climate on site quality and the management of watersheds.
Prerequisite, Forestry 523 or equivalent. *Credit, 3.* Mr. Mader.

704. ADVANCED SILVICULTURE.

Growth and reproductive characteristics and requirements of trees and forest stands as they affect silvicultural management, particularly in relation to thinning and the establishment of forest regeneration.
Prerequisites, Forestry 523, 524 and 526 or equivalents. *Credit, 3.* Mr. Rhodes.

705. RESEARCH CONCEPTS IN FOREST BIOLOGY.

A study of the development of biological knowledge relating to forestry from both the historical and philosophical points of view with special emphasis on contributions of contemporaneous scientific research. Given in alternate years.
Credit, 3. Mr. Abbott.

706. ADVANCED FOREST MENSURATION.

Regression analysis applied to stand and tree volume determination, stand growth and yield, forest site evaluation, and related measurement problems. Computer techniques will be used to solve some of the problems.
Prerequisites, Forestry 525 and 534 or equivalents. *Credit, 3.* Mr. Mawson.

707. ADVANCED FOREST MANAGEMENT.

Economic evaluation of forest enterprises; appraisal of rates of return, damage, and stumpage values.
Prerequisite, Forestry 540 or equivalent. *Credit, 3.* Mr. MacConnell.

708. MICRO-ECONOMICS OF FORESTRY I.

Principles of micro-economics as applied to forestry problems with special emphasis on marginal analysis in regard to land, labor, and capital.
Prerequisite, Forestry 535 or equivalent. *Credit, 3.* Mr. Bond.

709. MICRO-ECONOMICS OF FORESTRY II.

A continuation of Forestry 708 with emphasis on supply and demand, marketing, taxation, and social problems in relation to the forest economy.
Credit, 3. Mr. Bond.

791, 792. SEMINAR.

Specialized study in a selected area of forestry. *Credit, 1-3.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

521. TIMBER HARVEST AND CONVERSION.

Timber harvesting, milling techniques, and markets; field trip of one week duration to observe these processes in major wood industries.
Four 40-hour weeks in the summer.

Credit, 4. Mr. Bond and Mr. MacConnell.

523. SILVICS.

Forest ecology as a foundation for silviculture; environmental factors and their effect upon vegetation; development and classification of trees and forest communities; forest influences. *Credit, 3.* Mr. Mader.

524. FOREST SOILS.

Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and range management; forest soil description, classification and mapping.
Prerequisite, Soil Science 105. *Credit, 3.* Mr. Mader.

525. THE ELEMENTS OF FOREST MENSURATION.

The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data. Given each summer, and in alternate years the first semester.

Credit, 3. Mr. Mawson and Mr. MacConnell.

526. THE PRINCIPLES OF SILVICULTURE.

Forest culture of wood crops; regeneration and intermediate cuttings, silvicides, prescribed burning, site treatment, slash disposal, nursery management, forest planting and direct seeding; interactions with management for water, wildlife, and recreation.
Prerequisite, Forestry 523 recommended.

Credit, 4. Mr. Rhodes and Mr. Abbott.

529. FOREST PROTECTION.

Principles of protecting forests from fire, insects, diseases, domestic animals, wildlife, and atmospheric agencies with special emphasis on the prevention and control of forest fires. *Credit, 3.* Mr. Abbott.

531. AERIAL PHOTOGRAMMETRY.

Principles of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces. Photographic interpretation and map making from aerial photographs. *Credit, 3.* Mr. MacConnell.

532. FOREST TREE IMPROVEMENT.

Tree introduction, geographic variation, tree selection, vegetative propagation, controlled pollination and hybridization, seed orchard management.
Credit, 3. Mr. Abbott.

534. FOREST SURVEY AND SAMPLING DESIGN.

The theory and application of sampling techniques in forest survey and research problems including simple random, stratified, sub-sampling, representative, and probability sampling. *Credit, 3.* Mr. Mawson.

535. FOREST ECONOMICS.

The application of economic principles to the allocation of land, labor and capital in forest enterprises; market and pricing theory of forest products.
Prerequisite, Introductory Economics. *Credit, 3.* Mr. Bond.

536. FOREST RESOURCES POLICY.

Forest policy in the United States: history of policy development; factors affecting forest resources management; forest taxation, credit, insurance, and resource planning. *Credit, 3.* Mr. Bond.

540. PRINCIPLES OF FOREST MANAGEMENT.

Multiple-use management of forest land, organization of the forest for sustained-yield management; preparation of a management plan for a 10,000-acre forest. Laboratory period optional for non-forestry majors.
Prerequisite for the laboratory, Forestry 525. *Credit, 3-5.* Mr. MacConnell.

WOOD TECHNOLOGY

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROJECT.

Selected research problem in wood technology not related to the candidate's thesis. *Credit, 2-4.* The Staff.

710. CHEMICAL MODIFICATION OF WOOD.

Basic concepts and techniques concerning the chemical modification of wood; the potential and limitations of physical and chemical treatments as they affect the dimensional stability and durability of wood.
Prerequisites, Organic Chemistry and Forestry 504. *Credit, 3.* The Staff.

791, 792. SEMINAR.

Specialized study in a selected segment of wood products marketing or wood technology. *Credit, 1-3 each semester.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

501. WOOD ANATOMY AND IDENTIFICATION.

A basic anatomical study of wood elements, their various structural characteristics and function; identification of woods. *Credit, 3.* Mr. Hoadley.

502. PRIMARY TIMBER CONVERSION. (1967-68)

Survey of operations, principally sawmilling, in primary conversion of logs into lumber and allied by-products; drying, grading, handling and market distribution of sawmill products. Not open to students in forest management except by special permission. *Credit, 3.* Mr. Hoadley.

503. FOREST PRODUCTS.

A survey of the principal forest products, their manufacture and distribution. *Credit, 3.* Mr. Gatslick.

504. PROPERTIES OF WOOD. (1966-67)

The physical and chemical characteristics of wood in relation to its use; the influence of growth upon wood properties; methods of testing. *Credit, 3.* Mr. Hoadley.

506. WOOD MACHINERY THEORY AND PRACTICE. (1967-68)

Fundamental principles of knife and saw-tooth action as applied to problems of severing, surfacing, and shaping; general survey of commercial wood machining equipment.

Prerequisites, Forestry 501 and 504. *Credit, 3.* Mr. Hoadley.

508. WOOD SEASONING AND PRESERVATION. (1966-67)

Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment. *Credit, 3.* Mr. Gatslick.

510. WOOD COATING AND ADESIVE TECHNOLOGY. (1967-68)

Basic concepts and applied techniques in wood substrate surface modification and bonding to include materials and methods in finishing and gluing wood and fibrous composites.

Prerequisites, Organic Chemistry, Forestry 501 and 504. *Credit, 3.* Mr. Gatslick.

GEOLOGY

GRADUATE FACULTY

Harold T. U. Smith, *Head of Department and Professor of Geology,* B.S., Wooster College, 1930; M.A., Harvard, 1933; Ph.D., Harvard, 1936.

Oswald C. Farquhar, *Professor of Geology,* B.A., Oxford, 1947; M.A., Oxford, England, 1948; Ph.D., Aberdeen, Scotland, 1951.

Miles O. Hayes, *Assistant Professor in Geology,* A.B., Berea College, 1957; M.A., Washington University, 1959; Ph.D., Texas, expected 1965.

Howard W. Jaffe, *Associate Professor of Geology,* B.A., Brooklyn College, 1942.

George E. McGill, *Associate Professor of Geology,* B.A., Carleton College, 1953; M.S., Minnesota, 1955; Ph.D., Princeton, 1958.

Ward S. Motts, *Associate Professor of Geology,* B.A., Columbia, 1949; M.S., Minnesota, 1951; Ph.D., Illinois, 1957.

Charles W. Pitrat, *Associate Professor of Geology,* B.A., Kansas, 1949; M.S., Wisconsin, 1951; Ph.D., Wisconsin ,1953.

Peter Robinson, *Assistant Professor of Geology,* A.B., Dartmouth, 1953; M.Sc., Otago University, New Zealand, 1958; Ph.D., Harvard, 1964.

Gregory W. Webb, *Associate Professor of Geology,* B.A., Columbia, 1948; M.A., Columbia, 1950; Ph.D., Columbia, 1954.

Requirements for the M.S. degree are as follows:

1. A minimum of 60 credits in geology, including both undergraduate and graduate work.

2. Courses in related sciences comparable to those required for undergraduate majors: one year each of chemistry and physics, one semester of approved biologic science and mathematics through calculus.

3. Proficiency in technical writing.

4. At least six weeks of training in field geology.

5. Graduate credits in geology as required by the Graduate School.

6. A qualifying examination on knowledge of general geology, including field and laboratory techniques and sources of geologic information.

7. A thesis based at least in part on field study, and representing an original contribution to geologic knowledge.

8. A final examination, emphasizing defense of the thesis, together with a more advanced knowledge of the field or fields which represent background for the thesis.

At the beginning of the first semester in residence, new graduate students are given placement interviews covering prior training and fields of their geologic interests. These interviews provide a partial basis for planning the student's course of study.

Requirements for the Ph.D. degree, in addition to general requirements of the Graduate School, are as follows:

1. Ordinarily the doctoral candidate is assumed to have received the Master's degree or equivalent training; however, selected students with outstanding records may be accepted provisionally with the Bachelor's degree only, and proceed more directly toward meeting doctoral requirements.
2. Basic training in physics, chemistry, mathematics, and biology, and additional work in at least one of these fields.
3. At least 6 months of approved field training and experience.
4. A broad knowledge of fundamental concepts, methods of investigation, and historical development of geologic science.
5. Mastery of an elected field or fields of specialization.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Either or both of the following options may be selected:

A. Independent study — guided reading and/or laboratory study in subjects or techniques not covered by other courses in the department.

B. Research — original library, field, and/or laboratory investigation of a selected problem.

Prerequisites, 45 credits in geology and consent of department head and of instructor concerned. *Credit, 2-6.* The Staff.

712. ADVANCED MINERALOGY.

Physical and chemical characteristics of minerals and methods of laboratory investigation, including X-ray, differential thermal analysis, and microchemical techniques.

Prerequisites, Geology 611 and permission of instructor. *Credit, 3.* Mr. Jaffe.

716. GEOCHEMISTRY.

Principles of geochemistry and interpretation of geochemical data in relation to geological processes and to the origin and history of the earth.

Prerequisites, Geology 110, 520, one year of college chemistry and permission of instructor. *Credit, 3.* Mr. Jaffe.

722. IGNEOUS PETROLOGY.

Description, classification, origin, and alteration of igneous rocks. Examination of rocks in hand specimen and in thin section under the microscope.
1967-68 and each alternate year.
Prerequisites, Geology 520, 611. *Credit, 3.* Mr. Robinson.

723. SEDIMENTARY PETROLOGY.

Description, classification, and origin of sedimentary rocks; laboratory study of structure, texture, and composition using the microscope and other analytical techniques.
Prerequisites, Geology 611 and 550. *Credit, 2.* Mr. Hayes.

724. METAMORPHIC PETROLOGY.

Description, classification and origin of metamorphic rocks. Microscopic study of suites of thin sections.
1966-67 and each alternate year.
Prerequisites, Geology 520 and 611. *Credit, 3.* Mr. Robinson.

732. ADVANCED STRUCTURAL GEOLOGY.

Dynamics and mechanics of rock deformation, including theoretical and experimental studies, with field applications.
Prerequisites, Geology 130, 531 and calculus. *Credit, 3.* Mr. McGill.

735. REGIONAL GEOLOGY OF NORTH AMERICA.

Tectonic concepts as exemplified by the stratigraphic and structural evolution of North America.
Prerequisites, Geology 102 and 130. *Credit, 3.* Mr. McGill.

741. STRATIGRAPHIC PALEONTOLOGY.

Application of selected fossils and faunal assemblages to stratigraphic correlation, and paleoecological and paleogeographic analysis, with reference to evolutionary trends.
Prerequisites, Geology 540 and 645. *Credit, 3.* Mr. Pitrat.

751. SEDIMENTATION.

A critical analysis of modes of origin of the several types of sedimentary rocks.
Prerequisites, Geology 550 and 645. *Credit, 3.* Mr. Hayes.

752. MARINE GEOLOGY.

Physical characteristics and geological processes of the ocean basins and margins, and their bearing on interpretation of geologic history.
Prerequisites, Geology 645 and 666. *Credit, 3.* Mr. Webb.

756. COASTAL PROCESSES.

Erosional, transportational, and depositional phenomena, including organic processes, of the various types of coastal environments, their relation to geologic, geomorphic, and oceanographic factors, and their significance in stratigraphic interpretation and in other fields.
Prerequisites, Geology 645, 655, and 660, or permission or instructor.
Credit, 2. Mr. Hayes.

761. MAP INTERPRETATION.

A laboratory study of the various types of maps used by geologists, with special reference to the identification and interpretation of landforms and structures.
Prerequisites, Geology 660. *Credit, 2.* Mr. Smith.

762. ADVANCED GEOMORPHOLOGY.

A critical study of selected topics and current problems in geomorphology.
Prerequisite, Geology 660. *Credit, 2.* Mr. Smith.

769. ADVANCED PHOTOGEOLOGY.

A laboratory study of surface expression as a key to subsurface phenomena as illustrated by specific areas.
Prerequisites, Geology 660, and 668. *Credit, 2.* Mr. Smith.

782. PETROLEUM GEOLOGY

Geologic occurrence of oil and gas. Laboratory work consists of problems related to reservoir and trap conditions and to methods of subsurface study.
Prerequisites, Geology 130, 110 and 645; 735 desirable. *Credit, 3.* Mr. Webb.

783. METALLIFEROUS ECONOMIC GEOLOGY.

Nature, origin, and distribution of metalliferous ores. Criteria for recognition of ore deposits, changes in character of ore with depth, mineral associations, and types of wallrock alteration. Optical and microchemical properties of ore minerals and ore concentrates.
Given in alternate years.
Prerequisites, Geology 130, 110 and 520; 722 desirable.
Credit, 3. Mr. Farquhar.

784. NON-METALLIFEROUS ECONOMIC GEOLOGY.

Geology, distribution, and utilization of non-metallic mineral deposits, including coal and other solid hydrocarbons.
Given in alternate years.
Prerequisites, Geology 130, 110, 520, 645 and 611. *Credit, 3.* Mr. Farquhar.

786. GROUND-WATER GEOLOGY.

Theoretical and practical ground-water hydrogeology and its relation to geomorphology, glacial geology, sedimentology, and engineering geology.
Prerequisites, Chemistry 1 and 2, 15 hours of geology; 645 and 666 recommended.
Credit, 3. Mr. Motts.

790. SEMINAR.

Review of current literature or discussion of selected topics.
Credit, 1 each semester. Maximum credit, 2. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

805. EVOLUTION OF GEOLOGIC CONCEPTS.

Perspective on current geological thought in the light of its historical background; particular attention to controversial questions and to the rise and decline of ruling theories.
Prerequisite, one year of graduate study. *Credit, 2.* Mr. Motts.

846. CENOZOIC STRATIGRAPHY.

Occurrence, correlation, and origin of marine and terrestrial Cenozoic deposits and their relation to paleogeographic and tectonic conditions, with particular reference to North America.
Prerequisites, Geology 645 and 660; 735 recommended. *Credit, 3.* Mr. Webb.

863. PHYSIOGRAPHY OF NORTH AMERICA.

A survey of the physiographic provinces of North America and their evolution, with emphasis on problems and methods of approach.
Prerequisite, Geology 660 and 735 desirable. *Credit, 3.* Mr. Motts.

887. ADVANCED HYDROGEOLOGY.

Advanced ground-water hydrology, analog models, pumping tests, flow-duration curves, flow nets, Hubbert's hydrologic models, water chemistry, and geophysical methods of investigation.
Prerequisites, Geology 786 and Math. 110, or permission of instructor.
Credit, 3. Mr. Motts.

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

611. OPTICAL MINERALOGY.

Principles of optics, optical properties of minerals and methods for their measurement, relationship between optical properties and crystallography, and mineral identification by the immersion method.
Prerequisites, Geology 110, Physics 103 and 104. *Credit, 3.* Mr. Farquhar.

621. PETROGRAPHY.

Identification of minerals in thin section, study of common igneous, sedimentary, and metamorphic rocks in thin section, routine petrographic calculations and measurements, and introduction to petrogenetic theory. Examination of selected igneous and metamorphic rocks in the field.
Prerequisites, Geology 220 and 611. *Credit, 3.* Mr. Robinson.

655. PHYSICAL OCEANOGRAPHY.

Physical properties of sea water and their variations; water masses and their circulation patterns; interaction between ocean and atmosphere; dynamics of waves, tides, and ocean currents; techniques of oceanographic study.
Prerequisites, Two years of college work toward a major in science or engineering; Physics 103 and 104, or 105, 106, and 107; calculus recommended.
Credit, 3. Mr. Hayes.

660. GEOMORPHOLOGY.

Origin and development of landforms in relation to geological processes, climatic environment, and tectonic history. Application of geomorphic methods to interpretation of Cenozoic geologic history.
Two class hours, one 2-hour laboratory period.
Prerequisites, Geology 101, 102 and 130. *Credit, 3.* Mr. Smith.

666. PLEISTOCENE GEOLOGY.

Geochronology of Pleistocene time as related to climatic changes and their influence on glaciology, erosional and depositional processes, landforms, sedimentary deposits, shifting sea level, and the paleontological record. Field trips by arrangement.
Two class hours, one 2-hour laboratory period.
Prerequisites, Geology 101 and 102. *Credit, 3.* Mr. Motts.

668. PHOTOGEOLOGY.

A laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos.
Two 3-hour laboratory periods.
Prerequisites, Geology 130 and 531. *Credit, 3.* Mr. Smith.

670. GEOPHYSICS.

The physics of the earth and the gravitational, magnetic, electrical, and seismic methods of geophysical exploration. Laboratory work consists of problems and computations.
Prerequisites, Geology 130 and 520 or permission of instructor.
Credit, 3. Mr. Rice.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Geology)

520. LITHOLOGY.

A descriptive study of the classes of rocks with reference to manner of origin, modes of occurrence, structural features and the chemical and petrographic distinction within each group.
One class hour, two 2-hour laboratory periods.
Prerequisites, Geology 101 and 110. *Credit, 4.* Mr. Nelson.

530. FIELD AND STRUCTURAL GEOLOGY I.

Basic methods of field geology; occurrences and recognition of geologic structure; preparation and interpretation of geologic maps; solution of simple structural problems.
Prerequisites, Geology 101 and Trigonometry.
Credit, 3. Mr. McGill and Mr. Robinson.

531. FIELD AND STRUCTURAL GEOLOGY II.

Structural and dynamic analysis of deformed rocks; introduction to tectonics; field study of complex areas.
Prerequisites, Geology 102, 520, 530. *Credit, 3.* Mr. McGill and Mr. Robinson.

540. INVERTEBRATE PALEONTOLOGY.

History, development and identification of invertebrate animal fossils. Field trips by arrangement.
Prerequisites, Geology 102. *Credit, 3.* Mr. Pitrat.

550. SEDIMENTOLOGY AND STRATIGRAPHY.

Composition, origin, and classification of sedimentary rocks and principles of stratigraphic correlation, with problems and examples from major rock units.
Prerequisites, Geology 102, 520, and 530. *Credit, 4.* Mr. Hayes and Mr. Webb.

580. ENGINEERING GEOLOGY.

Materials and surface features of the earth and their relation to engineering problems; map reading as related to the phenomena of physical geology.
Two class hours, one 3-hour laboratory period. *Credit, 3.* Mr. Farquhar.

589. FIELD PROBLEMS.
Directed field study and/or research.
One week of full-time summer work for each credit.
Prerequisites, approval of Faculty advisor and department head.
Credit, 2-6. The Staff.

PROFESSIONAL COURSES
(No credit towards a degree in Geology)

403. CONCEPTS OF EARTH SCIENCE FOR TEACHERS.
Evolution of earth and life; basic materials ,principles, and methods of study; relation to other sciences; role in modern life; use of maps, specimens, literature, and field studies. *Credit, 3.* The Staff.

GERMAN-RUSSIAN

GRADUATE FACULTY

Frederick C. Ellert, *Professor of German,* B.S., Massachusetts, 1930; M.A., Amherst College, 1943; Ph.D., Stanford University, 1956.

Ronald Hauser, *Assistant Professor of German,* A.B., California at Berkeley, 1951; M.A., 1954; Ph.D., 1957.

Peter Heller, *(Commonwealth) Professor of German,* B.A., McGill University, 1944; M.A., Columbia, 1945; Ph.D., 1951.

Eva Schiffer, *Assistant Professor of German,* B.S., Massachusetts, 1946; M.A., Radcliffe, 1947; Ph.D., 1962.

Willy Schumann, *Associate Professor of German,* B.A., Southern Methodist University, 1952; M.A., 1953; Ph.D., Columbia, 1959.

Laszlo M. Tikos, *Assistant Professor of Russian,* M.A., University of Debrecen, Hungary, 1954; Ph.D., University of Tübingen, German, 1962.

Hermann J. Weigand, *Visiting Professor of German,* A.B., Michigan, 1913; M.A., 1914; Ph.D., 1916.

Master of Arts

Prerequisites for admission: A B.A. degree with a major in German language and literature and indication of ability to do successful graduate work. Deficiencies in literary background and insufficient command of spoken or written German must be made up before the candidate can be admitted to certain courses required for the degree.

Language: For this degree the student must have, or must acquire, a reading knowledge of at least one major language, modern or ancient, other than German and English.

Program of study: A minimum of twenty-one credits in the major field. Twelve of these credits must be earned in "courses open to graduate students only" 700-999 series, unless a student chooses to offer a thesis in place of six of these credits. The Proseminar in Bibliography and Methodology is required and should be taken as early as possible. One course must be of linguistic character; this will normally be the course in Middle High German.

Cooperative, Ph.D. Degree in German
In order to enroll for this program candidates must satisfy a Screening Committee as to their qualifications for advanced work in the field. Language requirements include a reading knowledge of French and of an additional language (other than German or English) pertinent to the candidate's field of specialization. Study programs for Ph.D. candidates, which must include 1) Old High German or Gothic and 2) Middle High German, will be determined by the Guidance Committees.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEMS COURSE.
Directed study in some special area of literature or linguistics.
Credit, 3-12. The Staff.

701. MIDDLE HIGH GERMAN.
Readings in Middle High German Literature in the original with an introduction to the grammar. *Credit, 3.* Mr. Schaefer.

702. GERMAN LITERATURE IN THE MIDDLE AGES.
A study of German literature from the earliest literary documents to the 15th century. *Credit, 3.* Mr. Schaefer.

703. EPIC AND LYRICAL POETRY 1150-1250.
Intensive study of heroic and courtly epics and of major representatives of *Minnesang.*
Prerequisite, 701. *Credit, 3.* Mr. Schaefer.

704. GERMANIC PHILOLOGY.
Gothic, Old High German. *Credit, 3.* The Staff.

706. THE AGE OF HUMANISM AND THE REFORMATION.
German literature between 1400 and 1600; *Der Ackermann aus Böhmen,* Brant, Murner, Hutten, Luther, Hans Sachs. *Credit, 3.* The Staff.

708, 709. THE AGE OF BAROQUE.
German Literature of the 17th century. *Credit, 3 each semester.* Mr. Born.

711. THE AGE OF ENLIGHTENMENT WITH SPECIAL REFERENCE TO LESSING.
Credit, 3. Mr. Heller.

713. YOUNG GOETHE.
A close survey of Goethe's work prior to the Weimar period.
Credit, 3. Mr. Heller.

714. THE CLASSICAL GOETHE. *Credit, 3.* The Staff.

721, 722. SCHILLER.
A study of his life and works. *Credit, 3 each semester.* Mr.Weigand.

725, 726. THE GERMAN BILDUNGSROMAN.
Goethe, Novalis, Keller, Stifter, Mann, Hesse.
Credit, 3 each semester. Mr. Weigand.

730. HEINE AND HIS AGE. *Credit, 3.* Mr. Ellert.

735. THE DRAMA OF THE ROMANTIC PERIOD.
Comprehensive treatment of the works of Tieck, Kleist and Grillparzer.
Credit, 3. The Staff.

736. THE REALISTIC DRAMA.
Comprehensive treatment of the works of Hebbel, Büchner and Hauptmann.
Credit, 3. Mr. Hauser.

740. LYRICAL POETRY OF THE XXTH CENTURY.
Intensive study of the works of George, Hofmannsthal and Rilke.
Credit, 3. Mr. Weigand.

745. NIHILISM AND AFFIRMATION IN CONTEMPORARY LITERATURE.
A study of drama, fiction and essays reflecting the crisis of the modern age, with special emphasis on the period of Expressionism. *Credit, 3.* Mr. Heller.

755. STYLISTICS.
An advanced course in German composition, audio-lingual proficiency, literary interpretation, and grammar. *Credit, 3.* Miss Schiffer.

770. PROSEMINAR. *Credit, 3-9.* The Staff.
The following Proseminars are available at 3 credits each per semester:

I. BIBLIOGRAPHY AND METHODOLOGY.

An introduction to tools and methods of research. The course is designed to acquaint students with major reference works and scholarly publications and to examine some basic approaches to litererary criticism. Required of all candidates for graduate degrees. Offered in the fall. Mr. Lea.

II. and III. INTERPRETATION OF TEXTS.

Problems in philology or in literary interpretation. Reports and papers on selected texts.
Prerequisite, Proseminar I. The Staff.

780. SEMINAR.
Close study of a single topic, author or work. One of the main purposes of the course is to suggest projects for independent research to advanced students. The subject matter will vary from year to year. *Credit, 3-9.* Mr. Ellert, Mr. Heller.

800. THESIS, MASTER'S DEGREE. *Credit, 6-9.*

900. THESIS, Ph.D. DEGREE. *Credit, 30*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

551. NINETEENTH CENTURY PROSE.

German prose from the death of Goethe to 1890 (early realism to naturalism) with emphasis on literary and social forces in the works of Stifter, Keller, Fontane, and others. *Credit, 3.* Mr. Weigand.

552. POETRY AND DRAMA OF THE NINETEENTH CENTURY.

The development of the drama and of lyric poetry from 1830 to 1890 with special emphasis on dramatic works of Grillparzer, Hebbel, and Büchner and the poetry of Mörike and C. F. Meyer. *Credit, 3.* Mr. Hauser.

553. TWENTIETH CENTURY PROSE.

Main literary currents in contemporary German prose from Nietzsche to the present with particular attention to the works of Thomas Mann, Kafka and Werfel. *Credit, 3.* Mr. Weigand.

554. POETRY AND DRAMA OF THE TWENTIETH CENTURY.

Reading and discussion of significant lyrical works of Hofmannsthal, George, and Rilke, and representative dramas by Hauptmann, Georg Kaiser and Brecht. *Credit, 3.* Mr. Lea.

555. STORM AND STRESS.

Storm and Stress in German literature centering in the young Goethe.
Credit, 3. Mr. Ellert.

556. ROMANTICISM.

The poetry and prose writings of the romantic period from Novalis to Heine.
Credit, 3. Mr. Born, Miss Schiffer.

557. GOETHE'S FAUST. *Credit, 3.* Mr. Ellert, Mr. Heller or Mr. Weigand.

558. KLOPSTOCK—WIELAND—LESSING.

The major preclassical figures and works in the poetry, novel, drama and criticism of 18th century German literature. *Credit, 3.* The Staff.

559. THE GERMANIC LANGUAGES.

An introduction to general and Germanic philology for German and English majors; a survey of the relationship between German, English, and the other Indo-European tongues and of the historical development of German and English as the two major Germanic literary languages. *Credit, 3.* Mr. Schaefer.

560. THE CLASSICAL GOETHE.

Definitions of "Classicism"; *Egmont, Iphigenie, Tasso;* poetry; *Die Wahlverwandtschaften* or selections from *Wilhelm Meister;* selections from *Italienische Reise* and pertinent expository prose. *Credit, 3.* The Staff.

561. SCHILLER.

Representative plays of the early and of the classical phase (e.g., *Die Räuber, Kabale und Liebe; Wallenstein, Maria Stuart, Wilhelm Tell).* Selections from Schiller's poetry and essays. *Credit, 3.* The Staff.

COMPARATIVE LITERATURE

564. MODERN EUROPEAN DRAMA (in translation).

(see English 564 for description).
Credit, 3. Mr. Rudin, Mrs. Hogan, and Mr. Halpern.

591. THE ENLIGHTENMENT.

Characteristic themes, ideas and attitudes in 18th Century European literature. The course will focus on major representatives of the Ages of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany.
Prerequisite, proficiency in French or German.
Credit, 3. Mr. Heller and Mr. Page.

592. ROMANTICISM.
The Western Romantic movement as exemplified by its principle figures from the age of Rousseau to 1850.
Prerequisite: permission of the instructor. *Credit, 3.*

593. ANGLO-GERMAN LITERARY RELATIONSHIPS.
Credit, 3. Mr. Page and Mr. Weigand.

595. SYMBOLISM.
The development of symbolism in the 19th and 20th century poetry of France (Baudelaire, Verlaine, Mallarmé, Rimbaud), Germany (George, Hofmannsthal, Rilke) and England (Yeats, Pound, Eliot).

409. GRADUATE READING COURSE.
Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of German required. *No credit.* The Staff.

RUSSIAN

553 (I). DOSTOEVSKY. *Credit, 3.* The Staff.

554 (II). TOLSTOY. *Credit, 3.* The Staff.

556 (II). RUSSIAN DRAMA.
Drama in the originals from the beginnings to the establishment of a national theatre culminating in plays of Ostrovskij, Chekhov, Gorky.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

557 (I). SOVIET LITERATURE.
A representative study of the beginnings and development of Soviet prose, drama and criticism from Gorky to Sholokhov and Pasternak.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

558 (II). RUSSIAN POETRY.
Russian poetry in the originals, from the early days of the 19th century to the present, with an emphasis on the major poetic trends.
Prerequisite, proficiency in Russian. *Credit, 3.* The Staff.

564 (II). THE HISTORY OF THE RUSSIAN LANGUAGE.
A description of the historical development of the Russian language (and its relation to other languages) from the earliest period to the present.
Prerequisite, Russian 62, Jr. or Sr. standing. *Credit, 3.* The Staff.

GOVERNMENT

GRADUATE FACULTY

William C. Havard, *Head of Department and Professor of Government,* B.A., Louisiana State, 1943; M.A., 1947; Ph.D., University of London, 1956.

Luther A. Allen, *Associate Professor of Government,* B.A., Williams College, 1941; M.A., State University of Iowa, 1942; Ph.D., University of Chicago, 1952.

Loren P. Beth, *Professor of Government,* B.A., Monmouth College, 1946; M.A., University of Chicago, 1948; Ph.D., 1949.

James A. Bolner, *Assistant Professor of Government,* B.S., Louisiana State, 1958; M.A., 1960; Ph.D., Virginia, 1962.

Gerard Braunthal, *Associate Professor of Government,* B.A., Queens College, 1947; M.A., Michigan, 1948; Ph.D., Columbia, 1953.

Edward E. Feit, *Assistant Professor of Government,* B.A., Witwatersrand, 1944; M.A., University of South Africa, 1949; Ph.D., Michigan, 1965.

John H. Fenton, *Commonwealth Professor of Government,* B.A., Kentucky, 1948; M.A., 1951; Ph.D., Harvard, 1956.

John S. Harris, *Commonwealth Professor of Government,* B.S., University of Richmond, 1939; M.A., College of William and Mary, 1941; M.S., Syracuse, 1942; Ph.D., University of Chicago, 1951.

Franklin W. Houn, *Associate Professor of Government,* B.A., National Cheng-Chih University, 1946; M.A., University of Denver, 1950; Ph.D., Wisconsin, 1953.

Guenter Lewy, *Associate Professor of Government,* B.S.S., City College of New York, 1951; M.A., Columbia, 1952; Ph.D., 1957.

Lewis C. Mainzer, *Associate Professor of Government,* B.A., New York University, 1948; M.A., University of Chicago, 1950; Ph.D., 1956.

Felix E. Oppenheim, *Professor of Government,* Docteur en droit, Brussels University, 1938; Ph.D., Princeton, 1942.

Anwar H. Syed, *Associate Professor of Government,* B.A., University of the Panjab, 1946; M.A., 1956, University of Chicago, 1953, Pennsylvania, 1954; Ph.D., 1957.

Ferenc A. Vali, *Professor of Government,* Doctor Juris, University of Budapest, 1927; Ph.D., University of London, 1932.

John H. Wiarda, *Assistant Professor of Government,* B.A., Michigan, 1961; Ph.D., Florida, 1965.

In addition to the general requirements for the Master of Arts degree, candidates in Government must possess a reading knowledge of a foreign language approved by the department or an adequate knowledge of statistics or computer language where appropriate. An acceptable Master's thesis and a final oral examination also required.

Study programs for Ph.D. candidates will be determined by the Guidance Committees — the designation of fields in political science to be covered and the selection of courses in minor field (if any).

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 3 or 6.*

701. RECENT POLITICAL THEORY.

The major trends of twentieth-century political theory will be surveyed; in addition, intensive analysis of selected thinkers of this period will be carried out. Prerequisite, a course in Political Theory.

Credit, 3. Mr. Havard, Mr. Oppenheim or Mr. Lewy.

702. SELECTED PROBLEMS IN POLITICAL THEORY.

An examination of significant problems within the field of political theory. Students will be asked to study traditional solutions and to devise original solutions. Prerequisite, Government 701.

Credit, 3. Mr. Havard, Mr. Oppenheim or Mr. Lewy.

703. THE INDIVIDUAL, CHURCHES, AND THE STATE.

The study of such selected problems in political theory as political obligation and church and state, which involve the relationship between the individual, religious institutions and political authority.

Prerequisite, Government 501 or 502 or equivalent. *Credit, 3.* Mr. Lewy.

719. POLITICS AND THE LEGISLATIVE PROCESS.

Selected topics relating to American politics, political parties, elections and the legislative process.

Prerequisite, Government 518. *Credit, 3.* Mr. Fenton.

720. RESEARCH IN POLITICAL BEHAVIOR.

Introduction to research techniques as applied to special problems in the field of political behavior. Emphasis upon various approaches to the study of the individual voter, the American politician, interest groups and legislatures.

Credit, 3. Mr. Fenton.

721. DIRECTED STUDIES IN POLITICS.

The study in depth of a particular aspect of political behavior. The content of this course will vary with the particular research interests of the instructor and the students. Credit, 3. Mr. Fenton.

736. COMPARATIVE GOVERNMENT.

An historical and functional analysis of the institutions of government in modern democracies and dictatorships.
Prerequisite, Government 150 or equivalent.
Credit, 3. Mr. Allen, Mr. Braunthal or Mr. Harris.

737. COMPARATIVE POLITICAL PARTIES AND POLITICS.

The ideology, structure and dynamics of diverse types of political parties, party systems and electoral systems, in an effort to suggest interrelationships.
Credit, 3. Mr. Allen, Mr. Braunthal or Mr. Harris.

738. SEMINAR IN COMPARATIVE GOVERNMENT.

Intensive study of selected political systems and of particular governmental institutions and processes. *Credit, 3.* Mr. Allen, Mr. Braunthal or Mr. Harris.

739. SEMINAR OF THE GOVERNMENT AND POLITICS OF SOUTH ASIA.

Intensive study of selected problems relating to the government and politics of India, Pakistan, and Ceylon. *Credit, 3.* Mr. Syed.

740. SEMINAR ON EAST ASIAN POLITICS.

Intensive study of selected problems relating to the politics of China, Japan and other Asian countries. *Credit, 3.* Mr. Houn.

755. PROBLEMS OF INTERNATIONAL RELATIONS.

Analysis of major problems in international relations.
Prerequisite, Government 554 or equivalent.
Credit, 3. Mr. Vali or Mr. Braunthal.

756. PROBLEMS OF INTERNATIONAL LAW AND ORGANIZATION.

Analysis of major problems in international organizations.
Prerequisite, Government 556 or 557 or equivalent.
Credit, 3. Mr. Vali or Mr. Braunthal.

757. EAST ASIAN FOREIGN POLICIES.

Study of the foreign policies of China, Japan and other East Asian countries in modern times and of Western diplomacy in the area. *Credit, 3.* Mr. Houn.

758. THEORY OF INTERNATIONAL POLITICS.

Analysis and conceptualization of the forces and drives that condition politics among nations. *Credit, 3.* Mr. Syed.

772. PUBLIC ADMINISTRATION: ORGANIZATION.

Behavior within governmental bureaucracy, in terms of the interaction between the individual and organizational influences. *Credit, 3.* Mr. Harris or Mr. Mainzer.

773. PUBLIC ADMINISTRATION: RESPONSIBILITY.

Problems of political responsibility of government bureaucracy within specific constitutional systems. *Credit, 3.* Mr. Harris or Mr. Mainzer.

774. COMPARATIVE PUBLIC ADMINISTRATION.

Comparative study and analysis of the government administrative systems of the U. S., Britain, Canada, France, the U.S.S.R., and selected other countries.
Prerequisite, Government 572 or equivalent. *Credit, 3.* Mr. Harris.

790. SEMINAR IN PUBLIC LAW.

A study of selected topics in public law.
Prerequisites, Government 590 or 591 or equivalent. *Credit, 3.* Mr. Beth.

791. LAW AND THE POLITICAL PROCESS.

The interrelationships between law and politics, and the necessity for law in organized societies.
Prerequisites, Government 590 or 591 or equivalent. *Credit, 3.* Mr. Beth.

800. THESIS, MASTER'S DEGREE. *Credit, 6.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

501. ANCIENT AND MEDIEVAL POLITICAL THOUGHT.

The development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages.
Credit, 3. Mr. Lewy, Mr. Havard.

502. MODERN POLITICAL THOUGHT.

The development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present.
Credit, 3. Mr. Havard, Mr. Lewy and Mr. Oppenheim.

503. AMERICAN POLITICAL THOUGHT.

The development of American political thought from Colonial times to the present.
Credit, 3. Mr. Oppenheim or Mr. Syed.

504. SCOPE AND METHODS OF POLITICAL SCIENCE.

Critical examination of the scope and unity of political science and the significant methodological positions and research techniques. *Credit, 3.* Mr. Mainzer.

519. MUNICIPAL GOVERNMENT.

A survey of the governmental structure and function of American municipalities. *Credit, 3.* Mr. Grady.

520. STATE GOVERNMENT.

State politics, organization and functions with emphasis on the role of the state in our federal system. *Credit, 3.* Mr. Coulter.

521. THE PRESIDENCY IN AMERICAN GOVERNMENT.

The growth of the executive in United States Government. Varying conceptions of the presidential office. Constitutional and political aspects of the office in legislation, administration and conduct of foreign and military affairs. The president as party leader.
Prerequisite, Government 100. *Credit, 3.* Mr. Gordon.

522. THE LEGISLATIVE PROCESS.

The role of the legislature in national and state government. The functions of legislatures; legislative procedures; the role played by political parties and pressure groups in the legislative process.
Emphasis on research.
Prerequisite, Government 100 or 523. *Credit, 3.* Mr. Mayhew or Mr. Fenton.

523. POLITICAL PARTIES AND ELECTIONS.

The American political process, with emphasis on parties, pressure groups, and public opinion. *Credit, 3.* Mr. Gordon, Mr. Fenton, Mr. Mayhew.

524. METROPOLITAN POLITICS.

A study of the problems of metropolitan areas from the standpoint of the actual and possible political approaches to their solution. Includes the role of parties, development of political leadership, existing political institutions, pressure group activity, and other relevant political phenomena.
Prerequisite, Government 523 or equivalent. *Credit, 3.* Mr. Coulter.

525. PUBLIC OPINION IN POLITICS.

Opinion and communication as aspects of the political process with emphasis upon communication through mass media. The relations between mass attitudes and communication and political institutions and the formation of public policy. *Credit, 3.* Mr. Fenton.

536. THE GOVERNMENT AND POLITICS OF RUSSIA.

The development, organization and functioning of the Communist party; governmental organization and the administrative process; terror as a system of power; organization for governmental control in industry and agriculture; Soviet foreign policy, its formation and execution.
Prerequisite, Government 150. *Credit, 3.* Mr. Vali, Mr. Ryavec.

537. GOVERNMENTS OF CHINA AND JAPAN.

An analysis of the political ideologies, party movements, governmental institutions, and major domestic and foreign policies of contemporary China and Japan.

Credit, 3. Mr. Houn.

538. GOVERNMENT AND POLITICS OF SOUTH AND SOUTHEAST ASIA.

A comparative study of the institutions and dnaymics of government and politics in South and Southeast Asia, especially India, Pakistan, Indonesia, and Malaysia, with particular reference to issues of political stability, economic development, and relations with the U. S. and other great powers. *Credit, 3.* Mr. Syed.

548. GREAT BRITAIN AND THE COMMONWEALTH.

The practice of parliamentary government in Great Britain and the Commonwealth countries, with emphasis on the development of the conception of the Commonwealth, the institutions through which the commonwealth operates, and its role in contemporary world politics. *Credit, 3.* Mr. Harris.

554. INTERNATIONAL RELATIONS.

The nation-state system and conceptions of national interest in modern world politics. The forms and distribution of power by which states seek to implement national interests. The making of foreign policy and methods of adjusting international conflict. Current international problems.

Prerequisite, Government 150 or equivalent.

Credit, 3. Mr. Ryavec, Mr. Braunthal, Mr. Vali and Mr. Allen.

555. AMERICAN FOREIGN POLICY.

Constitutional, political and administrative considerations which influence the formulation and execution of American foreign policy. Special emphasis on current issues. *Credit, 3.* Mr. Braunthal and Mr. Allen.

556. INTERNATIONAL LAW.

The origin, character, and function of international law.

Prerequisite, Government 554 or equivalent.

Credit, 3. Mr. Braunthal or Mr. Vali.

557. INTERNATIONAL ORGANIZATION.

International organization in the twentieth century, with emphasis upon the United Nations and regional organizations.

Prerequisites, Government 150 and 554 or equivalent.

Credit, 3. Mr. Braunthal or Mr. Vali.

572. PUBLIC ADMINISTRATION.

Organization and management in modern government, with emphasis on the bureaucracy's role in public policy formation.

Credit, 3. Mr. Mainzer, Mr. Sweeney.

573. PUBLIC PERSONNEL ADMINISTRATION.

Theory, practice, and organization of the personnel functions in governmental administration, including recruitment, testing, classification, compensation, promotions, training, and employee relations.

Prerequisite, Government 100 or 572. *Credit, 3.* Mr. Mainzer, Mr. Sweeney.

574. ADMINISTRATIVE LAW.

Governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate.

Credit, 3. Mr. Martin.

590. CONSTITUTIONAL LAW.

A study of the United States Constitution as interpreted by decisions of the Supreme Court.

Prerequisite, Government 100. *Credit, 3.* Mr. Beth.

591. CIVIL LIBERTIES.

A study of the development in American Constitutional Law of the concept of civil liberty, including the following fields: free speech and religion, fair trial, and race discrimination. The function of courts in the safeguarding of these liberties.

Prerequisite, Government 100. *Credit, 3.* Mr. Beth, Mr. Lewy.

593, 594. SEMINAR.

Special problems in the field of government.

Prerequisite, permission of the department. *Credit, 3.* The Staff.

Interdepartmental Courses

SOCIAL SCIENCE 550. AFRICA, SOUTH OF THE SAHARA.

Recent political, economic, and social developments in the principal countries in Africa south of the Sahara.

Prerequisites, at least two courses in one or more of the following fields: Government, Economics, Sociology. *Credit, 3.* The Staff.

SOCIAL SCIENCE 569. INDIA AND SOUTHEAST ASIA.

Recent political, economic, and social developments in India and the countries of South and Southeast Asia.

Prerequisites, at least two semester courses in one or more of the following fields: Government, Economics, and Sociology. *Credit, 3.* Mr. Driver.

HISTORY

GRADUATE FACULTY

Howard H. Quint, *Head of Department of History and Professor of History,* B.A., Yale, 1940; M.A., Stanford University, 1942; Ph.D., Johns Hopkins, 1947.

Dean Albertson, *Professor of History,* B.A., California at Berkeley, 1942; M.A., 1947; Ph.D., Columbia, 1955.

Theodore C. Caldwell, *Professor of History,* B.A., College of Wooster, 1925; M.A., Harvard, 1927; Ph.D., Yale, 1934.

Milton Cantor, *Assistant Professor of History,* B.A., Brooklyn College, 1947; M.A., Pennsylvania, 1948; Ph.D., Columbia, 1954.

Harold W. Cary, *Professor of History,* B.A., Williams College, 1925; M.A., Harvard, 1926; Ph.D., Yale, 1938.

Cecil E. Cody, Jr., *Assistant Professor of History,* B.A., Nebraska, 1949; M.A., 1951; Ph.D., Washington, 1955.

Mario S. DePillis, *Assistant Professor of History,* B.A., University of Chicago, 1952; M.A., 1954; Ph.D., Yale, 1961.

Harold J. Gordon, Jr., *Professor of History,* B.A., University of Richmond, 1940; M.A., Yale, 1948; Ph.D., 1953.

Louis S. Greenbaum, *Associate Professor of History,* B.A., Wisconsin, 1950; M.A., 1951; Ph.D., Harvard, 1955.

Vincent Ilardi, *Associate Professor of History,* A.B., Rutgers, 1952; A.M., Harvard, 1953; Ph.D., 1958.

Edgar N. Johnson, *Professor of History,* Ph.B., University of Chicago, 1922; Ph.D., 1931.

Robert A. Potash, *Professor of History,* A.B., Harvard, 1942; M.A., 1947; Ph.D., 1953.

Franklin B. Wickwire, *Assistant Professor of History,* B.A., Hanover College, 1952; M.A., Indiana University, 1956; Ph.D., Yale, 1961.

THE Ph.D. PROGRAM

The Department of History offers doctoral work in seven major fields: (1) Medieval; (2) Early Modern Europe; (3) Modern Europe; (4) Great Britain; (5) Latin America; (6) the United States to 1860; and (7) the United States since 1860. The doctoral candidate will concentrate his course of study in four of them and his program will be determined by his guidance committee. He must take a minimum of four graduate seminars in at least three of his chosen fields. Such seminars will concentrate on research training and the techniques of historical writing.

At the conclusion of the candidate's first two semesters of graduate work at the University he will be required to take a preliminary "screening" examination; failure to pass it will automatically bar him from further study for the Ph.D. degree, but not from acquiring the M.A. degree. The General Examination will be taken no later than the end of the student's fifth semester of full-time work or its equivalent. Not until he has passed the General Examination will he be admitted to formal candidacy for the doctoral degree.

A student entering the University of Massachusetts with previous graduate training at other institutions may be admitted to the graduate program wih advanced standing at the discretion of the Department. The Department's Graduate Committee will evaluate his previous graduate training and he will be informed of his exact status upon notification of admission to the Department's graduate program.

THE M.A. PROGRAMS

I. REGULAR MASTER OF ARTS PROGRAM.

1. Each graduate student entering this program will select a major field of concentration from among those offered by the History Department for doctoral work. Selection of the student's advisor will be based upon his selection of field.

All M.A. candidates must demonstrate a reading proficiency in one foreign language. Students who plan to specialize in areas where English is not the basic language will be required to demonstrate to the Department a reading proficiency in the relevant foreign language upon entrance.

A student specializing in an area of History where English is not the basic language will also be required to utilize the relevant foreign language either in a seminar paper or in a thesis.

2. Basic Course Requirements.
   a. Each student must complete 30 credit hours for the Master's degree. Six of these credits may be earned by the preparation of a thesis at the election of the student.
   b. Each student may take as many as six hours in associated disciplines at the discretion of his advisor.
   c. Four courses is the normal permissible load per semester.
   d. Each student will complete a minimum of two courses in Historiography.
   e. Each student will complete a minimum of two seminars with the minimum grades of B, unless he chooses to write a thesis, in which case he may be exempted from one seminar.

3. Examination.

Each student will take a screening examination after fulfilling all other requirements for the Master of Arts degree. The examination will consist of broad questions intended to test his ability to employ his knowledge and imagination rather than to test the depth or extent of his knowledge. This examination will serve a double function: (a) It will be both a comprehensive examination for the Master's degree and (b) a selection examination (one factor) for the doctorate. The selection grade for continued graduate work will be substantially higher than the minimum passing grade for the Master's degree.

II. TERMINAL MASTER OF ARTS PROGRAM

This program emphasizes the special needs of secondary school teachers; it stresses breadth of knowledge rather than concentration, and critical reading more than the development of research techniques.

The student is required to earn thirty credits. His program will be planned with reference to preparation for teaching. He must complete four courses in European and American historiography: History 701-702 and History 703-704, and may include up to nine credits in associated disciplines.

Examinations in foreign languages are not required of students in this program, yet admission to certain courses in the history of non-English speaking countries will necessitate a competence in the relevant language.

Twelve credits is the normal load per semester. The student should expect to complete his program within a six-year period.

Transfer to the Regular Master of Arts program is possible when all requirements of the regular program are met by the student.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN HISTORY.

Directed research and writing for qualified students.
Prerequisite, permission of instructor. *Credit, 1-6.* The Staff.

701. EUROPEAN HISTORIOGRAPHY TO THE ENLIGHTENMENT.

Critical evaluation of the techniques and ideas of major historians and influential schools of historical interpretation from the Greeks through the Renaissance.
Credit, 3. Mr. Ware.

702. EUROPEAN HISTORIOGRAPHY, THE ENLIGHTENMENT TO THE PRESENT.
A study of the techniques and ideas of major historians and influential schools of historical interpretation, and the relation of historiography to the intellectual and political history of modern Europe. *Credit, 3.*

703, 704. AMERICAN HISTORIOGRAPHY.
Interpretations of major themes as developed in the works of leading historians. The first course will treat the period through the Civil War; the second, 1865 to the present. *Credit, 3 each semester.* The Staff.

705. PHILOSOPHY OF HISTORY.
A consideration of the "philosophy of history" both as epistemology and as a method of explanation, and a comparison of the aims of history and the sciences. The course involves an analysis of the nature of history: the difference between truth and fact, the possibility of objectivity, and the theory of historical explanation. Major historians in the field are read, from Thucydides and Augustine to Croce and Toynbee. *Credit, 3.*

711. TOPICS IN EARLY MEDIEVAL HISTORY.
Continuity between ancient and medieval civilization.
Prerequisites, working knowledge of Latin and one modern language (German, French, Italian) or by special permission of instructor.
Credit, 3. Mr. Ware.

712. TOPICS IN THE AGE OF THE RENAISSANCE AND REFORMATION.
A study of European culture between 1400 and 1600. A reading knowledge of a modern European language is generally required. Credit, 3. Mr. Ilardi.

713. TOPICS IN THE AGE OF THE ENLIGHTENMENT.
The movement of ideas in Atlantic civilization during the 18th Century. Study of the mind and writings of representative European and American thinkers with emphasis upon politics, religion, science, literature and the arts.
Credit, 3. Mr. Greenbaum.

714. TOPICS IN TUDOR AND STUART ENGLAND.
Selected aspects of the Tudor age; the interplay of social, economic, intellectual and political factors involved in the Stuart Revolution. Constitutional development receives major emphasis. *Credit, 3.* Mr. Caldwell.

715. RECENT EUROPEAN HISTORY.
Basic developments in diplomatic, political, social and economic history since 1890 with particular emphasis upon organic growth and change.
Credit, 3. Mr. Gordon.

716. WORLD WAR II AND AFTERMATH.

A study of pre-nuclear total war in its military development and its political, economic and social ramifications in modern Western society, followed by a study of the postwar settlements and their effects. *Credit, 3.*

717. TOPICS IN THE RECENT SOCIAL HISTORY OF EUROPE.

The social changes resulting from the industrialization of Europe since 1815 and their relationship to economic and political developments. The student is introduced to the methods and materials needed for effective work in recent social history. He is guided through a series of short problems illustrating proper utilization of the sources. *Credit, 3.* Mr. Gordon.

718. TOPICS IN NINETEENTH CENTURY INTELLECTUAL HISTORY.

Selected major currents in European thought since the French Revolution, their origins, development and influence. Reading knowledge of French or German is desirable. *Credit, 3.*

719. PROBLEMS IN BRITISH IMPERIAL HISTORY SINCE 1783.

Aspects of such general topics as the problems of imperial government after the American Revolution, the Durham Report and the growth of the dominions, the difficulties and effect of implantation of British institutions in Asia and Africa, the lessening of British control and the Statute of Westminster, and the political and economic importance of the Commonwealth in world affairs.

Credit, 3. Mr. Wickwire.

720. BRITAIN IN THE NINETEENTH CENTURY.

Central themes and topics. Emphasis on the history of thought in its relation to political, economic and social developments. *Credit, 3.* Mr. Caldwell.

721. PROBLEMS IN RUSSIAN HISTORY.

Russia in the 19th and 20th centuries with particular emphasis on Russian and Soviet historiography. The student has the opportunity of doing intensive reading and presenting careful analyses of selected topics. *Credit, 3.* Mr. Dilkes.

722. TOPICS IN MODERN SPANISH HISTORY.

Spanish history from the end of the reign of Philip II to the end of the Spanish Civil War. *Credit, 3.*

730. TOPICS IN EARLY AMERICAN HISTORY.

A study of colonial America from discovery and settlement of the New World through the Federalist era. *Credit, 3.* Mr. Bernhard.

731. ERA OF THE CONFEDERATION AND THE CONSTITUTION.

The formative years of the American nation; the evolution of federal and state constitutions; basic political issues and conflicts; the pattern of economic and social development; and the origins of American foreign policy.

Credit, 3. Mr. Davis, Mr. Bernhard.

732. TOPICS IN THE NATIONAL PERIOD.

A reading course designed to analyze the basic features of American political, social, and economic history from the rise of Jeffersonianism to the Civil War.

Credit, 3. Mr. Cantor.

733. TOPICS IN THE AMERICAN CIVIL WAR ERA.

Analysis and interpretation of slavery and abolition, Southern nationalism, the breakdown of national parties, causes of the War, wartime politics and the War's impact. *Credit, 3.* Mr. McFarland.

734. TOPICS IN THE GILDED AGE.

Investigation of national re-unification, Grantism, dead center politics, genteel reform, the new industrialism and business leadership, labor and agrarian problems. *Credit, 3.* Mr. McFarland.

735. TOPICS IN THE TWENTIETH CENTURY.

Studies on the nature of Progressivism, American involvement in World Wars I and II, the character of recent American politics, and cultural and economic changes since the turn of the century. *Credit, 3.* Mr. Quint, Mr. Albertson.

736. TOPICS IN AMERICAN DIPLOMATIC HISTORY.

Readings in the primary and secondary sources for the study of important phases in American diplomacy. *Credit, 3.* Mr. Cary, Mr. Hart.

738. TOPICS IN UNITED STATES INTELLECTUAL HISTORY.

Specific aspects of such general topics as the American adaptation of the European heritage, the growth of the concept of Americanism, the emergence of patrician leadership, the achievement of realistic democracy, the triumph of nationalism, the assertion of individualism in a corporate society, and the scientific-humanistic culture conflict. *Credit, 3.* Mr. Quint, Mr. Doherty.

739. TOPICS IN MASSACHUSETTS HISTORY.

The development of the Commonwealth and its relationship to regional and national institutions and thought from early colonial times to the present. The course, utilizing abundant primary and secondary source materials, provides a foundation for the pursuit of further research. *Credit, 3.* Mr. Cary.

745. TOPICS IN CONTEMPORARY LATIN AMERICAN HISTORY.
A study of major movements since about 1930 with attention directed to the political, economic, social, and ideological forces contributing to change. A reading knowledge of Spanish or Portuguese is generally required.
Credit, 3. Mr. Potash.

751. MEDIEVAL HISTORY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ware, Mr. Johnson.

752. RENAISSANCE AND REFORMATION.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ilardi, Mrs. Chrisman.

753. THE ENLIGHTENMENT.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Greenbaum.

754. EIGHTEENTH CENTURY BRITAIN.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Wickwire.

755. MODERN ENGLISH HISTORY.
Research on selected topics, 1890-1940.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Caldwell.

756. MODERN GERMANY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Gordon.

757. MODERN FRANCE.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.*

758. RUSSIAN HISTORY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Dilkes.

759. EUROPEAN DIPLOMACY BETWEEN THE WARS.
Training in historical research and an introduction into the relationships among European nations in a critical period.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Gordon.

761. UNITED STATES IN THE COLONIAL PERIOD.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Bernhard.

762. SEMINAR IN THE AGE OF JACKSONIAN DEMOCRACY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Cantor.

763. CIVIL WAR AND RECONSTRUCTION.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. McFarland.

764. SEMINAR IN THE WESTWARD MOVEMENT OF THE UNITED STATES.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. DePillis, Mr. Davis.

765. THE PROGRESSIVE ERA IN THE UNITED STATES.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint, Mr. Albertson.

766. THE UNITED STATES BETWEEN THE WORLD WARS.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint, Mr. Albertson.

767. SEMINAR IN AMERICAN DIPLOMATIC HISTORY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Cary.

768. SEMINAR IN AMERICAN INTELLECTUAL HISTORY TO THE CIVIL WAR.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint.

769. SEMINAR IN AMERICAN INTELLECTUAL HISTORY SINCE THE CIVIL WAR.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Quint.

771. ARGENTINE HISTORY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Potash.

772. MEXICAN HISTORY.
Training in historical research.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Potash.

800. THESIS, MASTER'S DEGREE. *Credit, 5-10.*

900. THESIS, Ph.D. DEGREE.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

500. THE ANCIENT WORLD TO ALEXANDER THE GREAT.

From the neolithic background of civilization to the dissolution of Alexander's Empire. *Credit, 3.* Mr. Ware.

501. THE ANCIENT WORLD: THE HELLENISTIC PERIOD TO CONSTANTINE.

From the development of Hellenistic civilization to the stagnation of Graeco-Roman culture. *Credit, 3.* Mr. Ware.

502. EARLY MIDDLE AGES 300-1100.

Spread of Christianity; pagan and early Christian culture; Germanic kingship; the Carolingian world; early feudalism; monasticism and ecclesiastical centralization. *Credit, 3.* Mr. Ware.

503. THE LATER MIDDLE AGES 1100-1350.

Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism. *Credit, 3.* Mr. Ware.

504. TUDOR-STUART ENGLAND, 1485-1688.

Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. *Credit, 3.* Mr. Caldwell.

505, 506. THE AGE OF THE RENAISSANCE AND REFORMATION, 1300-1600.

A study of the changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Ilardi.

507. EUROPE IN THE ENLIGHTENMENT, 1685-1789.

Civilization of Western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions, and the growth of revolutionary spirit. *Credit, 3.* Mr. Greenbaum.

508. THE FRENCH REVOLUTION AND NAPOLEON.

Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon. *Credit, 3.* Mr. Greenbaum.

509. HISTORY OF EUROPE, 1815-1870.

Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-Prussian War. *Credit, 3.*

510. EUROPE, 1870-1918.

Internal developments of the principal countries; a detailed study of conditions and diplomacy which led to the World War; and military and diplomatic history of the war years. *Credit, 3.* Mr. van Steenberg.

511. EUROPE SINCE 1918.

Major developments in the internal and international affairs of the European states since World War I. *Credit, 3.* Mr. van Steenberg.

512. EUROPEAN INTELLECTUAL HISTORY IN THE NINETEENTH CENTURY.

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture. *Credit, 3.* Mr. Della Grotte.

513. EUROPEAN INTELLECTUAL HISTORY IN THE TWENTIETH CENTURY.

Philosophical, academic, literary, aesthetic, political and popular currents since 1900. *Credit, 3.* Mr. Della Grotte.

514, 515. A HISTORY OF RUSSIA.

A survey of the political, economic, social and intellectual development of Russia. The first semester will treat the Tsarist era, the second, the origins of Russian Marxism and the Soviet period. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Dilkes.

516. THE RUSSIAN REVOLUTION.

A study of the forces bringing about the Bolshevik seizure of power of 1917 and its repercussions upon the rest of the world. *Credit, 3.* Mr. Dilkes.

517. EASTERN EUROPE.

The economic, social, cultural and political condition of the Slavic people from the Baltic to the Aegean. *Credit, 3.*

518. EARLY MODERN GERMANY.

The evolution of Germany from the late medieval period through the Napoleonic era. *Credit, 3.* Mr. Gordon.

519. THE HISTORY OF MODERN GERMANY.

The evolution and development of Germany since the Congress of Vienna with emphasis upon diplomatic, political, military and social-economic trends and problems. *Credit, 3.* Mr. Gordon.

520. HISTORY OF SPAIN SINCE THE 15TH CENTURY.

The rise and fall of Spanish power to Spain's present position in the Western world. *Credit, 3.*

521, 522. ENGLISH HISTORY.

Emphasis on economic, social, and cultural influences, as well as constitutional development. Either semester may be elected independently.

Credit, 3. Mr. Caldwell, Mr. Wickwire.

523. HISTORY OF THE BRITISH EMPIRE AND COMMONWEALTH SINCE 1783.

Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent empire; role of the Empire in world politics.

Credit, 3. Mr. Wickwire.

524. MODERN BRITAIN.

A study of selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. *Credit, 3.* Mr. Caldwell.

525. FRANCE SINCE 1789.

A study of selected, formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France. *Credit, 3.*

526. THE ATLANTIC COMMUNITY IN THE TWENTIETH CENTURY.

A study of the idea and development of the Atlantic Community and the components and the forces working both for cohesion and atomization. *Credit, 3.*

527. MILITARY HISTORY OF MODERN EUROPE.

Development of European military theory and practice from the Napoleonic era to the present. *Credit, 3.* Mr. Gordon.

600. COLONIAL LATIN AMERICA.

A study of Mexico from the end of the eighteenth century to the present. Emphasis cultures, the development of political, social, and economic institutions, and the growth of the independence movement to 1810. *Credit, 3.* Mr. Potash.

601. ARGENTINA AND BRAZIL SINCE INDEPENDENCE.

The emergence of the major South American states. Particular attention will be paid to the themes of political organization and economic change; and in the contemporary period to the growth of nationalism and mass-based political movements. *Credit, 3.* Mr. Potash.

602. THE HISTORY OF MEXICO.

A study of Spanish and Portuguese expansion into the New World, the Indian will be given to political, economic, and social developments.

Credit, 3. Mr. Potash.

603. THE CARIBBEAN.

The geographical, cultural and political study of the Caribbean as a cockpit of five centuries of continuous struggle and adjustment. *Credit, 3.* Mr. Elam.

604. THE HISTORY OF GRAN COLOMBIA.

A comparison of the historical development of the Bolivarian republics, with particular emphasis on Colombia, Venezuela and Ecuador. *Credit, 3.* Mr. Elam.

620. AMERICAN COLONIAL HISTORY TO 1763.

Discovery and exploration; early European settlements; systems of political and economic control; religious and intellectual development; and Anglo-French rivalry. *Credit, 3.* Mr. Bernhard.

621. THE AMERICAN REVOLUTIONARY ERA.

Coming of the Revolution; War for Independence; evolution of American federalism. *Credit, 3.* Mr. Bernhard.

622. JEFFERSONIAN AND JACKSONIAN AMERICA.

Political, economic and social developments in the National Period. *Credit, 3.* Mr. Cantor.

623. CIVIL WAR AND RECONSTRUCTION, 1860-1877.

Conduct of the war; political problems, national reunification. *Credit, 3.* Mr. McFarland.

624. THE PROGRESSIVE AGE, 1900-1920.

A study of the political response to the changing economic and social conditions in American life. *Credit, 3.* Mr. Thompson, Mr. Albertson.

625. CONSERVATISM AND REFORM 1920-1945.

American political, economic and intellectual life between the two World Wars. *Credit, 3.* Mr. Thompson, Mr. Albertson.

626, 627. HISTORY OF AMERICAN THOUGHT AND CULTURE.

The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently. *Credit, 3 each semester.* Mr. Quint, Mr. Doherty.

628. UNITED STATES CONSTITUTIONAL HISTORY TO THE CIVIL WAR.

Origins and development of American constitutionalism from the 17th century to the outbreak of sectional armed conflict. *Credit, 3.* Mr. Cantor.

629. UNITED STATES CONSTITUTIONAL HISTORY FROM THE CIVIL WAR TO THE PRESENT.

Evolution of constitutional power in modern America. *Credit, 3.* Mr. Cantor.

630. SOCIAL HISTORY OF THE UNITED STATES.

The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. *Credit, 3.* Mr. DePillis.

631. HISTORY OF AMERICAN WESTWARD EXPANSION (1763-1893).

Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions.

Credit, 3. Mr. DePillis, Mr. Davis.

632. THE SOUTH IN AMERICAN HISTORY.

From early settlement to contemporary regional problems.

Credit, 3. Mr. Thompson.

633. NEW ENGLAND TO 1860.

A study of the colonial and early national periods, with emphasis upon the political, social and economic aspects of life in this region.

Credit, 3. Mr. Cary, Mr. Bernhard.

634, 635. DIPLOMATIC HISTORY OF THE UNITED STATES.

The development of American foreign relations, 1776 to the present. Either semester may be elected independently.

Credit, 3 each semester. Mr. Cary, Mr. Hart.

650, 651. HISTORY OF FAR EASTERN CIVILIZATION.

The first semester will stress traditional and modern China, the second, Japan and Korea. Either semester may be elected independently.

Credit, 3 each semester. Mr. Cody.

HOME ECONOMICS

GRADUATE FACULTY

Marion A. Niederpruem, *Dean of School of Home Economics and Professor of Home Economics,* B.S., College of Education, Buffalo, N. Y., 1935; M.S., New York University, 1944; Ph.D., Michigan, 1956.

Gladys M. Cook, *Associate Professor of Home Economics,* B.S., Battle Creek College, 1934; M.S., Massachusetts, 1936; Ph.D., Indiana, 1935.

Mary E. Lojkin, *Assistant Professor of Home Economics,* Ph.D., Columbia, 1937.

Nancy Myers, *Assistant Professor of Home Economics,* B.A., Mount Holyoke, 1952; M.A., Wisconsin, 1954; Ph.D., 1957.

Adreen Nichols, *Associate Professor of Home Economics,* B.S., Oregon State, 1939; M.S., 1953; Ph.D., Michigan State, 1963.

Elwood F. Reber, *Professor of Nutrition,* B.A., Berea College, 1944; M.N.S., Cornell, 1948; M.S., 1950; Ph.D., Oklahoma State, 1951.

Elizabeth Rust, *Associate Professor of Home Economics,* B.S., Kansas State, 1937; M.S., 1954; Ph.D., 1963.

A Master of Science degree may be earned in the School of Home Economics by candidates who hold an accredited baccalaureate degree and are accepted under the general regulations of the Graduate School of the University. Emphasis may be selected from the areas of Food and Nutrition; Textiles, Clothing and Environmental Arts; Home Economics Education; Management and Family Economics; and Human Development.

In general, the baccalaureate degree of the applicant need not be in Home Economics. However, adequate concentration in studies basic to the areas of emphasis is required, or must be satisfied, before acceptance as a candidate will be granted.

Students applying for graduate work in Home Economics Education should have a Bachelor's degree in Home Economics and supporting disciplines to qualify for graduate work in one of the areas of emphasis listed above. Student's background should include some courses in Education and Practice Teaching. The candidates for this degree are required to take at least 9 credits in one subject matter area of Home Economics, excluding a problem or a thesis.

Other areas of emphasis require the following prescribed academic backgrounds: Food and Nutrition — strength in the physical and biological sciences; Textiles, Clothing and Environmetal Arts — strength in the social sciences; Management and Family Economics — strength in the social sciences and mathematics; Human Development — strength in the biological and social sciences. Candidates interested in the latter area, which includes Child Development and Family Life, may wish to avail themselves of the privilege of affiliating at Merrill-Palmer in Detroit. Such students must take at least 15 credits in residence at the University.

FOOD AND NUTRITION (FN)

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

421. DEVELOPMENTS IN NUTRITIONAL EDUCATION.

Interpretation and application of changing and new concepts of nutrition — its place in schools and health programs.
Prerequisite, FN 352 or 3 credits in a biological science. *Credit, 3.*

700. SPECIAL PROBLEMS IN FOOD OR NUTRITION. *Credit, 3-6*

703. ADVANCED NUTRITION — METABOLISM OF MAJOR FOOD STUFFS.
Metabolic role of carbohydrates, lipids, proteins and amino acids; biological oxidations; mechanisms of energy production and utilization.
Prerequisite, Biochemistry. *Credit, 3.*

704. ADVANCED NUTRITION — VITAMINS AND MINERALS.
Metabolic role of vitamins and minerals, specific functions, requirements, sources, assay methods, effects of deficiencies and excesses.
Prerequisite, Biochemistry. *Credit, 3.*

710. SEMINAR.
Readings, reports and discussions on the current literature in the area of Food or Nutrition. *Credit, 1-3. Maximum Credit, 6.*

800. THESIS, MASTER'S DEGREE.
Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

551. INSTITUTIONAL ADMINISTRATION.
Principles of organization, management, sanitation, food service planning and equipment selection. 3 field trips.
Prerequisite, FN 251 or 156. *Credit, 4.*

552. ADVANCED NUTRITION.
Absorption, utilization, and interrelationship of food nutrients. Factors and critique of methods for determining nutrient requirements.
Prerequisites, FN 127, 251, Chem. 520, Zool. 135. *Credit, 3.*

560. EXPERIMENTAL FOODS.
Fundamental principles of food quality evaluation; development of an independent research problem.
One class hour, two 3-hour laboratories.
Prerequisites, FN 251, Chem. 160 or permission of instructor. *Credit, 3.*

573. NUTRITION DURING GROWTH AND DEVELOPMENT.
Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children.
Prerequisite, FN 127 or 352. *Credit, 3.*

575. NUTRITION IN DISEASE.
Physiological basis for therapeutic diets in certain diseases. Current medical and nutrition literature used.
Prerequisites, Chem. 520, Zool. 135, FN 130, 352 or permission of instructor.
Credit, 3.

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS (TCEA)
COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. SPECIAL PROBLEMS IN TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS. *Credit, 3-6.*

710. SEMINAR.
Readings, reports and discussions on the current literature in the area of Textiles, Clothing and Environmental Arts. *Credit, 1-3. Maximum Credit, 6.*

800. THESIS, MASTER'S DEGREE.
Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

553. ADVANCED CLOTHING CONSTRUCTION I.
Study of patterns and problems of fitting with opportunities for students to create original designs.
One class hour, two 2-hour laboratories.
Prerequisite, TCEA 128, or permission of instructor. *Credit, 3.*

560. ADVANCED CLOTHING CONSTRUCTION II.
Recent developments in clothing construction. Emphasis on tailoring methods and on handling of woolens and special fabrics.
One class hour, two 2-hour laboratories.
Prerequisite, TCEA 128 or 253, or permission of instructor. *Credit, 3.*

570. TEXTILES II.
Analysis and evaluation of recent scientific and technical developments in fibers and finishes.
Prerequisite, TCEA 124. *Credit, 3.*

576. HISTORY OF DECORATIVE ARTS.
Style periods in their historic contexts with emphasis on developments in furniture and furnishings. Illustrated lectures. Study tours.
Prerequisite, TCEA 123 or permission of instructor. *Credit, 3.*

577. HISTORY OF COSTUME.
A study of Western Costume from ancient civilization to the present; exploration of the relationship of clothing to the period. *Credit, 3.*

578. ADVANCED INTERIOR DESIGN.
Creative approach to architectural space; rendering of interiors with emphasis on interpreting textures, light and form in perspective.
One class hour, four studio hours.
Prerequisites, TCEA 123, 279, Art 500, Ag. Eng. 251 or equivalent. *Credit, 3.*

HOME ECONOMICS EDUCATION (HEEd.)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. SPECIAL PROBLEMS IN HOME ECONOMICS EDUCATION. *Credit, 3-6.*

710. SEMINAR.
Readings, reports and discussions on the current literature in the area of Home Economics Education. *Credit, 1-3. Maximum Credit, 6.*

800. THESIS, MASTER'S DEGREE.
Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

581. ADULT EDUCATION IN HOME ECONOMICS.
Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement.
Prerequisite, minimum 6 credits in major area. *Credit, 3.*

582. CURRICULUM AND METHODS IN HOME ECONOMICS.
Organization, scope and sequence of learning experiences in home economics education. Philosophy and content of curriculum, development of resource units, and methods of teaching.
Prerequisites, Psychology 601, 563, and Education 351. *Credit, 4.*

MANAGEMENT AND FAMILY ECONOMICS (MFE)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

430. HOME MANAGEMENT FOR TODAY'S FAMILIES.
Emphasis on management principles involved in family economics, work simplification, and decision making in the home. For those who work in an advisory capacity with families.
Prerequisites, B.S. degree in Home Economics, MFE 275, 377, or equivalent, and professional experience. *Credit, 3.*

700. SPECIAL PROBLEMS IN MANAGEMENT AND FAMILIES ECONOMICS.
Credit, 3-6.

710. SEMINAR.
Readings, reports and discussions on the current literature in the area of Family Economics and Home Management. *Credit, 1-3. Maximum Credit, 6.*

800. THESIS, MASTER'S DEGREE.
Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

550. FAMILY MANAGEMENT AND DECISION MAKING.
A presentation of the integrated nature of management in the family; concerns values and goals as reflected in decision making about family resources.
Prerequisite, permission of instructor. *Credit, 3.*

575. PERSONAL AND FAMILY ECONOMICS.
Analyzing financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society.
Prerequisite, Economics 125, or permission of instructor. *Credit, 3.*

HUMAN DEVELOPMENT (HD)

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. SPECIAL PROBLEMS IN HUMAN DEVELOPMENT. *Credit, 3-6.*

710. SEMINAR.
Readings, reports and discussions on the current literature in the area of Human Development. *Credit, 1-3.*

800. THESIS, MASTER'S DEGREE.
Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

570. CHILD DEVELOPMENT.
The study of the child from the developmental point of view. Emphasis on interaction of heredity and environment on development.
Prerequisites, Sociology 101, Psychology 101, or permission of instructor.
Credit, 3.

572. DIRECTED NURSERY SCHOOL OBSERVATION.
Directed experience in observation techniques with nursery school children.
Prerequisite, HD 570 or equivalent. *Credit, 3.*

583. NURSERY SCHOOL MANAGEMENT.
Principles and methods of Nursery School Education. Directed experience in teaching and curriculum planning for three- and four-year-old children. Field trips.
Prerequisite, HD 570 or equivalent, 572. *Credit, 3.*

584. NURSERY SCHOOL MANAGEMENT.
Continuation of 583.
Prerequisite, HD 583 or permission of instructor. *Credit, 3*

JOURNALISTIC STUDIES

GRADUATE FACULTY
Arthur B. Musgrave, *Director of Graduate Program for Journalists,* B.S., Boston University, 1931; M.S., 1943; Ph.D., Minnesota, 1961.

This program is intended for both new and experienced newspaper men and women, and for both small and large newspapers. Its basic aim is to advance journalism as a profession, particularly in New England. It seeks to attract to and encourage in journalism well-qualified college graduates, to increase their knowledge of journalism as a profession, and to educate them for superior performance.

It seeks also to enrich the background knowledge that newspaper men and women use in their daily work. The program, hence, combines the practical with the academic in the traditional way of professional education.

The program has two parts. The first leads to a certificate that will be awarded jointly by the University and the New England Society of Newspaper Editors. The second, which is optional for the newspaper men or women who have earned the certificate, leads to a Master of Arts degree in one of several academic disciplines. Journalists who are accepted as candidates for the certificate will be known as New England Newspaper Fellows. For this phase, a New England newspaper may finance any qualified college graduate on its staff who has had at least three months of professional experience and is accepted for admission by the Graduate School.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

570. WRITING AND PUBLIC AFFAIRS (I).

A reading course on problems presented by the reporting of public affairs in our society, with a focus on the relations between government and mass communication. Designed for New England Newspaper Fellows. *Credit, 3.* Mr. Musgrave.

571. WRITING AND PUBLIC AFFAIRS (II).

A continuation of Journalistic Studies 570. Designed for New England Newspaper Fellows. *Credit, 3.* Mr. Musgrave.

580. THE COMMUNICATION PROCESS.

A study of the way the communication process has been organized in our society through mass communication media. *Credit, 3.* Mr. Musgrave.

LABOR STUDIES

GRADUATE FACULTY

Ben B. Seligman, *Director and Professor of Economics,* A.B., Brooklyn College, 1934.

Leo F. Redfern, *Dean of Administration,* A.B., New Hampshire, 1950; M.A., 1951; Ph.D., Harvard, 1958.

J. R. Beattie, *Associate Director of the Cooperative Extension Service,* B.S., New Hampshire, 1939; M.S., 1940.

John L. Blackman, Jr., *Associate Professor of Economics,* B.A., Haverford College, 1930; M.A., Harvard, 1948; Ph.D., 1957.

John T. Conlon, *Assistant Dean of Business Administration and Associate Professor of Management,* B.B.A., Massachusetts, 1949; M.A., Connecticut, 1951; Ph.D., Michigan State, 1960.

Hilda H. Golden, *Assistant Professor of Sociology,* A.B., Skidmore, 1942; M.A., Duke, 1944; Ph.D., 1950.

William C. Havard, Jr., *Head of Department of Government and Professor of Government,* B.A., Louisiana State, 1943; M.A., 1947; Ph.D., University of London, 1956.

Edward C. Moore, *Dean of the Graduate School and Coordinator of Research,* B.A., Western Michigan, 1938; M.A., Michigan, 1946; M.A., 1947; Ph.D., 1950.

Bruce R. Morris, *Professor of Economics,* A.B., Western Reserve, 1931; M.A., Ohio State, 1932; Ph.D., Illinois, 1937.

Howard H. Quint, *Head of Department of History and Professor of History,* B.A., Yale, 1940; M.A., Stanford, 1942; Ph.D., Johns Hopkins, 1947.

Richard W. Trueswell, *Associate Professor of Industrial Engineering,* B.S.M.E., Stevens Institute of Technology, 1952; M.S.I.E., 1958; Ph.D., Northwestern, 1964.

LABOR STUDIES

Students admitted to the M.S. in Labor Studies program must meet the admission requirements of the Graduate School. An undergraduate major in a social science or in Business Administration is a normal prerequisite to admission. Applicants for admission should ordinarily have completed introductory college courses in Principles of Economics, Labor Economics, Statistics, and Sociology or Psychology. Students may be admitted who are deficient in one or more of these courses but such students will be required to remove any deficiencies without credit toward the M.S. degree. College level courses that would be helpful, although not required, include Industrial Relations, Government, and Industrial Engineering.

Students will be required to take the following courses in order to qualify for this degree:

Business Administration 761 Seminar in Personnel Management

Economics 744 Labor Statistics

Economics 742 Union History, Structure, and Theory

Economics 743 Wage Theory and Wage Relationships

Economics 741 Collective Bargaining

Labor Relations 710 Seminar in Labor

Two graduate courses (in the 500,600, or 700 series) in Psychology and/or Sociology, approved by the Director.

In addition, students will be required to choose four electives included in the following list.

LABOR RELATIONS AND RESEARCH CENTER

710. SEMINAR IN LABOR RELATIONS.*

Current critical issues in the labor field, such as automation, "unemployment pockets", racial integration in unions. Based upon historical perspective, selected research and field work. A paper is required. *Credit, 3.*
**Required course.*

764. FINANCIAL MANAGEMENT OF UNIONS.

The organization and analysis of financial management in union activity including health and welfare funds, pension plans, budgets, and financial controls.
Prerequisite, Accounting and Labor Economics. *Credit, 3.*

SCHOOL OF BUSINESS ADMINSTRATION

564. WAGE AND SALARY ADMINISTRATION.

A study of the objectives, procedures, and problems involved in the establishment and administration of operative and executive compensation plans. *Credit, 3.*

566. MANAGEMENT AND UNION RELATIONS II.

A study of the human relations problems encountered in the interpretation and administration of collective bargaining agreements.
Prerequisite, Management 565, Management and Union Relations I. *Credit, 3.*

751. PRINCIPLES AND POLICIES OF ADMINISTRATION.

An advanced course in the Theory of Business Administration, including the generic functions of management, organization theory, and systematic corporate decision making. *Credit, 3.*

761. SEMINAR IN PERSONNEL MANAGEMENT.*

The study and analysis of current practices and major problems of personnel administration through use of the case method and role playing techniques.
Prerequisite, Personnel Management. *Credit, 3.*
**Required Course.*

762. MANAGEMENT OF INDUSTRIAL RELATIONS.

Organization and administration of the industrial relations function within business firms, with special emphasis on alternative approaches to management rights and responsibilities in Labor Relations. *Credit, 3.*

763. SEMINAR IN INDUSTRIAL RELATIONS.

Analysis of the major current problems encountered by business management in the negotiation and administration of labor relations agreements. A major research study is required of all students.
Prerequisite, Management Union Relations I. *Credit, 3.*

DEPARTMENT OF ECONOMICS

341. ECONOMIC SECURITY.

Appraisal of insecurity and the methods for meeting it, including a survey of existing social security legislation. *Credit, 3.*

541. LABOR PROBLEMS.

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions, and government to solve them. *Credit, 3.*

542. LABOR LAW AND LEGISLATION.

Economic effects and historical survey of Federal and State laws and an analysis of important court decisions.
Prerequisite, Economics 541, Labor Problems. *Credit, 3.*

741. COLLECTIVE BARGAINING.*

The legal background of collective bargaining, the process, subject matter, and problems involved. Individual case problems.
Prerequisite, Economics 541, Labor Problems. *Credit, 3.*
**Required Course.*

742. UNION HISTORY, STRUCTURE, AND THEORY.*

Review of the rise of labor unionism and an analysis of the theory and structure of unions.
Prerequisite, Labor Problems. *Credit, 3.*
**Required Course.*

743. WAGE THEORY AND WAGE RELATIONSHIPS.*

Theoretical and institutional study of theories of wages and wage structure.
Prerequisite, Labor Problems. *Credit, 3.*
**Required Course.*

744. LABOR STATISTICS.*

Advanced statistical analysis and processing of data relevant to labor.
Prerequisite, Statistics and/or Labor Problems. *Credit, 3.*
**Required Course.*

745. LABOR DISPUTE SETTLEMENT.

Ways of settling labor disputes, including grievance proceedings, arbitrations, and presidential intervention.
Prerequisite, Labor Problems. *Credit, 3.*

746. COMPARATIVE LABOR MOVEMENTS.

A study of labor movements in various countries with an analysis of their similarities and differences.
Prerequisites, Union History and Labor Problems. *Credit, 3.*

711. ECONOMIC PLANNING.

Various kinds of economic plans in effect or proposed. Appraisal of the techniques of economic planning. *Credit, 3.*

801. HISTORY OF ECONOMIC THOUGHT.

Treatment in depth of various topics within the history of economic thought.
Prerequisite, Economics 306 or consent of instructor. *Credit, 3.*

DEPARTMENT OF PSYCHOLOGY

661. PSYCHOLOGY OF OCCUPATIONS.

A study of interests, abilities, and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized.
Prerequisite, Psychology 311, Psychological Tests. *Credit, 3.*

841. ADVANCED INDUSTRIAL PSYCHOLOGY I.

Human factors in work and performance; interrelationships of motivational and perceptual phenomena to the working environment.
Prerequisite, Industrial Psychology II, or permission of instructor. *Credit, 3.*

851. ADVANCED INDUSTRIAL PSYCHOLOGY II.

The theory and principles of man-machine-environment systems, with special attention to description, analysis, and synthesis in terms of information theory, servo analogues, psychophysiological effects, and operations research. Operations research will be considered only as it applies to the context of industrial psychology.
Prerequisites, Psychology 651, Industrial Psychology II, and Psychology 840, Advanced Industrial Psychology I. *Credit, 3.*

DEPARTMENT OF SOCIOLOGY

551. URBAN SOCIOLOGY.

A comparative analysis of cities and urbanization with special reference to demographic characteristics of urban populations, urban ecology, and urban social structure. *Credit, 3.*

729. SOCIOLOGY OF SMALL GROUPS.

Survey of sociological theory and research of small groups. Dynamics of leadership patterns, role theories, organization-disorganization theories, decision making, internal process and sociometric structuring. The relevance of small group theory and research to concepts of the inclusive social system.
Prerequisite, Sociology 282, Sociological Theory or equivalent, or permission of instructor. *Credit, 3.*

731. SOCIAL GERONTOLOGY.

Implications of aging for society and the individual. Position of the aged in non-industrialized and industrialized societies. Changing roles of older people in the American family and the community.
Prerequisite, Sociology 257, The Family, or permission of instructor. *Credit, 3.*

759. SOCIAL STRATIFICATION.

A consideration of the major contemporary writers and their contribution to this area. Research techniques in the analysis of social class and social mobility are examined.
Prerequisite, Sociology 259, Social Stratification or equivalent, or permission of instructor. *Credit, 3.*

DEPARTMENT OF GOVERNMENT

522. THE LEGISLATIVE PROCESS.

The role of the legislature in national and state government. The functions of legislatures; legislative procedures; the role played by political parties and pressure groups in the legislative process.
Prerequisite, Government 100, American Government, or Government 523, Political Parties and Elections. *Credit, 3.*

574. ADMINISTRATIVE LAW.

Governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate.
Credit, 3.

590. CONSTITUTIONAL LAW.
A study of the United States Constitution as interpreted by decisions of the Supreme Court.
Prerequisite, Government 100, American Government. *Credit, 3*

591. CIVIL LIBERTIES.
A study of the development in American Constitutional Law of the concept of civil liberty, including the following fields: free speech and religion, fair trial, and race discrimination. The function of courts in the safeguarding of these liberties.
Prerequisite, Government 100, American Government. *Credit, 3.*

690. SEMINAR IN PUBLIC LAW.
A study of selected topics in public law.
Prerequisite, Government 590 or 591, or equivalent. *Credit, 3.*

DEPARTMENT OF HISTORY

624. THE PROGRESSIVE AGE, 1900-1920.
A study of the political response to the changing economic and social conditions in American life. *Credit, 3.*

625. CONSERVATISM AND REFORM, 1920-1945.
American political, economic and intellectual life between the two World Wars. *Credit, 3.*

SCHOOL OF EDUCATION

666. PREPARATION AND USE OF AUDIO-VISUAL AIDS. *Credit, 3.*

LANDSCAPE ARCHITECTURE

GRADUATE FACULTY

Ervin H. Zube, *Head of Department and Professor of Landscape Architecture,* B.S., Wisconsin, 1954; M.L.A., Harvard, 1959; F.A.A.R., American Academy in Rome, 1961.

Theodore S. Bacon, Jr., *Associate Professor of Landscape Architecture,* B.A., Amherst, 1942; M.C.P., *Massachusetts Institute of Technology,* 1956.

Thomas W. Hamilton, Jr., *Assistant Professor of Landscape Architecture,* B.F.A., Illinois, 1950; M.S., Massachusetts, 1962.

Robert L. Kent, Jr., *Assistant Professor of Landscape Architecture,* B.S., Michigan State, 1957; M.L.A., 1959.

Raymond H. Otto, *Professor of Landscape Architecture,* B.S., Massachusetts, 1926; M.L.A., Harvard, 1929.

Paul N. Procopio, *Professor of Landscape Architecture, B.S., Massachusetts,* 1941; M.S., 1954.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Individual study by the B.L.A. candidate in lieu of a thesis; or exploratory work preliminary to the thesis by the M.L.A. candidate. *Credit, 3.* The Staff.

790. THEORY.

Special studies in the history and theory of landscape architecture and planning. *Credit, 3.* Mr. Kent or Mr. Bacon.

791. DESIGN.

Individual problems in any or all branches of public and private work. *Credit, 3.* Mr. Otto.

792. CONSTRUCTION.

Road alignment, computations and advanced landscape construction. *Credit, 3.* Mr. Procopio.

793. PRESENTATION.

Studies in drafting, pen and crayon, rendering, water coloring, etc. *Credit, 3.* Mr. Kent.

794. PRACTICE.

Professional field work under supervision, conducted upon going projects as opportunity offers. *Credit, 3.* The Staff.

797. ARCHITECTURE.

Selected problems. *Credit, 3.* Mr. Kantianis.

800. THESIS, MASTER'S DEGREE, *Credit, 10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

533. PLANTING DESIGN.

The utilization of plant materials in combination as applied to the many conditions and demands of landscape work. *Credit, 3.* Mr. Otto.

567. ARCHITECTURE.

Architectural development, including styles and forms in architecture, especially as affected by materials and methods of construction. *Credit, 3.* Mr. Kantianis.

568. ARCHITECTURAL DESIGN.

The relations between exterior and interior spaces and structures as a primary element in design and construction. A series of problems integrating theory, design analysis, and graphics. *Credit, 4.* Mr. Kantianis.

573, 574. CITY PLANNING.

The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. Either semester may be elected independently.
Credit, 3 each semester. Mr. Bacon.

575, 576. PROJECTS IN PLANNING.

An application of the principles of modern civic development through a series of problems on the design of various types of urban land areas.
Credit, 3 each semester. Mr. Bacon.

577, 578. URBAN PROBLEMS.

Housing, industrial location and development, decentralization, arterial systems, civic and metropolitan design, and regional planning.
Open to non-majors.
Prerequisites, L.A. 573 and 574 or permission of instructor.
Credit, 3 each semester. Mr. Bacon.

581, 582. ADVANCED DESIGN.

Comprehensive site planning projects covering the major areas of landscape and urban design, plus exchange problems whenever applicable. Field trips required, approximate cost $40.00.
Prerequisites, L.A. 553 and 554 *Credit, 4 each semester.* Mr. Procopio.

584. PRESENTATION.

Preparation and rendering of landscape and architectural plans, elevations, perspectives, etc. *Credit, 2.* Mr. Kent.

590. PROFESSIONAL PRACTICE.

Seminar on the methods and procedures of the professional office.
Credit, 1. Mr. Otto.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Landscape Architecture)

525. CONSTRUCTION DETAILS.
A series of problems in architectural garden features as walks, steps, walls, fences, pools and small structures. *Credit, 4.* Mr. Procopio.

553. INTERMEDIATE DESIGN.
Projects involving the fundamentals of landscape design integrating theory, analysis, research, application and graphics.
Prerequisites, Landscape Architecture 102 and 128. *Credit, 4.* Mr. Kent.

554. INTERMEDIATE DESIGN.
Spatial organization, intuitive aspects of design, and perceptual studies within comprehensive projects. Field trip required, approximate cost $40.00.
Prerequisites, L.A. 124 and 553. *Credit, 4.* Mr. Kent.

FOR THE DEGREE OF BACHELOR OF LANDSCAPE ARCHITECTURE

To receive this professional bachelor's degree, each candidate will be required:

1. To have received the degree of Bachelor of Science or Bachelor of Arts from a recognized institution.

2. To have completed as a prerequisite 24 semester credits in landscape architecture, substantially equivalent to the technical courses now required in the undergraduate major in landscape architecture at this university.

3. In addition, to have completed in residence at this institution, 30 credits in landscape architecture and closely related subjects prescribed by the department. (See Fifth Year Program below.)

4. To have received the unanimous approval of the faculty of the department and the vote of approval of the faculty of the Graduate School.

FIFTH YEAR PROGRAM

The regular program of studies for the Fifth Year, subject to minor changes dependent upon courses taken previously, is as follows:

First Semester

701. GENERAL DESIGN.
Class A Exchange problems and advanced local projects. *Credit, 5.* Mr. Fabos.

703. ECOLOGY AND PHYSIOGRAPHY.
Plant associations as related to ground forms and conditions.
Credit, 3. Mr. Mosher.

705. ARCHITECTURE.
Studies in principles and problems of architectural design.
Credit, 3. Mr. Kantianis.

707. CONTRACTS, SPECIFICATIONS, ESTIMATING COSTS.
Preparation of supporting data for proposed plans. *Credit, 3.* Mr. Hamilton.

709. SEMINAR.
Special training in the theory and philosophy of the creative art professions through research and discussions. *Credit, 1.* Mr. Kent.

Second Semester

702. GENERAL DESIGN.
Continuation of 701. *Credit, 5.* Mr. Fabos.

706. ARCHITECTURE.
Studies in principles and problems of architectural design.
Credit, 3. Mr. Kantianis.

708. CONSTRUCTION.
Problems in landscape construction as related to general design.
Credit, 3. Mr. Procopio.

710. SEMINAR.
Continuation of L.A. 709. *Credit, 1.* Mr. Kent.

Elective: Suitable subject assigned.

MATHEMATICS

GRADUATE FACULTY

Wayman L. Strother, *Head of Department and Professor of Mathematics,* B.S., Alabama State, 1943; M.S., University of Chicago, 1949; Ph.D., Tulane, 1951.

John D. Aczel, *Professor of Mathematics,* M.S., University of Budapest, 1945; Ph.D., 1950; D.Sc., University of Debrecen, 1950.

Yu W. Chen, *Professor of Mathematics,* Ph.D., University of Goettingen, Germany, 1934.

Haskell Cohen, *Professor of Mathematics,* A.B., University of Omaha, 1942; S.M., University of Chicago, 1947; Ph.D., Tulane, 1952.

Helen F. Cullen, *Associate Professor of Mathematics,* A.B., Radcliffe, 1940; M.A., Michigan, 1944; Ph.D., 1950.

David J. Dickinson, *Associate Professor of Mathematics,* B.S., University of Denver, 1942; M.A., Columbia, 1948; Ph.D., Michigan, 1954.

David J. Foulis, *Professor of Mathematics,* B.A., Miami, 1952; M.S., Miami, 1953; Ph.D., Tulane, 1958.

Henry G. Jacob, *Professor of Mathematics,* B.E., Yale, 1943; M.E., 1947; Ph.D., 1953.

Eleanor Killam, *Assistant Professor of Mathematics,* B.S., New Hampshire, 1955; M.S., 1956; Ph.D., Yale, 1961.

Esayas G. Kundert, *Professor of Mathematics,* B.A., University of Zurich, 1945; Ph.D., 1953.

Lorraine D. Lavallee, *Assistant Professor of Mathematics,* A.B., Mount Holyoke, 1953; M.A., Massachusetts, 1955; Ph.D., Michigan, 1962.

Teng-Sun Liu, *Assistant Professor of Mathematics,* B.S., National Taiwan University, 1954; M.A., Pennsylvania, 1961; Ph.D., 1963.

Larry N. Mann, *Associate Professor of Mathematics,* B.A., Pennsylvania, 1955; M.A., 1956; Ph.D., 1959.

Wallace S. Martindale, *Associate Professor of Mathematics,* B.A., Amherst College, 1952; M.A., Pennsylvania, 1954; Ph.D., 1958.

Berthold Schweitzer, *Associate Professor of Mathematics,* B.S., Massachusetts Institute of Technology, 1951; M.S., Illinois Institute of Technology, 1954; Ph.D., 1956.

Doris S. Stockton, *Assistant Professor of Mathematics,* B.S., Douglass College in Rutgers University, 1945; M.S., Brown, 1947; Ph.D., 1958.

Robert W. Wagner, *Associate Dean of the College of Arts and Sciences and Professor of Mathematics,* A.B., Ohio, 1934; M.A., Michigan, 1935; Ph.D., 1937.

Ta-Sun Wu, *Assistant Professor of Mathematics,* B.S., National Taiwan University, 1954; Ph.D., Tulane, 1962.

SPECIAL DEPARTMENT ENTRANCE REQUIREMENTS

Candidates for admission who plan to major in this department must have completed at least eighteen semester credit hours in undergraduate mathematics beyond the content of Mathematics 173 and 174 (Differential and Integral Calculus). A one-year course in Modern Algebra and a one-year course in Advanced Theoretical Calculus would be desirable. Both of these courses as well as a course in Set Theory are necessary, before entrance to graduate school, if a student is to complete the work of a Master's degree in one year or of a Ph.D. in three years.

SPECIAL DEGREE REQUIREMENTS

Master's Degree Program

The following courses, or equivalent courses taken elsewhere, are required for a Master's degree: 211, 212 (no graduate credit for Mathematics majors), 625, 626, 671, 771, 711; either 723 or 721; one of the four courses 712, 724, 722, 772.

A total of 30 graduate credit-hours is required of which not more than six credit-hours may be taken in other departments, and at least 12 must be in the 700 series mathematics courses. The choice of courses taken in other departments is subject to the approval of this department.

Ph.D. Program

The Ph.D. program conforms to the general provisions of the Graduate School.

The two languages presented to fulfill the language requirements will normally be chosen from French, German, and Russian.

A student need not obtain a Master's degree on the way to the doctorate, but all students may be required to pass the Master's examination prior to taking the comprehensive examination for the Ph.D. The preparation for the comprehensive examination normally requires 21 credits beyond the minimum for a Master's degree or 51 credits beyond the undergraduate major. The guidance committee designing the program of the individual student will indicate any necessary additional course work.

The comprehensive examination will consist of both a written and an oral part, and will be based upon (but not limited to) the material in or prerequisite to the following courses:

(a) 711-712. Introduction to modern algebra.
(b) 723-724. Theory of functions of a real variable.
(c) 721. Theory of functions of a complex variable.
(d) 771-772. Introduction to topology.
(e) At least four additional semester courses at the 700 or 800 level chosen from more than one area and approved by the Guidance Committee.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. TOPICS COURSE.

Topics may be chosen from the fields of algebra, geometry, theory of functions, topology, and applied mathematics.
Prerequisite, permission of instructor. *Credit, 1, 2, 3.*

711, 712. INTRODUCTION TO MODERN ALGEBRA.

Axiomatic foundation of algebra, groups, rings, fields and vector spaces; linear transformations and matrices.
Prerequisite, Mathematics 512. *Credit, 3 each semester.*

721. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.

Holomorphic functions, power series and complex integration, singularities, series and infinite products of holomorphic functions, entire and meromorphic functions.
Prerequisites, Mathematics 771 and 626. *Credit, 3.*

722. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.

Topics selected from: Conformal mappings, Riemann surfaces, special functions, Laplace and Fourier series and transforms, differential equations and boundary value problems. Physical applications.
Prerequisite, Mathematics 721. *Credit, 3*

723, 724. THEORY OF FUNCTIONS OF A REAL VARIABLE.

Limits, continuity and differentiability of functions of one and two real variables, theories of integration, sequences of functions.
Prerequisite, Mathematics 771. *Credit, 3 each semester.*

725. INTRODUCTION TO FUNCTIONAL ANALYSIS.

Banach and Hilbert spaces, continuous linear operators, spectral theory, Banach algebras.
Prerequisites, Mathematics 512 and 771. *Credit, 3.*

771. TOPOLOGY I — INTRODUCTION TO GENERAL TOPOLOGY.

Topological, Hausdorff and metric spaces; homeomorphisms; connectivity and compactness.
Prerequisites, Mathematics 625 and 671. *Credit, 3.*

772. TOPOLOGY II — INTRODUCTION TO ALGEBRAIC TOPOLOGY.

Simplexes, complexes, homology and homotopy.
Prerequisite, Mathematics 771. *Credit, 3.*

811, 812. ADVANCED ALGEBRA.

A detailed study of one or more advanced topics in modern algebra.
Prerequisite, permission of the department. *Credit, 3 to 6.*

823, 824. ADVANCED ANALYSIS.

A thorough study of one or more topics in classical or modern analysis.
Prerequisite, permission of the department. *Credit, 3 to 6.*

861, 862. ADVANCED GEOMETRY.
A careful study of one or more branches of geometry.
Prerequisite, permission of the department. *Credit, 3 to 6.*

871, 872. ADVANCED TOPOLOGY.
Advanced study of algebraic, general, or differential topological structures.
Prerequisite, permission of the department. *Credit, 3 to 6.*

881, 882. ADVANCED PURE AND/OR APPLIED MATHEMATICS.
A topic of current interest and perhaps reflecting the specialized research activity of the professor. This course may be concerned with the bond between two or more of the courses listed above as algebra, analysis, geometry, and topology.
Prerequisite, permission of the department. *Credit, 3 to 6.*

883, 884. DIRECTED READINGS.
Prerequisite, permission of the department. *Credit, up to 6.*

891, 892. LITERATURE SEMINAR.
A seminar designed for the beginning graduate student's initial experience in presenting material from the mathematics literature.
Credit, 1 each semester.

893, 894, 895, 896. RESEARCH SEMINAR.
Presentation by the advanced graduate student of research articles, preferably his own research. *Credit, 1 each semester.*

900. Ph.D. THESIS. *Credit, up to 12.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

551. NUMERICAL ANALYSIS.
Approximation and error evaluation; finite differences; approximation by polynomials using finite difference methods and minimal criteria; special reference to sets of orthogonal polynomials.
Three class hours.
Prerequisites, Mathematics 186 or 174; Computer Science 121 (may be taken concurrently). *Credit, 3.*

552. NUMERICAL ANALYSIS.
Evaluation of definite integrals; solution of differential equations, polynomial equations, other conditional equations, and systems of linear equations with

related matrix manipulations.
Three class hours.
Prerequisites, Mathematics 551 and 541 or 187. *Credit, 3.*

611. LINEAR ALGEBRA.

Row equivalence, Linear transformations and matrices. Similarity, invariant subspaces, canonical forms. Inner product spaces, linear functions, the spectral theorem, bilinear forms.
Three class hours.
Prerequisite, Mathematics 512 or 513. *Credit, 3.*

612. THEORY OF GROUPS AND GROUP REPRESENTATIONS.

Axiom systems, Lagrange theorem, generators, relations. Conjugate classes, normal subgroups, quotient groups. Sylow theorems. Abelian groups. Unitary and irreducible representations. Characters, orthogonality relations.
Three class hours.
Prerequisite, Mathematics 611. *Credit, 3.*

613. THEORY OF NUMBERS.

Euclid's algorithm, theory of prime numbers, aliquot parts, congruences, further topics in number theory.
Three class hours.
Prerequisite, Mathematics 511. *Credit, 3.*

625. INTRODUCTORY MODERN ANALYSIS.

Real and complex numbers. Basic topology of the real number system. Limit and continuity. Differentiation. Partial differentiation.
Three class hours.
Prerequisite, Mathematics 174. *Credit, 3.*

626. INTRODUCTORY MODERN ANALYSIS.

Bounded variation. Riemann-Stieltjes integration. Multiple integrals. Line integrals. Infinite series. Sequences of functions. Improper Riemann-Stieltjes integrals.
Three class hours.
Prerequisite, Mathematics 625. *Credit, 3.*

641. FOURIER SERIES AND ORTHOGONAL FUNCTIONS.

Solutions of boundary value problems by Fourier series, Bessel functions, Legendre polynomials; convergence of representations by orthogonal functions.
Three class hours.
Prerequisite, Mathematics 541 or 187. *Credit, 3.*

661. PROJECTIVE GEOMETRY.

A study, from both the synthetic and analytic viewpoints, of properties invariant under projection, with emphasis on the real plane. Equivalence of Desarguesian and coordinate projective geometries.
Three class hours.
Prerequisite, Mathematics 511. *Credit, 3.*

662. HIGHER GEOMETRY.

A study along the lines of Klein's *Erlanger Programm* of various geometries and their groups of transformations, emphasizing Projective, Affine, and Euclidean.
Three class hours.
Prerequisites, Mathematics 512 and 661, or permission of instructor. *Credit, 3.*

671. SET THEORY.

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic.
Three class hours.
Corequisite, Math 625 or permission. *Credit, 3.*

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Mathematics)

505. MATHEMATICS OF FINANCE.

The mathematical principles of simple and compound interest, annuities, depreciation, valuation of bonds, and insurance. May not be counted for Mathematics major credit.
Three class hours.
Prerequisite, Mathematics 111, 135 or 121. *Credit, 3.*

511. INTRODUCTION TO MODERN ALGEBRA I.

Basic concepts, groups, rings, the real and complex fields.
Three class hours.
Prerequisite, Mathematics 174 or 186, or permission. *Credit, 3.*

512. INTRODUCTION TO MODERN ALGEBRA II.

Polynomials, cyclic groups, finite demensional vector spaces, linear transformations, elementary theory of matrices and determinants.
Three class hours.
Prerequisite, Mathematics 511. *Credit, 3.*

513. INTRODUCTION TO VECTOR SPACES AND GROUPS.

The last two-thirds of Mathematics 512. Finite demensional vector spaces, linear transformations, elementary theory of matrices and determinants. Three class hours for the last two-thirds of a semester.
Prerequisite, Mathematics 123 or permission of the department head. *Credit, 2.*

521. VECTOR ANALYSIS.

The Algebra and Calculus of vectors. Applications to Physics and other fields will be considered.
Three class hours.
Prerequisite, Physics 104 or 106; corequisite, Mathematics 186 or 174. *Credit, 3.*

541. DIFFERENTIAL EQUATIONS.

Three class hours.
Prerequisite, Mathematics 174. *Credit, 3.*

557. LINEAR PROGRAMMING AND THEORY OF GAMES.

Topics include sets, probability, vectors, matrices, and an introduction to linear programming and theory of games.
Three class hours.
Prerequisite, permission of instructor. *Credit, 3.*

585. ADVANCED ENGINEERING MATHEMATICS.

Series solution of differential equations, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in Mathematics.
Three class hours.
Prerequisite, Mathematics 541 or 187. *Credit, 3.*

586. ADVANCED ENGINEERING MATHEMATICS.

Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in Mathematics.
Three class hours.
Prerequisite, Mathematics 541 or 187. *Credit, 3.*

621. COMPLEX ANALYSIS.

The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration. Taylors series, and residues.
Three class hours.
Prerequisite, Mathematics 541 or 187. *Credit, 3.*

MECHANICAL AND INDUSTRIAL ENGINEERING

GRADUATE FACULTY

Maurice E. Bates, *Professor of Mechanical Engineering,* B.S.E., Michigan, 1934; M.S., Massachusetts Institute of Technology, 1935; Ph.D., 1937.

Robert W. Day, *Associate Professor of Mechanical Engineering,* B.S., Massachusetts, 1948; M.M.E., Rensselaer Polytechnic Institute, 1954.

John H. Dittfach, *Professor of Mechanical Engineering,* B.S.M.E., Minnesota, 1947; M.S.M.E., 1948.

Carl A. Keyser, *Commonwealth Professor of Metallurgical Engineering,* B.S., Worcester Polytechnic Institute, 1939; M.S., 1941; B.S., Carnegie Institute of Technology, 1946.

Joseph M. O'Byrne, *Associate Professor of Mechanical Engineering,* B.S.M.E., Cincinnati, 1950; M.E., 1952; M.S.M.E., Kentucky, 1952.

Robert K. Patterson, *Associate Professor of Mechanical Engineering,* B.S., Maine, 1948; M.S., 1955.

Edward J. Rising, *Associate Professor of Mechanical Engineering,* B.M.E., Rensselaer Polytechnic Institute, 1950; M.M.E., Syracuse, 1954; Ph.D., State University of Iowa, 1959.

D. Sobala, *Associate Professor of Mechanical Engineering,* B.S.A.E., Massachusetts Institute of Technology, 1947; B.S.B.A., 1948; M.S.M.E., 1952.

J. D. Swenson, *Professor of Mechanical Engineering,* B.S.M.E., New York University, 1932; M.A., Columbia, 1936.

R. W. Trueswell, *Associate Professor of Industrial Engineering,* B.S.M.E., Stevens Institute of Technology, 1952; M.S.I.E., 1958; Ph.D., Northwestern, 1964.

MECHANICAL ENGINEERING

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major and minor credit)

700. SPECIAL PROBLEMS IN MECHANICAL ENGINEERING.

Special investigational or research problems, the scope to be varied to meet specific conditions.

Prerequisite, as required by the problem. *Credit, 1-6.* The Staff.

701. ADVANCED THERMODYNAMICS.

A detailed treatment of the first and second laws and a selection of advanced topics to fit individual needs.

Prerequisite, M.E. 287. *Credit, 3.* The Staff.

711. THEORY OF POWER MACHINES.

Advanced thermodynamic study applied to heat power equipment such as gasoline and Diesel engines, steam and gas turbines, rotary and reciprocating compressors, jet propulsion, and rockets.
Prerequisites, M.E. 577 and 587. *Credit, 3.* The Staff.

721. ADVANCED HEAT TRANSFER.

Advanced topics in heat transfer.
Prerequisite, M.E. 582. *Credit, 3.* The Staff.

741. ADVANCED DYNAMICS.

Vibration and stability of systems with many degrees of freedom, normal modes and frequencies; approximate methods. Nonlinear systems, self excited vibrations. Gyroscopic effects in mechanical systems. Selected topics with application to problems in engineering.
Prerequisite, M.E. 585. *Credit, 3.* Mr. White and Mr. Sobala.

751. ADVANCED TOPICS IN MACHINE DESIGN.

Application of advanced theories to Machine Design and Kinematics. A variety of topics and considerable creative work are included.
Prerequisite, M.E. 583 and 586. *Credit, 3.* Mr. Bates.

800. THESIS, MASTER'S DEGREE. *Credit, 3-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

404. MECHANICAL DRAWING IN HIGH SCHOOL.

Discussion of course material for pre-engineering high school mechanical drawing courses. Theory and laboratory practice.
Limit: 30 participants (Summer School). *Credit, 3.*

550. FUNDAMENTALS OF METALLURGY.

Physical metallurgy involving crystal structure, solid solutions, diffusion in the solid state, freezing of metals, hardening of metals, annealing, and equilibrium diagrams. Fundamentals are applied to the study of the iron-iron carbide diagram, the S-curve, heat treatment of steel and the properties and uses of the other principal engineering metals. Laboratory work stresses metallographic technique. Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 135 or Chemistry 586. *Credit, 3.* The Staff.

568. KINEMATICS.

Principles of mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions.
Two class hours, one 3-hour laboratory period.
Prerequisites, M.E. 101 and C.E. 252. *Credit, 3.* The Staff.

574. BASIC AERODYNAMICS.

An introduction of the basic concepts of applied aerodynamics, for the student who has no previous background in the subject. Topics include properties of air, ideal fluid flow, airfoils and their properties, aircraft performance and stability.
Three class hours.
Prerequisite, C.E. 276. *Credit, 3.* Mr. Sobala.

575. STEAM POWER PLANTS.

A study of steam power plants, including boilers, stokers, fuels, combustion, steam generation, prime movers, auxiliary equipment, and problems involved in design and operation.
Three class hours.
Prerequisite, M.E. 264. *Credit, 3.* Mr. Swenson.

576. REFRIGERATION AND AIR CONDITIONING.

The fundamental principles of thermodynamics as applied to refrigeration and air conditioning. Application of refrigeration to industrial processes and the control of temperature, humidity and motion of air in buildings.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 264. *Credit, 3.* Mr. Swenson.

577. INTERNAL COMBUSTION ENGINES.

The thermodynamic and performance aspects of reciprocating gasoline and Diesel engines, steady flow gas turbines and turbo-jet engines, and rockets are major topics.
Three class hours.
Prerequisite, M.E. 264. *Credit, 3.* Mr. Dittfach.

582. HEAT TRANSFER.

Methods of evaluating heat transfer rates and predicting operating temperatures. Heat transfer by conduction, radiation, and convection. Topics include one- and two-dimensional conduction, heat flow, transient heat flow, fins, numerical and graphical solutions, free and forced convection and radiation.
Three class hours.
Prerequisites, M.E. 264 and Mathematics 186 or 541. *Credit, 3.* Mr. O'Byrne.

583. MACHINE DESIGN.

Principles involved in the design of various machine parts. Related topics included such as economy of manufacture, safety, styling, invention, and creativity.
Two class hours, one 3-hour laboratory period.
Prerequisites, C.E. 253 and M.E. 568. *Credit, 3.* Mr. Bates and Mr. Patterson.

584. BASIC ENGINEERING ANALYSIS.

The application of mathematical methods to the solution of mechanical engineering problems in such fields as vibrations, elasticity, fluid mechanics, and dynamics. The analysis of the problems and the derivation of the governing equations.
Three class hours.
Prerequisites, M.E. 585, Mathematics 186 or 541. *Credit, 3.* The Staff.

585. DYNAMICS OF MACHINERY.

Elements of vibration theory, vibration isolation, vibration analysis of equivalent masses and shaft systems. Vibration absorbers of dynamics balancing. Students may schedule the course without the laboratory (3 cr.) or with the laboratory (4 cr.).
Three class hours, one 3-hour laboratory period.
Prerequisites, C.E. 252 and M.E. 568. *Credit, 3-4.* Mr. Sobala.

586. ADVANCED MACHINE DESIGN.

A continuation of Course 563. Additional elementary parts are analyzed, and some complete machines are studied. Considerable emphasis on invention and creativity.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 583. *Credit, 3.* Mr. Bates and Mr. Patterson.

587. ENGINEERING THERMODYNAMICS III.

Topics investigated include combustion and gas dynamics with emphasis on one dimensional flow with normal and oblique shock.
Three class hours.
Prerequisites, Math 186 and M.E. 264. *Credit, 3.* The Staff.

590. ADVANCED METALLURGY.

Advanced topics in metallurgy including the structure of metals and recent metallurgical developments.
Two class hours, one 3-hour laboratory period.
Prerequisite, M.E. 550. *Credit, 3.* The Staff.

597. EXPERIMENTAL MECHANICAL ENGINEERING.

Prerequisite, permission of instructor. *Credit, 3.* The Staff.

INDUSTRIAL ENGINEERING

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

700. SPECIAL PROBLEMS IN INDUSTRIAL ENGINEERING.

Special investigational or research problems in industrial engineering, the scope to be varied to meet specific conditions.
Prerequisite as required by the problem. *Credit, 1-6.* The Staff.

753. METHODS OF MEASUREMENT OF HUMAN WORK.

A critical study of the assumptions in measuring human effort in industry including the problems present in rating, predetermined data systems, the use of the high speed camera in securing data.
Three class hours.
Prerequisite, I.E. 253 and 272 or comparable courses. *Credit, 3.* The Staff.

754. ADVANCED TOPICS IN ENGINEERING ECONOMY.

A more intensive study of the basic subject field of engineering economy as stated in I.E. 254.
Three class hours.
Prerequisite, I.E. 254 or a similar basic course in engineering economy.
Credit, 3. The Staff.

756. ADVANCED TOPICS IN DATA PROCESSING.

Probability theory and information theory, components and operation of analog and digital computers, the analysis of large scale data processing systems as applied to the functioning of industrial control systems.
Three class hours.
Prerequisite, I.E. 256 or a similar basic course in data processing principles and applications. *Credit, 3.* The Staff.

777. MANUFACTURING CONTROL.

A quantitative approach to decision making in production management. Incremental analysis, linear programming, waiting line theory, statistics as applied to problems of economic quantity planning, production programming, statistical control and equipment purchase.
Three class hours.
Prerequisite, basic knowledge of statistics and the principles of operations research.
Credit, 3. The Staff.

779. QUANTITATIVE METHODS IN INDUSTRIAL ENGINEERING.

The application of mathematical concepts and the principles of operations research and probability to various Industrial Engineering problems. The theoretical background will be presented, demonstrated by example and applied by exercises and case problems.
Three class hours.
Prerequisite, a basic knowledge of statistics and the principles of operations research. *Credit, 3.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 3-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

553. METHODS AND STANDARDS ENGINEERING.

The principles involved in the simplification of the work pattern and the design of the work place, and in the establishment of production standards for industrial engineering students.
Three class hours, one 3-hour laboratory period.
Prerequisite, I.E. 271, previously or concurrently. *Credit, 4.* The Staff.

554. ENGINEERING ECONOMY.

A study of the bases for comparison of alternatives in engineering projects, break-even and minimum cost points, evaluation of proposals for new activities, economy of operations, the evaluation of public activities, the output and life of typical items of engineering and industrial equipment, manufacturing lot sizes, economic purchase quantities, the selection and replacement of structures and machines.
Three class hours.
Prerequisites, Economics 125, Mathematics 106, and Industrial Enginering 579.
Credit, 3. The Staff.

556. ANALYSIS OF DATA PROCESSING SYSTEMS.

Principles and applications of data processing and electronic computer systems for use by Industrial Engineers as a management tool for control and decision making.
Three class hours.
Prerequisite, approval of instructor. *Credit, 3.* The Staff.

I.E. 571. BASIC PROBABILITY FOR ENGINEERS.

A study of probability and its applications to engineering which utilizes calculus to examine frequency, density and cumulative distribution functions. Distributions

such as chi square, normal, binomial, etc. are treated. Hypothesis testing will be included.
Three class hours.
Prerequisite, Math 106. *Credit, 3.* The Staff.

572. PRINCIPLES OF ENGINEERING STATISTICS.

A study of statistical principles as applied to engineering problems including: analysis of variances, design of experiments, sampling plans, statistical quality control.
Three class hours.
Prerequisite, a basic course in statistics comparable to I.E. 271.
Credit, 3 The Staff.

575. JOB EVALUATION.

The principles used to determine an evaluation of all occupations in order to establish an equitable rating between them, to establish sound wage and salary policies.
Two class hours.
Prerequisite, I.E. 251. *Credit, 2.* The Staff.

576. TIME STUDY.

The principles involved in the establishment of production standards and their application in the management functions of cost accounting, estimating, production control, incentives, budgetary control.
Prerequisites, I.E. 575, 582 concurrently except for Business Administration majors.
Credit, 3. The Staff.

577. FACTORY PLANNING AND LAY-OUT.

The principles applying to the determination and development of the physical relationship between plant equipment and operators working toward the highest degree of economy and effectiveness in operation.
One class hour, one 3-hour laboratory period.
Prerequisites, M.E. 102 and I.E. 251. *Credit, 2.* The Staff.

578. PRODUCTION CONTROL.

The principles used to regulate production activities in keeping with the manufacturing plan.
Three class hours.
Prerequisite, I.E. 251. *Credit, 3.* The Staff.

579. INDUSTRIAL ENGINEERING PROBLEMS.

The principles of statistics, theory of probability, theory of games, principles of linear programming applied to solutions of problems in inventory control, costing,

production control, quality control, production standards, work measurement, delay allowances.
Three class hours.
Prerequisites, Mathematics I.E. 571, and I.E. 253. *Credit, 3.* The Staff.

580. PLANT BUDGETARY CONTROL.

The principles used to predetermine expenses for the factors of production and the comparison of results with the estimates to determine and deal with the causes of expense variations as applied by the operating organization in the industrial plant.
Three class hours.
Prerequisite, I.E. 251. *Credit, 3.* The Staff.

582. WORK SIMPLIFICATION.

The principles involved in the simplification of means of doing work and in the application and use of these principles.
One class hour, one 3-hour laboratory period.
Prerequisites, M.E. 568 and I.E. 576 concurrently. *Credit, 2.* The Staff.

MICROBIOLOGY

GRADUATE FACULTY

Charles D. Cox, *Head of Department and Professor of Microbiology,* B.S., Illinois, 1940; M.S., 1941; Ph.D., 1947.

Ercole Canale-Parola, *Assistant Professor of Microbiology,* B.S., Illinois, 1956; M.S., 1957; Ph.D., 1961.

Stanley G. Holt, *Assistant Professor of Microbiology,* B.S., N.Y.U., 1958; M.S., Michigan State, 1960; Ph.D., California at Davis, 1964.

Ross W. I. Kessel, *Assistant Professor of Microbiology,* B.S., University College, London; Ph.D., Rutgers, 1960.

Robert P. Mortlock, *Assistant Professor of Microbiology,* B.S., Rensselaer Polytechnic Institute, 1953; Ph.D., Illinois, 1958.

Charles J. Pfau, *Assistant Professor of Microbiology,* B.S., Rensselear Polytechnic Institute, 1956; M.S., Indiana University, 1958; Ph.D., 1960.

The Department of Microbiology provides facilities for students intending to complete the requirements for the Master of Science and Doctor of Philosophy degrees. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those students considered by the Depart-

ment to be deficient in cognate sciences may be accepted as graduate student majors in microbiology and their deficiencies removed during graduate study. Extensive advanced undergraduate courses in microbiology are not as essential as undergraduate background in chemistry, biological sciences, mathematics and physics, in preparation for graduate work in microbiology. Satisfactory knowledge of microbiology and cognate sciences is required for admission to advanced courses in microbiology.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. RESEARCH.

Not for thesis credit, but normally for research preliminary to registration for thesis credit. May be repeated for a total of no more than 9 credits for a Master's degree or 18 credits for a Doctor's degre. Permission of the instructor required.

Credit, 2-6 each semester. The Staff.

710. ADVANCED IMMUNOLOGY.

Advanced theories and laboratory procedures basic to immunology and serology. Permission of the instructor required. *Credit, 3-6.* The Staff.

720. MAMMALIAN VIROLOGY.

The structure, and the chemical, physical and biological properties of viruses with emphasis on mammalian viruses. Laboratory treatment includes technics of propagation and study, including tissue culture.
Permission of the instructor required. *Credit, 4.* Mr. Pfau.

730. MICROBIAL FERMENTATIONS.

Theories, methods, and processes by which various chemicals and biological materials are produced industrially through the action of microorganisms. The laboratory experiments consider the microorganisms involved, procedures used, and the chemistry of the fermentation reactions.
Permission of the instructor required. *Credit, 3.* Mr. Czarnecki.

735. ANTIBIOTICS.

The historical background and theory of action of antibiotics are correlated with practical laboratory procedures used in the study of their isolation, methods of assay, and effects on morphology and survival of bacteria.
Permission of the instructor required. *Credit, 3.* Mr. Czarnecki.

740. ADVANCED MICROBIAL PHYSIOLOGY.

Similar to Microbiology 640 except more intensive treatment of specific areas dictated by particular research interests and requirements of the student.
Permission of the instructor required. *Credit, 2-5.* The Staff.

750. MICROBIAL CYTOLOGY.

Lectures, literature reviews, and laboratory demonstrations, designed to give the student a comprehensive survey of the structure of microbial cells and the functions of their components.
Permission of the instructor required. *Credit, 3-5.* The Staff.

760. MICROBIAL METABOLISM.

Metabolic pathways and mechanisms in microorganisms. Lectures, readings and discussions.
Permission of the instructor required. *Credit, 3.* Mr. Mortlock.

770. MICROBIAL GENETICS.

Inheritance and variation in microorganisms. Mechanisms of recombination, transformation, transduction and other genetic phenomena in microorganisms, with emphasis on molecular basis.
Permission of the instructor required. *Credit, 4.* The Staff.

780. HOST-PARASITE RELATIONSHIPS.

Intensive treatment of specific relationships between parasitic microorganisms and their hosts, by appropriate literature and laboratory studies.
Permission of the instructor required. *Credit, 2-5.* Mr. Cox, Mr. Kessel.

790. SEMINAR.

Reports and discussions of pertinent literature. Normally required of all graduate majors each semester in residence. *Credit, 1.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

890. CURRENT TOPICS.

Intensive consideration of a specific microbiological topic of current interest, utilizing staff and student participation and visiting scientists. Lectures and discussions only. Credit depends upon particular topic each semester given.
Permission of the instructor required. *Credit, 1-2.* The Staff.

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

550. GENERAL MICROBIOLOGY I.

General considerations of microbial structure, growth and physiology, and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and other science majors.
Two class hours, two 3-hour laboratory periods.
Prerequisites, organic chemistry or concurrent registration, and one semester of biological science. *Credit, 4.* Mr. Canale-Parola, Mr. Mortlock.

560. GENERAL MICROBIOLOGY II.

Principles of selective enrichment and isolation; morphological, physiological and ecological characteristics of a number of microbial groups isolated from nature.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550, or Microbiology 150 and organic chemistry.
Credit, 4. Mr. Canale-Parola.

580. PATHOGENIC BACTERIOLOGY.

Correlation of physiologic and metabolic properties and processes of bacteria with the pathogenesis of disease.
Prerequisite, Microbiology 150 or 550. *Credit, 4.* Mr. Kessel.

610. IMMUNOLOGY.

Fundamental study of the nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550, or Microbiology 150 and organic chemistry.
Credit, 4. Mr. Cox, Mr. Kessel.

620. VIROLOGY.

The structure, and the chemical, physical and biological properties of viruses, with emphasis on the bacterial viruses.
Two class hours, two 3-hour laboratory periods.
Prerequisite, Microbiology 550, or permission of the instructor.
Credit, 4. Mr. Pfau.

640. MICROBIAL PHYSIOLOGY.

Fundamental study of the growth, nutrition, metabolism and respiration of microorganisms.
Prerequisites, Microbiology 550, or permission of the instructor.
Credit, 4. Mr. Mortlock.

PHILOSOPHY

GRADUATE FACULTY

Clarence Shute, *Head of Department and Professor of Philosophy,* A.B., Asbury College, 1923; A.M., Columbia, 1925; Ph.D., 1941.

John A. Brentlinger, *Assistant Professor of Philosophy,* A.B., University of Chicago, 1958; M.S., Yale, 1960; Ph.D., 1962.

Leonard H. Ehrlich, *Assistant Professor of Philosophy,* B.S., Roosevelt University, 1947; M.S., University of Basel, 1951; Ph.D., Yale, 1960.

Edward C. Moore, *Dean of the Graduate School and Research Professor of Philosophy,* B.A., Western Michigan University, 1938; M.A., Michigan, Educational Administration, 1946; M.S., Philosophy, 1947; Ph.D., 1950.

Felix E. Oppenheim, *Professor of Government and Philosophy,* LL.D., Brussels University, 1938; Ph.D., Princeton, 1942.

Joe W. Swanson, *Associate Professor of Philosophy,* B.A., Southern Methodist University, 1948; M.A., 1954; M.A., Harvard, 1955; Ph.D., 1959.

Students are advised to consult the departmental office prior to preregistration for a list and detailed descriptions of scheduled graduate courses.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

Each course numbered above 700 is conducted as a seminar.

700. RESEARCH AND READING IN PHILOSOPHY.

Independent graduate research on specific topics in philosophy under the supervision of a faculty member.

Prerequisite, permission of the department.

Credit, 2-6. Maximum credit, 6. The Staff.

710, 711. SELECTED PHILOSOPHERS.

Each semester a leading philosopher will be chosen for intensive reading.

Prerequisite, permission of instructor. *Credit, 3.* The Staff.

720. KANT.

The *Critique of Pure Reason* will be read in its relation to Kant's philosophy as a whole.

Prerequisite, permission of instructor. *Credit, 3.* Mr. Ehrlich.

745. ETHICAL THEORY.

Analysis of selected problems of normative and meta-ethics involved in contemporary development of ethical theory.
Prerequisite, permission of instructor. *Credit, 3.* Miss Ferguson or Mr. Foster.

750. PHILOSOPHY OF EDUCATION.

An evaluation of various educational theories and practices on the different levels viewed in the light of historical perspective and contemporary thought.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Ehrlich.

755. PHILOSOPHY OF LANGUAGE.

An inquiry into the nature of language, meaning, reference, communication and translation. Topics include the later Wittgenstein, Quine's contextualism, the Whorf-Sapir hypothesis, problems in psycholinguistics.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Swanson.

756. CONFIRMATION THEORY.

Explanation and prediction, verifiability, status of theoretical terms, contrafactual conditions, reduction, confirmation.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Clay or Mr. Swanson.

760. METAPHYSICS.

The leading issues in contemporary debate on the nature and limits of metaphysical theory; examination of metaphysical concepts in relation to their use and treatment by other disciplines.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Brentlinger.

765. THEORY OF KNOWLEDGE.

A study of perception, subject-object relation, origins of knowledge, concept formation and language, the anlytic-synthetic distinction, limits of empiricism and rationalism, relation of epistemology to metaphysics.
Prerequisite, permission of instructor. *Credit, 2.* Mr. Swanson.

780, 781. PROBLEMS IN THE HISTORY OF IDEAS.

An inquiry into a distinct major philosophical problem or group of related philosophical problems.
Prerequisite, permission of instructor. *Credit, 3.* The Staff.

790, 791. SEMINAR.

Conferences and reports on special studies in philosophy.
Credit, 1-3. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 6-10.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Prerequisites. The prerequisites listed are those normally required of undergraduate students. They may be waived by the instructor for graduate students with adequate preparation.

501. PLATO AND ARISTOTLE.

The major works of Plato and Aristotle in ethics, logic, and metaphysics will be read for the systematic character of their thought and its contemporary relevance. *Credit, 2-3.* Mr. Brentlinger.

502. PHILOSOPHY IN THE MIDDLE AGES.

The writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought. *Credit, 2-3.* Mr. Ehrlich.

503. EUROPEAN PHILOSOPHY FROM MONTAIGNE TO ROUSSEAU.

A study of representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal. *Credit, 3.* Mr. Ehrlich.

504. BRITISH PHILOSOPHY FROM BACON TO HUME.

A study of representative philosophical texts, with emphasis on Locke, Berkeley, and Hume, and their historical influence, especially on contemporary empiricism. *Credit, 3.* Miss Ferguson.

518. AMERICAN PHILOSOPHY.

Examination by means of a study of selected original texts by the outstanding American philosophers, of their contribution to Western thought and American civilization. *Crdit, 2-3.* Mr. Moore.

525. INDIAN PHILOSOPHIES.

Theories of reality, of knowledge, of art, and of human destiny in the leading schools of Indian Asia; traditional and contemporary political theory. *Credit 2-3.* Mr. Shute.

526. FAR EASTERN PHILOSOPHIES.

Theories of human nature, society, and the state in philosophies of Chinese and Japanese origin; the modification of Buddhism under the influence of Chinese thought. *Credit, 2-3.* Mr. Shute.

530. PHILOSOPHY OF SCIENCE.

A critical analysis of the structure of scientific method and the language of science, the respective roles of induction and deduction in science, and the status of theoretical terms. *Credit, 2-3.* Mr. Swanson.

541. PHILOSOPHY OF RELIGION.

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience. *Credit. 2-3.* Mr. Shute.

543. AESTHETICS.

Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism. *Credit 2-3.* Mr. Shute.

561. CONTEMPORARY ANALYTIC PHILOSOPHY.

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine.
Prerequisite, one semester course in philosophy. *Credit, 3.* Mr. Clay.

564. EXISTENTIAL PHILOSOPHIES.

Examination, by means of a study of selected original texts, of the main problems peculiar to this movement as a whole and to its main exponents individually.
Prerequisite, one semester course in philosophy other than 125.
Credit, 3. Mr. Ehrlich.

581. MATHEMATICAL LOGIC.

Turing machines, theory of computability, effective procedures, combinatorial systems, natural deduction, completeness of quantification theory.
Prerequisite, Philosophy 125 or consent of the instructor. *Credit, 3.* Mr. Clay.

582. THEORY OF FORMAL SYSTEMS.

Equivalence, completeness, incompleteness, decision procedure, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic.
Prerequisite, Philosophy 581, its equivalent, or the instructor's approval.
Credit, 3. Mr. Swanson.

590. POLITICAL PHILOSOPHY.

A systematic approach to major controversies of political science and political ethics; e.g., rationalism vs. empiricism, natural law vs. legal positivism.
Prerequisite, one semester course in philosophy. *Credit, 3.* Mr. Oppenheim.

595. CONTEMPORARY PROBLEMS.

A consideration of selected persistent philosophical problems — e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc.

Prerequisite, two semester courses in philosophy. *Credit, 2-3.* Mr. Clay.

690, 691. SEMINAR.

A study of one major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry.

Prerequisites, two semester courses in philosophy and the permission of the instructor. *Credit, 3.* The Staff.

PHYSICAL EDUCATION

GRADUATE FACULTY

Warren J. McGuirk, *Dean of the School of Physical Education,* Ph.B., Boston College, 1929; Ed.M., Boston University, 1949.

David C. Bischoff, *Assistant Dean of the School of Physical Education and Professor of Physical Education,* B.S., Pennsylvania State College, 1952; M.Ed., North Carolina, 1953; Ph.D., Pennsylvania State, 1958.

Harry K. Campney, Jr., *Professor of Physical Education,* B.S., Pittsburgh, 1952; M.S., Illinois, 1953; Ph.D., Iowa, 1960.

Margaret A. Coffey, *Professor of Physical Education,* B.S., DePauw University, 1943; M.A., State University of Iowa, 1946; Ph.D., State University of Iowa, 1963.

E. Vickery Hubbard, *Associate Professor of Physical Education,* B.S., Wisconsin, 1932; M.A., Chicago, 1951; Ed.D., California, 1961.

Benjamin Ricci, Jr., *Professor of Physical Education,* B.S., Springfield College, 1949; M.Ed., 1950; Ph.D., 1958.

C. Lynn Vendien, *Assistant Professor of Physical Education,* B.S., Eastern Michigan University, 1932; M.A., Michigan, 1945; Ph.D., Stanford, 1957.

The School of Physical Education offers a M.S. in Physical Education. The following school requirements for admission to the Graduate Physical Education Program are in addition to the University requirements for admission:

1. Thirty semester hours of Physical Education, including student teaching, or twenty-four semester hours without student teaching, accompanied by evidence of successful salaried teaching in which Physical Education was included. Kinesiology, Physiology of Exercise, Tests and Measurements, Adapted Physical Educa-

tion, and Statistics and Anatomy, or their content equivalents, shall be included. In the event any of these requirements have not been satisfied, the applicant will be required to complete his deficiencies without graduate credit.

2. A medical examination presenting evidence of good physical condition.

3. Evidence of proficiency in physical activities. The candidate will be required to demonstrate a high level of competency in four activities that he may choose from those activities offered in the Physical Education Programs at the University of Massachusetts.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

701. RESEARCH METHODS IN PHYSICAL EDUCATION.

Experimental, historical, descriptive, and philosophical methods of research. Identification and comparison of methods in significant research studies. Required. *Credit, 3.* Mr. Campney.

702. CONTEMPORARY PROBLEMS IN PHYSICAL EDUCATION.

Seminar, review, analysis, and evaluation of contemporary problems. Required. A broad review of literature combined with critical analysis of selected items. Required. *Credit, 3.* Mr. Campney.

703. PHILOSOPHY OF PHYSICAL EDUCATION.

An investigation of the attitudes toward and contributions of physical education in the evolution of educational thought. Required.
Prerequisite, Physical Education 276 or its equivalent. *Credit, 3.* Mr. Bischoff.

724. SUPERVISION OF PHYSICAL EDUCATION PROGRAMS.

A description and evaluation of creative leadership responsibilities of the teacher or administrator in a supervisory capacity. Special emphasis will be given to analysis of duties, cooperative relationships, research, and new techniques. *Credit, 3.* Miss Vendien.

727. COMPARATIVE PHYSICAL EDUCATION AND ATHLETICS.

A comparative analysis of physical education and athletics in selected countries. Special emphasis will be given to historical, cultural, and social values affecting the status of sports and recreation, and current international cooperation. *Credit, 3.* Miss Vendien.

735. BIOMECHANICS.

Physical and biological considerations applied to the teaching of motor skills.
Prerequisite, Physical Education 142 or its equivalent. *Credit, 3.* Mr. James.

736. EXPERIMENTAL PHYSIOLOGY OF EXERCISE.
The experimental investigation of the physiological effects of exercise. Prerequisite, Physical Education 278 or its equivalent. *Credit, 3.* Mr. Ricci.

738. KINESTHETIC FORM.
The problem of the definition of form in movement as it relates to learning. *Credit, 3.* Miss Hubbard.

745. DANCE COMPOSITION.
A survey of various theories of dance composition, providing experience in the composition, presentation, and critical evaluation of dances. *Credit, 3.* Miss Reid.

747. COMPARATIVE THEORY AND METHOD OF DANCE EDUCATION.
Educational aims of dance. The expressive purpose and formal principles common to various types of dance included in the curriculum; the use of resources provided by the theory and method of leading dance artists. *Credit, 3.* Miss Hubbard.

800. MASTER'S THESIS. *Credit, 6.* The Staff.

COURSE FOR MINOR CREDIT ONLY

The following course may not be counted toward the M.S. Degree in Physical Education.

580. DRIVER EDUCATION INSTRUCTION COURSE.
Driver education and driver training at the instructor's level. Leads to certification as instructor in driver education and driver training. *Credit, 3.* Mr. Briggs.

PHYSICS

GRADUATE FACULTY

Robert L. Gluckstern, *Head of Department of Physics and Professor of Physics,* B.E.E., City College of New York, 1944; Ph.D., Massachusetts Institute of Technology, 1948.

Leroy F. Cook, *Associate Professor of Physics,* B.A., California at Berkeley, 1953; Ph.D., 1959.

William D. Foland, *Associate Professor of Physics,* B.A., Tennessee, 1951; M.S., 1955; Ph.D., 1958.

Norman C. Ford, *Assistant Professor of Physics,* B.S., Massachusetts Institute of Technology, 1953, M.S., Syracuse, 1960; Ph.D., California at Berkeley, 1959.

Phillips R. Jones, *Associate Professor of Physics,* B.S., Massachusetts, 1951; M.S., Connecticut, 1956; Ph.D., 1959.

Ik-Ju Kang, *Assistant Professor of Physics,* B.S., Yonsei University, Seoul, Korea, 1955; M.S., 1957; Ph.D., Northwestern, 1962.

Shin-R. Lin, *Assistant Professor of Physics,* B.S., National Taiwan University, 1955; M.S,. South Carolina, 1958; Ph.D., Michigan, 1962.

Raymond A. Patten, *Assistant Professor of Physics,* B.S., Massachusetts Institute of Technology, 1958; Ph.D., Duke, 1962.

Philip Rosen, *Professor of Physics,* B.S., City College of New York, 1944; M.S., Yale, 1946; Ph.D., 1949.

Kandula S. R. Sastry, *Assistant Professor of Physics,* B.S., Andhra University, India, 1955; M.S., 1956; Ph.D., Indiana University, 1962.

Edward A. Soltysik, *Associate Professor of Physics,* B.S., Lafayette College, 1950; M.S., Indiana University, 1952; Ph.D., 1956.

Morton Sternheim, *Assistant Professor of Physics,* B.S., City University of New York, 1954; M.S., New York University, 1956; Ph.D., Columbia, 1961.

Martial L. Thiebaux, *Assistant Professor of Physics,* B.S., California Institute of Technology, Berkeley, 1958; M.A., California, 1959; Ph.D., 1962.

Candidates planning to major in Physics should have completed at least (preferably, more than) fifteen semester credit hours in undergraduate physics beyond an introductory course (such as Physics 105, 106, 107) and also six credits of mathematics beyond a full year of college-level calculus.

Requirements for the Master's degree include either six credits of work devoted to thesis, or six credits of class work in or above the 700 series instead. A general written examination must be passed before the degree is awarded.

The general requirements for the Ph.D. in Physics are those of the Graduate School. These are implemented along the following lines. A student takes a normal load of basic courses during the first two years. After passing the qualifying examination the student will be expected to devote his major effort to research. Courses taken during this period will usually be in the student's reseach field. The basic courses of the program are 597, 598, 701, 703, 704, 706, 707, 711, 712, 713, 719, 720, and 801.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. INDEPENDENT STUDY.
Special study in some branch of physics, either theoretical or experimental, under the direction of a faculty member. Open only by the consent of the Head of the Department and the faculty member under whose direction the work is to be done. Prerequisite, permission of instructor. *Credit, 1-6.*

701. CLASSICAL MECHANICS.

Methods of Lagrange, Hamilton and Hamilton-Jacobi, classical perturbation theory, rigid body motion, small oscillations and relativistic mechanics.
Prerequisites, Physics 552 and 556 and Mathematics 241. *Credit, 3.*

703, 704. METHODS OF MATHEMATICAL PHYSICS (I), (II).

Selected topics with applications to physics in vector and tensor analysis, vector spaces, Hilbert spaces and integral transforms, complex variables, Green's functions, partial differential equations.
Prerequisite, Mathematics 625, or consent of instructor. *Credit, 3 each semester.*

706. CLASSICAL ELECTRODYNAMICS (I).

Electrostatic fields in vacuum and material media, two and three dimensional potential problems, the magnetostatic field, interaction of steady currents, Maxwell's equations, the electromagnetic field, special relativity, and covariant formulation of electrodynamics.
Prerequisite, Physics 701, Physics 522. *Credit, 3.*

707. CLASSICAL ELECTRODYNAMICS (II).

The field of a moving charge, the Lienard-Wiechert potentials, Lorentz transformation and special relativity, covariant formulation of Maxwell's equations. Radiation of electromagnetic waves: the near field and far field, radiation damping and self fields, spectral resolution of radiation. Magnetohydrodynamics and plasma physics, collisions, scattering and absorption.
Prerequisite, Physics 706. *Credit, 3.*

711, 712. QUANTUM MECHANICS (I), (II).

This course emphasizes the foundations and physical logic of quantum mechanics. Simple systems are studied to illustrate the capability of the theory to predict experimentally observable quantities; special emphasis is given to bound state systems, quantum theory of scattering and elementary radiation theory.
Prerequisites, Physics 701 for 711, Physics 711 for 712. *Credit, 3 each semester.*

713. STATISTICAL PHYSICS.

Survey of thermodynamics, Boltzmann distribution, statistical interpretation of thermodynamics, Gibbsian ensembles and the method of Darwin, Fowler; quantum distributions and their applications, transport phenomena.
Prerequisites, Physics 701, 706. *Credit, 3.*

716. SOLID STATE.

Symmetry properties of crystals; crystalline field theory; magnetic properties, quasi-free electron theory; Brillouin zones; Fermi surfaces.
Prerequisites, Physics 701, 706, 711. *Credit, 3.*

717. RELATIVITY.

Mathematical and conceptual aspects of the special and general theories of relativity. Lorentz transformations, covariant formulation of the laws of nature. The equivalence principle, curved spaces, solutions of the equations of relativity.
Prerequisites, Physics 701, 706. *Credit, 3.*

718. ATOMIC STRUCTURE.

An advanced course covering the field of atomic structure including the theory of complex spectra, fine structure, hyperfine structure, electron spin, Zeeman effect, the theory of atomic collisions, general theory of multiplets and magnetic and radiative properties of atoms.
Prerequisites, Physics 711, 712. *Credit, 3.*

719. NUCLEAR PHYSICS.

Course devoted to basic concepts of nuclear physics, instruments and methods. Topics to be covered include natural radioactivity, nuclear radiations — their properties and interaction with matter, nuclear radiation detectors, electrostatic and magnetic analyzers, mass spectrometry, charged particle accelerators, elementary discussion of alpha and beta decay, nuclear isomerism, internal conversion, nuclear reactions ,neutron physics, fission, nuclear spin and magnetic moments, cosmic rays and elementary particles.
Prerequisites, Physics 585, 586. *Credit, 3.*

720. NUCLEAR THEORY.

Course devoted to a theoretical understanding of nuclear structure. Topics include internucleon forces, the deuteron and the two body problem, nuclear models and structure of complex nuclei, electromagnetic properties of nuclei, theory of alpha and beta decay, theory of nuclear reactions.
Prerequisites, Physics 711, 712. *Credit, 3.*

724. THEORY OF ANGULAR MOMENTUM.

The discussion of the theory of angular momentum with introduction of group theory, spin and isotopic spin formalism, rotation matrices, density matrices, irreducible tensors and polarization phenomena in scattering.
Prerequisite, Physics 711. *Credit, 3.*

731. PLASMA PHYSICS.

Properties of plasma, equation of motion, particle versus continuum description, magnetohydrodynamics, stabilities, linear theory of waves and oscillations, Landau damping, non-linear effects and transport phenomena.
Prerequisite, Physics 707. *Credit, 3.*

801, 802. ADVANCED QUANTUM MECHANICS (I), (II).

Relativistic quantum mechanics of a single particle, Dirac equation, elementary radiation theory, formal scattering theory, field quantization, interacting fields, interaction representation, S matrix. Also Bremsstrahlung, pair production and photoelectric effect. Covariant perturbation theory and Feynman diagrams, and its applications. Renormalizations, dispersion relations, and recent developments.
Prerequisites, Physics 711, 712. *Credit, 3 each semester.*

803. ADVANCED STATISTICAL PHYSICS.

Phase transitions, including condensation; description of imperfect gases. Transport theory and other nonequilibrium phenomena. Irreversible processes. Field theoretic quantum statistical physics.
Prerequisites, Physics 713, 801. *Credit, 3.*

804. ELEMENTARY PARTICLE PHYSICS.

Survey of empirical facts; strong, electromagnetic and weak interactions of elementary particles, selection rules, invariance principles and theories of elementary particles.
Prerequisites, Physics 711, 712. *Credit, 3.*

850. ADVANCED TOPICS IN PHYSICS.

One or more subjects of special interest are covered in lectures.
Prerequisite, permission of instructor. *Credit, 3.*

860. SEMINAR ON RESEARCH TOPICS.

Instruction via reading assignments and seminars on research topics not currently covered in regular courses.
Prerequisite, permission of instructor. *Credit, 1-3.*

800. MASTER'S THESIS. *Credit, 6.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

519. ELECTRONICS INSTRUMENTATION.

A laboratory oriented course designed expressly for physicists and chemists. Basic electronics principles, servo systems, operational amplifiers, digital circuits, other modern devices.
Prerequisite, permission of instructor. *Credit, 3.*

564. WAVE MOTION.

A presentation of physical optics, acoustics, and other wave phenomena into a single unified structure.
Prerequisite, Physics 552. *Credit, 3.*

571, 572. STATISTICAL PHYSICS (I), (II).

A presentation of thermodynamics, kinetic theory and statistical mechanics into a single unified structure.
Prerequisite, permission of instructor. *Credit, 3 each semester.*

585. MODERN PHYSICS (I).

Review of classical mechanics, theory of relativity, black body radiation, photoelectric effect, Compton effect, background for development of quantum mechanics, Bohr atom.
Prerequisites, Physics 552, 556. *Credit, 3.*

586. MODERN PHYSICS (II) AND QUANTUM MECHANICS.

Quantum mechanics, applications to atomic and nuclear physics, such as atomic spectra, Zeeman effect, angular momentum, barrier penetration.
Prerequisite, Physics 585. *Credit, 4.*

597, 598 ADVANCED EXPERIMENTAL WORK (I), (II).

Selected experiments and projects are investigated, according to the needs of the individual student.
Prerequisite, Physics 551. *Credit, 1 to 3 each semester.*

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Physics)

551. ELECTRICITY AND MAGNETISM (I).

The basic laws of electricity and magnetism applied to DC and AC circuits, and an introduction to electrical measurements.
Prerequisites, Physics 104 or 106 or 114; Mathematics 174 or 186. *Credit, 3.*

552. ELECTRICITY AND MAGNETISM (II).

Classical field theory: conservative force fields, the electrostatic field, the magnetic field of steady currents, time-varying fields and Maxwell's equations.
Prerequisites, Physics 104 or 106 or 114; Mathematics 174 or 186. *Credit, 3.*

555, 556. MECHANICS (I), (II).

Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation.
Prerequisites, Physics 104, 106 or 114; Mathematics 174 or 186.
Credit, 3 each semester.

PLANT AND SOIL SCIENCES

GRADUATE FACULTY

Franklin W. Southwick, *Head of Department of Plant and Soil Sciences and Professor of Pomology,* B.S., Massachusetts, 1939; M.S., Ohio State, 1940; Ph.D., Cornell, 1943.

John H. Baker, *Assistant Professor of Soil Chemistry,* B.S., Massachusetts, 1952; M.S., Cornell, 1954; Ph.D., 1959.

Allen V. Barker, *Assistant Professor of Plant Physiology,* B.S., Illinois, 1958; M.S., Cornell, 1959; Ph.D., 1962.

Alfred W. Boicourt, *Professor of Floriculture,* B.S., Cornell, 1938; M.S., 1941.

William J. Bramlage, *Assistant Professor of Post-Harvest Physiology,* B.S., Ohio State, 1959; M.S., Maryland, 1961; Ph.D., 1963.

William C. Colby, *Professor of Forage Crops,* B.S., Illinois, 1929; M.S., Rutgers, 1932; Ph.D., 1934.

Mack Drake, *Professor of Plant and Soil Chemistry,* B.S., Purdue, 1937; M.S., Purdue and Alabama Poly., 1939; Ph.D., 1946.

Walton C. Galinat, *Associate Professor of Genetics,* B.S., University of Connecticut, 1949; M.S., University of Wisconsin, 1951; Ph.D., 1955.

George B. Goddard, *Assistant Professor of Plant Physiology,* B.S., Massachusetts, 1954; M.S., 1958; Ph.D., 1963.

Haim B. Gunner, *Assistant Professor of Soil Microbiology,* B.S., University of Toronto, 1946; M.S., University of Manitoba, 1948; Ph.D., Cornell, 1962.

John R. Havis, *Professor of Plant Physiology,* B.S., Texas Technological College, 1942; M.S., Cornell, 1947; Ph.D., 1949.

William H. Lachman, *Professor of Plant Breeding,* B.S., Pennsylvania State, 1934; M.S., 1936.

William J. Lord, *Associate Professor of Pomology,* B.S., New Hampshire, 1943; M.S., 1953; Ph.D., Pennsylvania State, 1955.

Herbert V. Marsh, *Assistant Professor of Plant Physiology and Biochemistry,* B.S., Massachusetts, 1954; M.S., 1958; Ph.D., North Carolina State College, 1961.

Donald N. Maynard, *Assistant Professor of Plant Physiology,* B.S., Connecticut, 1954; M.S., North Carolina State College, 1956; Ph.D., Massachusetts, 1963.

Louis F. Michelson, *Assistant Professor of Plant and Soil Chemistry,* B.S., Massachusetts, 1950; M.S., 1955; Ph.D., 1959.

Jonas Vengris, *Associate Professor of Weed Biology,* Diploma, Agr. College, Lithuania, 1934; 1936; Dr. Agr. Sci., University of Bonn, Germany, 1939.

Martin E. Weeks, *Professor of Forage Crops,* B.S., South Dakota State College, 1934; Ph.D., Wisconsin, 1937.

Walter D. Weeks, *Associate Professor of Pomology,* B.S., New Hampshire, 1936; M.S., 1938; Ph.D., Massachusetts, 1941.

The Department of Plant and Soil Sciences offers doctoral work in either Plant Science or Soil Science. Specialization and thesis problems related to horticultural and agronomic plants and in soil science are available to both M.S. and Ph.D. degree candidates.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700, 701. SPECIAL PROBLEMS.

Selected research problems not related to a candidate's thesis.

Credit, 3 each semester. The Staff.

702, 703. RESEARCH LITERATURE.

A critical review of the scientific literature in an area of specialization.

Credit, 3 each semester. The Staff.

710. MORPHOLOGY OF ECONOMIC PLANTS.

A study of the anatomy of the plant body with emphasis on those structures which have horticultural and agronomic significance.

Prerequisite, Botany 291 or permission of the instructor.

Credit, 3. Mr. Goddard.

715. PLANT GROWTH REGULATORS.

A study of recent advances in the field of plant growth regulators; including phytochromes, auxins, gibberellins, kinins and herbicides. Emphasis will be placed on investigations designed to elucidate the mechanisms whereby these materials control plant growth and development.

Prerequisites, Botany 512 and Chemistry 524 or equivalent.

Credit, 2. Mr. Gentile and Mr. Marsh.

720. ADVANCED PLANT IMPROVEMENT.

Hybridization and selection methods in breeding economic plants; heterosis and its implications; sterility and seed production of F_1 hybrids.

Prerequisites, Plant and Soil Science 540, Zoology 540 or equivalent.

Credit, 3. Mr. Lachman.

730. ADVANCED SOIL CHEMISTRY.

The chemistry of soil formation, soil acidity, nutrient element availability, ionic exchange, and fixation, soil-plant microorganism relationships, and of organic matter of the soil will be discussed. The laboratory work will consist of physical, analytical and biochemical investigations of soils and important soil constituents.
Prerequisite, permission of the instructor. *Credit, 3.* Mr. Baker.

740. EXPERIMENTAL METHODS.

Some of the concepts of the application of statistics to the analysis and interpretation of data obtained in agricultural research. Such points as choice of field, design of experiments, effect of competition, interpretation of results, and other special factors that need to be considered in well planned experiments are discussed.
Prerequisite, permission of the instructor. *Credit, 3.* Mr. Yegian.

745. MICROBIAL ECOLOGY OF THE SOIL.

The biochemistry and physiology of interactions among microorganisms in, and their relation with, the soil environment. Lectures, discussion and a critical review of current literature on the subject.
Prerequisite, Plant and Soil Science 585 or permission of the instructor.
Credit, 3. Mr. Gunner.

750. PLANT PHOTOSYNTHESIS.

Lectures and discussions of the mechanisms, requirements, evolution, and specific processes related to photosynthesis. An extensive study of the literature contributing to the basic knowledge of photosynthesis will be required.
Prerequisite, Botany 512 or Chemistry 524 or equivalent.
Credit, 3. Mr. Barker and Mr. Marsh.

760. NITROGEN METABOLISM.

A comprehensive presentation of nitrogen metabolism in plants. The biological mechanisms of nitrogen absorption, synthesis and degradation of nitrogenous compounds, nitrogen fixation, specific roles of nitrogenous compounds and nitrogen toxicities will be studied.
Prerequisite, Botany 512 or Chemistry 524 or equivalent.
Credit, 3. Mr. Barker and Mr. Marsh.

790, 791. SEMINAR.

Required of all graduate students majoring in the department.
Credit, 1 each semester. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

530. PLANT NUTRITION.

A study of the accumulation and transport of inorganic ions in plants and their function in plant metabolism.
Prerequisite, Botany 211 or equivalent. *Credit, 3.* Mr. Maynard.

535. TAXONOMY OF ECONOMIC PLANTS.

A study of plant families, genera, species and cultivars of importance in the horticultural and agronomic fields. *Credit, 3.* Mr. Boicourt.

540. PLANT BREEDING.

An advanced study of genetic topics peculiar to plants, together with the methods and problems of the plant breeder.
Prerequisite, Zoology 240 or equivalent. *Credit, 3.* Mr. Lachman.

545. POST-HARVEST PHYSIOLOGY.

A study of physical and chemical processes of plants before and after harvest and the influence of environmental, chemical and storage factors on these processes. *Credit, 3.* Mr. Bramlage.

550. FORAGE AND FIELD CROPS.

Analysis of the principles involved in the establishment, fertilization, and harvest management of forage and field crops. *Credit, 3.* Mr. Colby.

555. AGROSTOLOGY.

The establishment and maintenance of turf grasses used on lawns, athletic fields, highways, airports and cemeteries. *Credit, 3.* Mr. Troll.

560. ECOLOGY AND CONTROL OF WEEDS.

Identification and ecology of common weeds and principles of weed control with emphasis on the use of chemical herbicides. *Credit, 3.* Mr. Vengris.

565. SOIL FORMATION.

The development of soils as related to physical, chemical, biological climatic and geological factors. *Credit, 3.* Mr. Southwick.

570. SOIL PHYSICS.

Physical properties of soil, including textural, structural, water, air and temperature relationships; their measurements, evaluation and influence in the soil system.
Prerequisite, Soil Science 105 or equivalent. *Credit, 3.*

575. SOIL CHEMISTRY.

The inorganic and organic chemical reactions related to the nutrient supply in soils and soil nutrition of plants. Colloidal aspects of soil chemical reactions and soil-plant mineral relationships.

Prerequisites, Chemistry 127 and Soil Science 265 or equivalent.

Credit: 3. Mr. Baker.

580. SOIL-PLANT MINERAL NUTRITION.

A study of mineral nutrients in the growth of plants; the use of fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities in plants.

Credit, 3. Mr. Drake.

585. MICROBIOLOGY OF THE SOIL.

Soil microorganisms; their distribution, ecology and transformation of organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium.

Prerequisite, Microbiology 250 or permission of the instructor.

Credit, 3. Mr. Gunner.

PSYCHOLOGY

GRADUATE FACULTY

Claude C. Neet, *Head of Department of Psychology and Professor of Psychology,* B.A., California at Los Angeles, 1930; M.A., Clark University, 1932; Ph.D., 1935.

Bernard G. Berenson, *Associate Professor of Psychology,* B.A., American University, 1953; M.A., Maryland, 1957; Ph.D., 1961.

Robert R. Carkhuff, *Assistant Professor of Psychology,* B.A., Rutgers, 1956; M.A., American International College, 1959; Ph.D., State University of New York at Buffalo, 1963.

Ernest Dzendolet, *Assistant Professor of Psychology,* B.S., California Institute of Technology, 1951; M.S., Brown, 1957; Ph.D., 1959.

Seymour Epstein, *Professor of Psychology,* B.A., Brooklyn College, 1948; M.A., Wisconsin, 1951; Ph.D., 1953.

Robert S. Feldman, *Professor of Psychology,* B.S., Michigan, 1943; M.A., 1944; Ph.D., 1951.

Albert E. Goss, *Professor of Psychology,* B.A., State University of Iowa, 1945; M.A., 1947; Ph.D., 1948.

Morton G. Harmatz, *Assistant Professor of Psychology,* B.A., Ohio State University, 1960; M.A., Washington, 1962; Ph.D., 1963.

Robert H. Harrison, *Assistant Professor of Psychology,* B.A., Oberlin, 1951; M.A., Pennsylvania State, 1953; Ph.D., 1957.

Samuel Z. Himmelfarb, *Assistant Professor of Psychology,* B.A., California at Los Angeles, 1958; Ph.D., 1964.

Harold Jarmon, *Assistant Professor of Psychology,* B.A., New York University, 1955; M.A., Kansas, 1959; Ph.D., 1962.

Solis L. Kates, *Professor of Psychology,* B.S., City College of New York, 1935; M.S., 1937; Ph.D., Columbia, 1948.

George Levinger, *Associate Professor of Psychology,* B.A., Columbia College, 1946; M.A., California at Berkeley, 1951; Ph.D., Michigan, 1955.

John W. Moore, *Assistant Professor of Psychology,* A.B., Lawrence College, 1958; Ph.D., Indiana University, 1962.

Stanley M. Moss, Assistant Professor of Psychology, B.A., Ohio State, 1957; M.A., 1958; Ph.D., 1962.

Jerome L. Myers, *Professor of Psychology,* B.A., Syracuse, 1953; M.A., Wisconsin, 1955; Ph.D., 1957.

Nancy A. Myers, *Assistant Professor of Psychology,* B.A., Mount Holyoke, 1952; M.A., Wisconsin, 1954; Ph.D., 1957.

Louis E. Price, *Assistant Professor of Psychology,* B.A., California at Los Angeles, 1957; M.A., State University of Iowa, 1959; Ph.D., 1960.

Harry Schumer, *Assistant Professor of Psychology,* B.S., Ohio State, 1954; M.A., 1956; Ph.D., 1961.

J. Alfred Southworth, *Professor of Psychology,* B.S., Naval Academy, 1943; M.A., Harvard, 1955; Ph.D., 1956.

The graduate student majoring in Psychology may orient his program toward either the Doctor of Philosophy degree or the Master of Science degree. Areas of concentration leading to the Ph.D. are: child, clinical, counseling, educational, engineering, learning, personality, physiological, sensory, and social psychology.

Students taking the doctorate must satisfy the general requirements of the Graduate School for the degree. They must also complete the course requirements of their area of specialization. A list of these requirements will be supplied on request to the Department. The doctorate program provides practicum courses in each of the applied specialization areas. Institutions and agencies available for such field work include Belchertown State Hospital, Clarke School for the Deaf, Department

of Psychology Child Guidance Clinic, Hartford V. A. Mental Hygiene Clinic, Holyoke Mental Health Clinic, Monson State Hospital, Northampton State Hospital, Northampton V. A. Hospital, Springfield Child Guidance Clinic, Springfield V. A. Mental Hygiene Clinic, University Guidance and Counseling Services, University Nursery School, Worcester V. A. Mental Hygiene Clinic, Worcester Youth Guidance Center, and various industrial concerns in nearby towns.

All students qualifying for the Master of Science degree in Psychology must, in addition to meeting the degree requirements of the Graduate School, take course 545 and either 700 or 800. A final oral examination given by the problem or thesis committee and the Department, is required. Credits taken to satisfy the requirements for the Master's degree can be applied to the total number of credits required for the doctorate.

Students applying for admission for either the Doctor's or Master's degree program, in addition to meeting the requirements of the Graduate School, should have taken an introductory course and 18 additional undergraduate credits in Psychology, including a course in laboratory experimental psychology, or the equivalent, and a course in statistics. In case the student has not taken this number of credits or lacks these courses, he may be allowed to make up the deficiencies in the Undergraduate School of the University. In exceptional cases, students with entrance deficiencies may, at the end of one semester's study, petition the Department to waive remaining undergraduate deficiencies.

All students applying for admission to either the Master's or Doctoral program must submit their scores on the Gradaute Record Examination and on the Miller Analogies Test.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEM IN PSYCHOLOGY.

A research project which may be taken in lieu of the master's thesis, or by doctoral students as minor research. *Credit, 4-6.* The Staff.

711. SENSORY PROCESSES I.

Auditory and cutaneous senses; the fundamental data with their implications concerning functioning of these systems.
Prerequisites, Psychology 211 or 6 credits of advanced Psychology and 3 hours of Zoology or the equivalent. *Credit, 3.* Mr. Dzendolet.

712. SENSORY PROCESSES II.

Visual, gustatory and olfactory senses; the fundamental data with their implications concerning functioning of these systems.
Prerequisites, Psychology 211 or 711 or 6 credits of advanced Psychology and 3 hours of Zoology or the equivalent. *Credit, 3.* Mr. Dzendolet.

715. PERCEPTION.

Methods, data, and theory concerning such phenomena as perception of movement, time and frequency, space, form and pattern, and attention.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 711 or 712 or equivalent and Psychology 721 or 723 or equivalent. *Credit, 3.* Mr. Moss.

716. ADVANCED PHYSIOLOGICAL PSYCHOLOGY.

A detailed study of the structure and function of the nervous system as they relate to sensory-motor systems and drives.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 515 or equivalent, or permission of the instructor.
Credit, 3. Mr. Feldman.

717. NEURAL CORRELATES OF BEHAVIOR.

The neurophysiological bases of behavior. Topics considered are neuroelectric phenomena, psychopharmacology, neurophysiology of learning and drive-reward systems.
Prerequisite, Psychology 515 or equivalent. *Credit, 3.* Mr. Feldman.

721. LEARNING I.

The basic laws of learning, and relevant research techniques. Lectures and laboratories. *Credit, 3.* Mr. Moore.

723. LEARNING II.

The implications of the basic laws of learning for explaining complex behavior. Lectures and laboratories.
Prerequisite, Psychology 721. *Credit, 3.* Mr. Moore.

725. VERBAL BEHAVIOR AND LEARNING.

Methods, situations, and variables involved in assessments of verbal repertoires and in investigations of changes in those repertoires.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 or 723 or equivalent *Credit, 3.* Mr. Goss.

727. MOTOR LEARNING AND PERFORMANCE.

Measures of motor learning and performance, pertinent tasks, and conditions influencing learning and performance.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 or 723 or equivalent. *Credit, 3.* Mr. Moss.

729. QUANTITATIVE THEORIES OF BEHAVIOR.

Several theories which generate quantitative predictions of behavior are presented. For each of several experimental situations of varying complexity, mathematical developments of model are discussed and adequacy of description of data evaluated.
Prerequisites, Psychology 545 and 721 or 723 or equivalent.
Credit, 3. Mr. Myers.

731. EMOTION AND MOTIVATION.

The nature, determinants, and interrelationships of emotion and motivation; the techniques involved in investigating these phenomena. Lectures and laboratories.
Credit, 3. Mr. Trowill.

735. SYSTEMATIC PSYCHOLOGY.

The general structure of psychological theory and an historical and comparative consideration of the backgrounds, viewpoints on scientific methodology, research interests and techniques, and the component variables, hypotheses, and laws of structural, Gestalt, functional, and behavioristic movements.
Credit, 3. Mr. Goss.

741. TEST CONSTRUCTION I.

Theory and practice of the construction and analysis of tests; correlation procedures; reliability; validity; item analysis; test weights; introduction to factor analysis techniques. Tests are constructed in the laboratory periods.
Prerequisite, Psychology 545, previously or concurrently.
Credit, 3. Mr. Manley.

742. TEST CONSTRUCTION II.

Measurement theory; psychophysical methods; construction, analysis, and comparison of various attitude scales. Each student constructs, administers, and evaluates one or more scales in the laboratory.
Prerequisite, Psychology 741. *Credit, 3.* Mr. Manley.

744. FACTOR ANALYSIS.

Theory and methods of factor analysis in psychological research. Lectures and laboratory exercises.
Prerequisite, Psychology 741 or equivalent. *Credit, 3.* Mr. Manley.

745. ADVANCED APPLIED STATISTICS.

Various experimental designs, the assumptions underlying their use, and the appropriate statistical analyses; orthogonal and randomized designs, trend analysis, non-parametric techniques, and multi-variate analysis.
Prerequisite, Psychology 545 or its equivalent. *Credit, 3.* Mr. Myers.

746. QUANTITATIVE METHODS IN PSYCHOLOGY.

Mathematical descriptions of psychophysical and time-dependent data; parameter estimation; stochastic processes.
Prerequisites, Psychology 545 and Math 123 or equivalent.
Credit, 3. Mr. Moore.

762. LEARNING AND MOTIVATION IN CHILDREN I.

Analysis of experiments on learning and motivation in simple situations with children.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 or 261 or consent of instructor.
Credit, 3. Mr. Price.

763. LEARNING AND MOTIVATION IN CHILDREN II.

Analysis of experiments on learning and motivation in complex situations with children. Topics include rote learning, transfer and retention, and concept formation.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 721 or 762 or consent of the instructor.
Credit, 3. Mr. Price.

766. PERSONALITY AND SOCIAL DEVELOPMENT IN CHILDREN.

Review and analysis of the literature on personality development and the socialization process in children.
Prerequisites, Psychology 261, 321 or their equivalent. *Credit, 3.* Mr. Schumer.

775. THE PSYCHOLOGY OF EXCEPTIONAL CHILDREN.

The etiology, diagnosis, and treatment of exceptional children, with special emphasis on intellectual, social, physical and sensory deviations.
Prerequisites, Psychology 312, and 325 or 825 and 261. Students having only two of these three prerequisites may take the course on consent of the instructor.
Credit, 3. Mr. Harmatz.

777. DIAGNOSIS AND TREATMENT OF BEHAVIOR DISORDERS IN CHILDREN.

The diagnosis and treatment of psychological maladjustments in infancy and childhood; treatment procedures, resources, and methods used in dealing with behavior

and personality problems. Lectures, discussions and practicum sessions.
Prerequisites, Psychology 612 and 325 or 825, 261 or 762, 832, and 833.
Credit, 3. Mr. Jarmon.

781. ATTITUDES AND SOCIAL PERCEPTION.

Cognitive mechanisms in social behavior; experimental and survey techniques in the study of social perception, attitudes, and attitude changes. Lectures, discussions, and laboratories.
Prerequisite, Psychology 281 or equivalent. *Credit, 3.* Mr. Himmelfarb.

784. GROUP DYNAMICS.

Interpersonal behavior in small groups, with attention to group structure, individual factors, communication, and experimental techniques. Lectures, discussions and laboratories.
Prerequisite, Psychology 286 or equivalent. *Credit, 3.* Mr. Levinger.

800. THESIS, MASTER'S DEGREE. *Credit, 8-10.*

821. THEORIES OF PERSONALITY.

Problems and sources of data relating to the study of personality. An evaluation of the contributions of psychological theories, and an approach to an integrated theory.
Prerequisite, Psychology 735. *Credit, 3.* Mr. Harrison.

823. PSYCHOANALYTIC THEORY.

The original theoretical writings of Freud, other orthodox psychoanalysts and selected neo-Freudians. Emphasis will be placed on the historical development of the key psychoanalytic concepts and on the reasons for their revision.
Prerequisite, one of the following: Psychology 321, 235, 821 or consent of the instructor. *Credit, 3.* Mr. Simon and Mr. Harrison.

825. ADVANCED ABNORMAL PSYCHOLOGY.

Behavior disorders and their relationships to normal behavior, with major emphasis on theories of etiology and symptom formation, and on general problems of therapy.
Prerequisite, Psychology 325 or the consent of the instructor.
Credit, 3. Mr. Neet.

830. FUNDAMENTALS OF CLINICAL PRACTICE.

The aim of the course is to provide a foundation for advanced courses in clinical psychology. Topics covered include history, professional problems, clinical theories, the clinical method, and fundamentals of diagnosis and treatment of emotional disturbances. Lectures and practicums. *Credit, 3.* Mr. Epstein.

831. DIAGNOSTIC METHODS I.

The nature, administration, scoring and interpretation of individual intelligence tests with emphasis upon different theories of intelligence. Lectures and laboratories.
Prerequisite, 18 credits of psychology or consent of instructor.
Credit, 3. Clinical Staff.

832. DIAGNOSTIC METHODS II.

The methods of administration and of the scoring procedures of a variety of diagnostic methods with emphasis on the Rorschach and Thematic Apperception Test. Lectures and laboratory periods.
Prerequisite, Psychology 612. *Credit, 3.* Mr. Harmatz and Mr. Simon.

833. DIAGNOSTIC METHODS III.

Basic interpretive procedures of diagnostic devices with emphasis on the Rorschach and Thematic Apperception Test. Lectures and laboratories.
Prerequisite, Psychology 832. *Credit, 3.* Mr. Harrison.

834. OBJECTIVE PERSONALITY, INTEREST AND APTITUDE ASSESSMENT.

Review and analysis of the psychological literature pertaining to structured personality, interest and aptitude tests.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 832 or its equivalent. *Credit, 3.* Mr. Johnson.

835. PSYCHOTHERAPY I.

Analyses of techniques of individual psychotherapy. The student may elect concurrently a practicum in psychotherapy in which a therapy case, under supervision, will be carried in one of the following facilities: child guidance clinic, student counseling center, mental hospital.
Prerequisites, Psychology 821, 825, 832 and 833. *Credit, 3.* Mr. Kates.

836. PSYCHOTHERAPY II.

Analyses of group and specialized techniques of psychotherapy. The student will elect concurrently a practicum in which supervised practice in one or more group psychotherapeutic methods will be given.
Prerequisites, Psychology 821, 825, 832, 833 and 835. *Credit, 3.* Mr. Kates.

841. ADVANCED INDUSTRIAL PSYCHOLOGY I.

Human factors in work and performance; interrelationships of motivational and perceptual phenomena to the working environment.
Prerequisite, Psychology 651 or permission of instructor. *Credit, 3.* Mr. Moss.

851. ADVANCED INDUSTRIAL PSYCHOLOGY.

The theory and principles of man-machine-environment systems, with special attention to description, analysis, and synthesis in terms of information theory, servo analogues, psychophysiological effects, and operations research. Operations research will be considered only as it applies to the context of industrial psychology.
Prerequisites, Psychology 651 and 841. *Credit, 3.* Mr. Moss.

860. BASIC CONCEPTS IN COUNSELING PSYCHOLOGY.

Introductory review and analysis of the psychological literature related to the practice, research and training functions in counseling psychology.
Three class hours.
Prerequisite, 18 credits of psychology or consent of instructor.
Credit, 3. Mr. Berenson and Mr. Carkhuff.

865. COUNSELING THEORIES AND TECHNIQUES.

A detailed consideration of current theories and techniques employed in counseling psychology.
Prerequisites, Psychology 321, 311 and 612 or permission of instructor.
Credit, 3. Mr. Carkhuff.

866. THE PSYCHOLOGY OF VOCATIONAL CHOICE.

Review and analysis of the psychological literature concerning the psychological bases for vocational choice.
Three class hours.
Prerequisite, Psychology 865 or its equivalent. *Credit, 3.* Mr. Johnson.

868. GROUP COUNSELING AND PSYCHOTHERAPY.

Review and analysis of the psychological literature in conjunction with experience in multiple counseling and therapeutic processes.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 835 or 865 or the equivalent. *Credit, 3.* Mr. Carkhuff.

871, 872. PRACTICUM.

Practice in the application of psychological techniques to the following areas of psychology: child, clinical, counseling, industrial, and social. Either semester may be elected independently. Total credit, 3-12. The Staff, with the Staffs of cooperating institutions and agencies.

891, 892. SEMINAR.

Selected topics of current significance in psychology. Research studies will be analyzed and theoretical advances explored. Either semester may be elected independently. Both may be taken only with change in topic.
Prerequisite, permission of instructor.
Credit, 2 each semester. Maximum credit, 6. The Staff.

895, 896. RESEARCH METHODOLOGY.

A study and evaluation of research methods and of problems in the major fields of psychology. *Credit, 2. each semester.* The Staff.

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

515. PHYSIOLOGICAL PSYCHOLOGY.

A study of the relationships between physiological and psychological variables in sensation and perception, motivation, learning, and neuro-pathological conditions.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 101 or 105, Zoology 135 or permission of instructor.
Credit, 3. Mr. Trowill.

545. PSYCHOLOGICAL STATISTICS.

The application of statistical procedures to the analysis of psychological data and to problems of measurement in psychology and related fields.
Two class hours, one 2-hour laboratory period.
Prerequisites, Psychology 101 or 105, Statistics 241 or Statistics.
Credit, 3. Mr. Myers.

551. ADVANCED EXPERIMENTAL PSYCHOLOGY.

The literature, techniques, and apparatus of experimental psychology. Selected projects carried out individually by the members of the class.
One class hour, two 2-hour laboratory periods.
Prerequisite, Psychology 211 or 221 or 231; Zoology 135.
Credit, 3. Mr. Dzendolet.

563. ADOLESCENT PSYCHOLOGY.

A consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Price.

581. SOCIAL PSYCHOLOGY I.

Development, interrelationships, and functions of attitudes. Emphasis upon religious and political behavior, psychoanalytic and behavioristic theories of prejudice, attitude measurement, propaganda, group persuasion.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Himmelfarb.

586. SOCIAL PSYCHOLOGY II.

Individual behavior in groups. Interpersonal perception and communication. Norms, power, leadership, and coalition formation. Individual motivation and group problem-solving.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Levinger.

611. PSYCHOLOGICAL TESTS.

Survey of tests of intelligence, aptitude, interest, personality and adjustment. Test rationale construction, characteristics, uses of evaluation are emphasized.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Schumer.

612. PSYCHOLOGICAL TESTS, INDIVIDUAL INTELLIGENCE TESTS.

A study of theories of intelligence and of individual intelligence tests.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Clinical Staff.

641. INDUSTRIAL PSYCHOLOGY I.

Psychological principles underlying personnel selection and training, communication and decision-making in industry.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Moss.

651. INDUSTRIAL PSYCHOLOGY II.

The application of human factors data to the analysis, evaluation, design and use of man-machine systems and equipment. Emphasis is on analysis of human abilities and limitations of speed, accuracy, perception and design processes.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Moss.

COURSES FOR MINOR CREDIT ONLY

(No graduate credit for students majoring in Psychology)

511. SENSATION AND PERCEPTION.

A study of the data, theories and the methods of studying sensation and perception.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101, 105, 106, or 101 or 105 and consent of instructor. *Credit, 3.* Mr. Dzendolet.

521. LEARNING AND THINKING.

A consideration of the effects and conditions of practice on acquisition, generalization, discrimination, transfer, retention and extinction phenomena.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101, 105, 106 or 101 or 105 and consent of instructor. *Credit, 3.* Mr. Moore.

531. MOTIVATION.

The data, theories and the methods of investigating motivation. Topics include primary drives, emotions, frustration and conflict, and learned drives.
Two class hours, one 2-hour laboratory period.
Prerequisites, any two of Psychology 101, 105, 106, or 101 or 105 and consent of instructor. *Credit, 3.* Mr. Trowill.

535. CONTEMPORARY PSYCHOLOGIES.

A logical, historical, and systematic analysis of contemporary psychological theories, including structuralism, functionalism, Gestalt and organistic psychologies, psychoanalysis, and behaviorisms.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Goss.

561. CHILD PSYCHOLOGY.

The psychological development of the child including maturation and development of behavior, language, emotions, intelligence, social behavior, motivation and personality. Nursery school observation and practice.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3* Mr. Price.

575. INTRODUCTION TO THE STUDY OF EXCEPTIONAL CHILDREN.

Emphasis is on the etiology, diagnosis, characteristics, education and prognosis of deviations in mental, physical and socio-emotional development.
Three class hours.
Prerequisite, Psychology 261 or consent of the instructor.
Credit, 3. Mr. Harmatz.

601. EDUCATIONAL PSYCHOLOGY.

Psychological principles and facts fundamental to educational situations. Major areas studies are: learner, learning, adjustment, guidance, teacher, teaching methods, evaluation and measurement.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Schumer.

621. PERSONALITY.
An introduction to the scientific study of personality. Topics include psychoanalytic and cognitive approaches, the influence of social-cultural conditions, personality types and learning.
Three class hours.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Kates.

625. ABNORMAL PSYCHOLOGY.
The etiology, symptoms and therapy of behavior abnormalities including the neuroses, psychoses, epilepsies, speech disorders and mental deficiency. Hospital trips and clinics.
Prerequisite, Psychology 101 or 105. *Credit, 3.* Mr. Neet.

631. CLINICAL PSYCHOLOGY.
An introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 325 or consent of the instructor.
Credit, 3. Mr. Epstein.

661. PSYCHOLOGY OF OCCUPATIONS.
A study of interests, abilities and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized.
Three class hours.
Prerequisite, Psychology 311. *Credit, 3.* Mr. Field.

665. THEORIES AND TECHNIQUES OF COUNSELING AND GUIDANCE.
The theories, techniques and tests necessary in counseling and guidance. Practice in organizing and evaluating relevant data in the analysis of illustrative cases.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psychology 311 or consent of the instructor.
Credit, 3. Mr. Carkhuff.

PUBLIC HEALTH

GRADUATE FACULTY

Robert W. Gage, M.D., *Head of Department of Public Health,* B.S., Massachusetts, 1938; M.D., Harvard, 1942.

William A. Darity, *Associate Professor of Public Health,* B.S., Shaw, 1948; M.S.P.H., North Carolina College, 1949; Ph.D., University of North Carolina, 1964.

Tsuan H. Feng, *Professor of Public Health,* B.S., Pei Yang University, China, 1940; M.S., Wisconsin, 1946; Ph.D., Wisconsin, 1950.

Warren Litsky, *Professor of Public Health,* B.A., Clark University, 1945; M.S., Massachusetts, 1948; Ph.D., Michigan State, 1951.

Jerome S. Peterson, M.D., Professor of Public Health, B.S., Syracuse, 1925; M.S., Harvard School of Public Health, 1939; Ph.D., College of Psysicians & Surgeons, Columbia Univ., 1931.

Students interested in pursuing investigation or obtaining training in the various areas of public health will be accepted if previous experience indicates an aptitude for graduate study. In general, the course of study will lead to the degree of Master of Science in Public Health. A cooperative program will be arranged with other departments in the event of special interest or need.

Applicants must satisfy the entrance requirements of the Graduate School. Usually they will be best prepared by having completed an undergraduate major in physical or biological science; they may in special circumstances be accepted with other undergraduate major training. Experience in health services may be accepted in lieu of specific undergraduate requirements.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN PUBLIC HEALTH.
Special investigational or research problems in public health for advanced students. The scope of the work can be varied to meet specific conditions.
Credit, 3-6. The Staff.

701. PUBLIC HEALTH LAW.
The uses and limitations of law in disease control. Individual work includes studies of court decisions and the preparation of administrative regulations.
Credit, 3. Mr. Wisnieski.

702. METHODS OF PUBLIC HEALTH EDUCATION.
The classical health education efforts that have favorably influenced community health. Individual work involves the preparation of pamphlets and exhibits, setting up demonstrations, and arranging short courses for adult groups.
Credit, 3. Mr. Darity.

703. THE PLANNING OF ENVIRONMENTAL HEALTH PROGRAMS.
Principles of environmental health are translated into community programs planned to meet attainable objectives. Sanitary surveys and rating systems are studied as measuring devices for the practical effect of programs.
Credit, 3. Mr. Wisnieski.

706. ADVANCED EPIDEMIOLOGY.
Lectures and discussions on the principles and methods of epidemiological investigation, with laboratory work in assembling and analyzing crude data resulting from field investigations of epidemics.
Prerequisite, Public Health 188 or equivalent. *Credit, 3.* The Staff.

707, 708. SEMINAR.
Lectures and reports on current literature and special topics.
Credit, 1 each semester. Maximum credit, 4. The Staff.

800. THESIS, MASTER'S DEGREE.
Independent research leading to the preparation of a thesis that will make an original contribution to public health literature. Results should be suitable for publication. The thesis is optional for M.S. candidates who have had sufficient training in public health before entering graduate school to profit more from thesis research than from additional courses. *Credit, 10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

561 (I), 562 (II). ENVIRONMENTAL HEALTH.
A study of man's essential environment needs; water, food, air, shelter; and how these are protected and improved through community action
Credit, 3. Mr. Wisnieski.

563. (I). INDUSTRIAL HYGIENE AND SANITATION.
The practices and principles of industrial processes involved in industrial health and sanitation. Discussion of the fundamentals of industrial sanitation and of occupational diseases and hazards, their evaluation and methods of control.
Credit, 3. Mr. Perriello.

564. (II). MICROSCOPY OF WATER.
Microscopic forms of life exclusive of the bacteria. Counting and control of plankton in potable waters. Elements of limnology.
Three class hours, one 2-hour laboratory period. *Credit, 3.* Mr. Snow.

581 (I). APPLIED PUBLIC HEALTH BACTERIOLOGY.
Standard methods used in present day applied bacteriology. Areas of study include: soils, dairy products, water and shellfish, and air.
Two class hours, two 2-hour laboratory periods.
Prerequisite, Microbiology 150 or permission of instructor.
Credit, 3. Mr. Perriello.

584 (II). PUBLIC HEALTH ADMINISTRATION.
The organization, function, and administration of governmental health agencies including: public health laws, regulations, and sanitary codes, their origin and enforcement. *Credit, 3.* Mr. Perriello.

586 (II). PUBLIC HEALTH STATISTICS.
Evaluation of environmental health practices using graphical summaries and biostatistical methods.
One class hour, one 4-hour laboratory period.
Prerequisites, Public Health 261 and 262. *Credit, 2.* Mr. Wisnieski.

588 (I). EPIDEMIOLOGY AND COMMUNICABLE DISEASE CONTROL.
The general principles of the spread of infections, supported through the study of the communicable diseases, grouped according to their modes of transmission.
Prerequisite, Microbiology 150 or permission of instructor.
Credit, 3. Mr. Wisnieski.

590 (II). SANITARY BACTERIOLOGY.
Sample collections and laboratory procedures in stream pollution studies, standard methods of bacteriological examination of foods, food poisonings and infections.
One 4-hour and one 2-hour laboratory periods.
Prerequisite, Applied Public Health Bacteriology 581 or permission of instructor.
Credit, 3. Mr. Perriello.

592 (SUMMER). SUPERVISED FIELD TRAINING.
A thirteen-week field training program with an official agency under the supervision of the Staff. This is a prerequisite for professional placement.
Credit, 3-6. The Staff.

ROMANCE LANGUAGES

GRADUATE FACULTY

Robert E. Taylor, *Director, Graduate French Studies, Head of Department of Romance Languages and Professor of French,* B.A., Reed College, 1943; M.A., Columbia, 1947; Ph.D., 1951.

Robert L. Bancroft, *Associate Professor of Romance Languages,* B.A., Washington, 1935; M.A., 1947; Ph.D., Columbia, 1957.

Stowell C. Goding, *Professor of Romance Languages,* B.A., Dartmouth, 1925; M.A., Harvard, 1926; Ph.D., Wisconsin, 1942.

Sumner M. Greenfield, *Associate Professor of Romance Languages,* B.A., Boston College, 1946; M.A., Boston University, 1947; M.A., Harvard, 1951; Ph.D., Harvard, 1957.

Agnes G. R. Howard, *Associate Professor of Romance Languages,* B.A., Wilson College, 1937; M.A., Syracuse, 1945; D.M.L., Middlebury College, 1956.

Patricia J. Johnson, *Assistant Professor of Romance Languages,* B.A., Minnesota, 1953; M.A., 1956; Ph.D., 1960.

Robert B. Johnson, *Professor of Romance Languages,* B.A., Ohio University, 1940; M.A., Wisconsin, 1946; Ph.D., 1949.

Paul A. Mankin, *Associate Professor of Romance Languages,* B.A., California at Los Angeles, 1948; M.A., 1953; Ph.D., Yale, 1959.

Guy Mermier, *Associate Professor of Romance Languages,* B.A., Lyceé Champollion, Grenoble, 1951; M.A., Université de Grenoble, 1954; Ph.D., Pennsylvania, 1961.

Irving P. Rothberg, *Associate Professor of Romance Languages,* B.S., Temple University, 1948; M.A., Pennsylvania State, 1951; Ph.D., 1954.

Seymour S. Weiner, *Professor of Romance Languages,* B.A., City College of New York, 1940; M.A., California at Berkeley, 1941; Ph.D., Columbia, 1950.

Students are required to have oral and written proficiency in the language of specialization before admission to candidacy for the M.A. in French or Spanish.

Course requirements for the M.A.:

1. French 705 (Bibliography and Methods), Spanish 705 (Bibliography and Methods), or an equivalent course.

2. French or Spanish 800 may be elected for not more than nine credits.

3. Terminal examinations as follows:
   a. Comprehensive examination.
   b. For those electing French or Spanish 800, oral defense of thesis.

Students are advised to elect French 710 (Romance Philology and the History of the French Language) or Spanish 710 (Romance Philology and the History of the Spanish Language). These two courses will be taught in English. All other courses offered by the Department are taught in French or in Spanish.

THE FOUR-COLLEGE COOPERATIVE Ph.D. IN FRENCH OR SPANISH

The University of Massachusetts requirements for admission to the Graduate School require "acceptance by the Department." For the Cooperative Ph.D. in French or Spanish, acceptance is by all four departments.

In addition to the general requirements for the degree at the University of Massachusetts, the following special requirements must be met:

1. Required courses:
   a. One semester of Romance Philology, or its equivalent.
   b. One semester of Old French or Old Spanish, or its equivalent.
   c. French 705 (Bibliography and Methods), Spanish 705 (Bibliography and Methods), or the equivalent knowledge.
   d. French or Spanish 900, Ph.D. thesis.

2. A reading knowledge of a second Romance Language and of German or another major language outside the Romance group other than English.

3. The ability to teach French or Spanish.

4. Candidates planning on writing a thesis on the Medieval or Renaissance field must have a reading knowledge of Latin.

5. An oral examination as part of the preliminary comprehensive examination, demonstrating proficiency in the language itself, a knowledge of the whole body of French or Spanish literature and in the history of the language, a thorough knowledge of the candidate's special field, evidence of knowledge of the history and the culture of the country or countries involved.

COURSES OPEN TO GRADUATE STUDENTS ONLY — *FRENCH*

(For either major or minor credit)

700. PROBLEM COURSE.
Directed study in some phase of linguistics or literature.
Credit, 3-6. The Staff.

705. BIBLIOGRAPHY AND METHODS OF LITERARY RESEARCH.
(Required of candidates for the degree of Master of Arts in French.)
Credit, 3. Mr. Taylor or Mr. Weiner.

710. ROMANCE PHILOLOGY AND THE HISTORY OF THE FRENCH LANGUAGE.
The development of the Romance Languages, particularly French, from Vulgar Latin. *Credit, 3.* Mr. Mermier.

711. FRENCH PHILOLOGY. *Credit, 3.* The Staff.

715. OLD FRENCH READINGS.
Study of the monuments of French literature from the earliest times to the fifteenth century.
Prerequisite, French 710 or the equivalent. *Credit, 3.* Mr. Mermier.

720. THE MEDIEVAL THEATER.
Study of the principal dramatic forms from the XIIth century through the XVth.
Credit, 3.

725. THE OLD FRENCH EPIC.
A study of some of the most outstanding *chansons de geste* and of the development of the cycles of epic poetry. *Credit, 3.*

730. THE "ROMAN COURTOIS."
Special emphasis upon Chrétien de Troyes and his successors. *Credit, 3.*

740. RABELAIS AND MONTAIGNE.
A study of the changing ideas in the French Renaissance. *Credit, 3.*

745. LYRIC POETRY OF THE RENAISSANCE.
Emphasis upon the Pléiade from the background of the "grands rhétoriqueurs," Marot, and the "école lyonnaise." *Credit, 3.*

750. LIBERTINAGE IN THE XVIITH CENTURY.
Aspects of the history of thought from Montaigne to Pierre Bayle.
Credit, 3. Mr. Taylor.

755. LA FONTAINE AND LYRIC POETRY.
From Malherbe to the *Fables.* *Credit, 3.*

760. MOLIERE.
The man and the dramatist; his ideas and his techniques.
Credit, 3. Mr. Taylor.

765. RACINE.
A detailed analysis of the major and minor plays as drama and as poetry.
Credit, 3. Mr. Johnson.

770. VOLTAIRE AND HIS TIMES. *Credit, 3.* Mr. Taylor.

775. DIDEROT.
The original thinker and the compiler. *Credit, 3.* Mr. Taylor.

780. MONTESQUIEU AND HIS TIMES.
Credit, 3. Mrs. Raymond or Mr. Taylor.

790, 791. THE CRAFT OF FICTION IN THE MODERN FRENCH NOVEL.
The exploration of different modes in the treatment of realism through a study of the craft of fiction of individual novelists, with emphasis upon the novel of the XIXth century. *Credit, 3 each semester.* Mr. Smith.

805. STENDHAL AND FLAUBERT.
The assimilation of the "mouvement des idées" of the period within the fictional worlds of the two novelists. *Credit, 3.* Mr. Smith.

810. BALZAC AND ZOLA. *Credit, 3.* Mr. Smith.

815. BAUDELAIRE AND THE SYMBOLISTS.
Principal emphasis on the aesthetics and poetics of Baudelaire alone, his work serving as an introduction to the gamut of symbolist poetry.
Credit, 3. Mr. Johnson.

820. THE CRITICS OF THE NINETEENTH CENTURY.
The development of criticism from Sainte-Beuve. *Credit, 3.* Mr. Weiner.

821. MODERN LITERARY CRITICISM.
The study of critical tenets and practices in the twentieth century. Readings and discussions of, for example, Thibaudet, Bachelard, Paulhan, Sartre. *Credit, 3.*

825. THE ANTI-NOVEL AND ANTI-THEATER.
A study of the reaction against established literary form and convention in the novels of such authors as Sarrauté, Robbe-Grillet, Butor, and Simon, and in the plays of such authors as Ionesco and Adamov. *Credit, 3.* Mrs. Johnson.

830. CLAUDEL AND GIRAUDOUX.
A study of aesthetic and moral values. *Credit, 3.* Mr. Mankin.

835. SARTRE AND CAMUS.
A study of the novels, short stories, plays, and philosophical essays.
Credit, 3. Mrs. Johnson.

840. PROUST AND GIDE. *Credit, 3.*

800. THESIS, MASTER'S DEGREE *Maximum Credit, 9.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS — *FRENCH*
(For either major or minor credit)

520. THE FRENCH RENAISSANCE.
A study of the major writers of the Sixteenth Century with appropriate attention to important humanistic and artistic developments. *Credit, 3.* Mr. Mermier.

525. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.
Emphasis upon the prose writers and non-dramatic forms.
Credit, 3. Mr. Taylor.

530. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.
Emphasis upon the theater. *Credit, 3.* Mr. Johnson.

540. FRENCH LITERATURE OF THE EIGHTEENTH CENTURY.
The chief writers and thinkers of the Age of Enlightenment.
Credit, 3. Mr. Taylor.

545. THE DRAMA OF THE FRENCH ENLIGHTENMENT.
Readings in the French theater from LeSage to Beaumarchais.
Credit, 3. Mrs. Raymond.

555. FRENCH NOVEL OF THE NINETEENTH CENTURY.
The development of the novel since the Revolution.
Three class hours. *Credit, 3.*

556. FRENCH THEATER OF THE NINETEENTH CENTURY.
The development of the theater from Hugo to Rostand and his contemporaries.
Three class hours. *Credit, 3.*

557. FRENCH POETRY OF EARLY NINETEENTH CENTURY.
A study of the major movements in poetry up to Baudelaire and the Symbolists.
Three class hours. *Credit, 3.*

560. FRENCH THEATRE OF THE TWENTIETH CENTURY.
The modern French Theatre from Scribe to the present. *Credit, 3.* The Staff.

565, 566. MAJOR FIGURES OF THE CONTEMPORARY FRENCH NOVEL.
A study of the novel of social concern, the novel of personal and aesthetic concern, and the novel concerned with the human condition.
Credit, 3 each semester. Mrs. Johnson.

575, 576. CONTEMPORARY FRENCH POETRY.
Study of French verse from Nerval to the present.
Credit, 3 each semester. Mr. Johnson.

600. COURS DE STYLE.
Syntax and idiom at an advanced level. *Credit, 2 each semester.* Mr. Smith.

610. FRENCH CIVILIZATION.

A study of those elements which underlie the cultural contribution of France to world civilization. Assigned reading will be drawn from contemporary French literature. *Credit, 3.* Mr. Mankin.

620. LANGUAGE STUDY.

Teaching methods. Recommended for those intending to teach French in high schools or elementary schools. *Credit, 3.* Mr. Goding.

COURSES OPEN TO GRADUATE STUDENTS ONLY — *SPANISH*

(For major or minor credit)

420. ADVANCED CONVERSATIONAL SPANISH.

Intended primarily for first-year graduate students. Intensive oral practice to insure fluency. Phonetic variants within the Hispanic world.
Two hours per week throughout the year. *Credit, 2.*

700. PROBLEM COURSE

Directed study in some phase of linguistics or literature. *Credit, 3-6.* The Staff.

705. BIBLIOGRAPHY AND METHODS OF LITERARY RESEARCH.

Required of candidates for the degree of Master of Arts in Spanish. *Credit, 3.*

710. ROMANCE PHILOLOGY AND THE HISTORY OF THE SPANISH LANGUAGE.

The development of the Romance Languages, particularly Spanish, from Vulgar Latin. *Credit, 3.*

715. READINGS IN MEDIEVAL SPANISH.

Prerequisite, A knowledge of Latin, Spanish 710, or the equivalent. *Credit, 3.*

720. SPANISH LITERATURE OF THE FOURTEENTH AND FIFTEENTH CENTURIES.

The literature of Spain in the late Middle Ages, with emphasis on the *Libro de buen amor* and the *Celestina*. *Credit, 3*

730. THE RENAISSANCE IN SPAIN.

A study of Spanish humanism and its effects in the sixteenth century.
Credit, 3. Mr. Rothberg.

735. GONGORA AND THE BAROQUE POETS.
The culmination of the development of lyric poetry in the Golden Age.
Credit, 3. Mr. Rothberg.

740. NARRATIVE LITERATURE OF THE GOLDEN AGE.
Aspects of novelistic prose in the late sixteenth and seventeenth centuries.
Credit, 3. Mr. Rothberg.

745. LOPE AND CALDERON.
The apogee of the theatre of the Golden Age. *Credit, 3.* Mr. Wexler.

755. THE ENLIGHTENMENT IN SPAIN. *Credit, 3.*

760. ROMANTICISM IN SPAIN.
Manifestations of the movement peculiar to Spain, with emphasis on Larra and Bécquer. *Credit, 3.* Mr. Greenfield.

765. THE NOVELS OF GALDOS.
The techniques of the novelist and his panoramic veiw of Spain.
Credit, 3. Mr. Boudreau.

770. THE GENERATION OF 1898.
A study of interpretive views of "the problem of Spain."
Credit, 3. Mr. Greenfield.

775 THE THEATRE OF GARCIA LORCA.
Detailed analysis of Lorca's Theatre as drama and as poetry.
Credit, 3. Mr. Greenfield.

780. CELA AND THE NOVEL SINCE 1939.
A study of the Novel in post-Civil War Spain, with emphasis on Camilo José Cela.
Credit, 3. Mr. Boudreau.

785. DARIO AND THE MODERNISTS.
The Modernist movement in Spanish-America with intensive study of the poetry of Rubén Dario. *Credit, 3.* Mr. Greenfield.

790. THE NOVEL OF THE MEXICAN REVOLUTION.
Credit, 3. Miss Haddad.

800. THESIS, MASTER'S DEGREE. *Maximum Credit, 9.*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS — *SPANISH*

(For either major or minor credit)

510. ADVANCED SPANISH COMPOSITION AND SYNTAX.
A study of syntax and idioms, and those more advanced and difficult elements which constitute stylistics. *Credit, 3.*

520. PROSE AND POETRY OF THE SIXTEENTH CENTURY.
Masterpieces of Renaissance prose; development of poetry from Garcilaso to Herrera. *Credit, 3.* Mr. Wexler.

530. CERVANTES.
Intensive study of the Quijote. *Credit, 3.* Mr. Wexler.

540. DRAMA OF THE GOLDEN AGE.
Deals primarily with the comedia during the period of maximum creation, 1556-1681. *Credit, 3.* Mr. Wexler.

550. PROSE AND POETRY OF THE SEVENTEENTH CENTURY.
The masterpieces of prose, excluding the Quijote; Gongora and the Baroque poets. *Credit, 3.* Mr. Wexler.

560. SPANISH LITERATURE OF THE NINETEENTH CENTURY.
A study of the major writers and literary movements of the period. *Credit, 3.* Mr. Greenfield.

570. SPANISH-AMERICAN LITERATURE TO 1900.
A general view, with intensive study of selected major works. *Credit, 3.* Mr. Greenfield.

580. TWENTIETH-CENTURY SPANISH LITERATURE.
Major writers of Spain in the late nineteenth and twentieth centuries. *Credit, 3.* Mr. Greenfield.

590. TWENTIETH-CENTURY SPANISH-AMERICAN LITERATURE.
Major writers of Spanish America from Dario to the present. *Credit, 3.* Mr. Greenfield.

Comparative Literature

564. MODERN EUROPEAN DRAMA (in translation).
(see English 564 for description.)
Credit, 3. Mr. Rudin, Mrs. Hogan, and Mr. Halpern.

591. THE ENLIGHTENMENT.

Characteristic themes, ideas and attitudes in 18th Century European literature. The course will focus on major representatives of the Ages of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany.
Prerequisite, proficiency in French or German.

Credit, 3. Mr. Heller and Mr. Page.

592. ROMANTICISM.

The Western Romantic movement as exemplified by its principle figures from the age of Rousseau to 1850.
Prerequisite, permission of the instructor. *Credit, 3.*

593. ANGLO-GERMAN-LITERARY RELATIONSHIPS.

Credit, 3. Mr. Page and Mr. Wiegand.

595. SYMBOLISM.

The development of symbolism in the 19th and 20th century poetry of France (Baudelaire, Verlaine, Mallarme, Rimbaud), Germany (George, Hofmannsthal, Rilke) and England (Yeats, Pound, Eliot). *Credit, 3.*

SOCIOLOGY AND ANTHROPOLOGY

GRADUATE FACULTY

J. Henry Korson, *Head of Department and Professor of Sociology,* B.S., Villanova, 1931; M.A., Yale, 1942; Ph.D., 1947.

Edwin D. Driver, *Professor of Sociology,* B.A., Temple University, 1945; M.A., Pennsylvania, 1947; Ph.D., 1956.

David H. Fortier, *Assistant Professor of Anthropology,* B.A., Columbia, 1949; M.A., 1953; Ph.D., 1964.

Thomas M. Fraser, Jr., *Assistant Professor of Anthropology,* B.A., Harvard, 1949; M.A., Columbia, 1958; Ph.D., 1963.

Hilda H. Golden, *Assistant Professor of Sociology,* A.B., Skidmore, 1942; A.M., Duke, 1944; Ph.D., 1950.

Milton M. Gordon, *Professor of Sociology,* A.B., Bowdoin, 1939; M.A., Columbia, 1940; Ph.D., 1950.

Eugene B. Piedmont, Assistant Professor, B.S., State University of New York, 1956; M.A., Rochester, 1959; Ph.D., Buffalo, 1962.

C. Wendell King, *Professor of Sociology,* B.A., Yale, 1940; M.A., 1941; Ph.D., 1943.

John F. Manfredi, *Associate Professor of Sociology,* B.A., Pennsylvania, 1942; M.A., Harvard, 1948; Ph.D., 1951.

John F. O'Rourke, *Assistant Professor of Sociology,* A.B., Massachusetts, 1956; Ph.D., Yale, 1963.

Peter Park, *Assistant Professor of Sociology,* B.A., Columbia, 1953; M.A., Yale, 1955; Ph.D., 1958.

Lelia Sussman, *Associate Professor of Sociology,* A.B., New York University, 1942; M.A., Chicago, 1947; Ph.D., Columbia, 1957.

Curt Tausky, *Assistant Professor of Sociology,* B.A., Portland State, 1959; Ph.D., Oregon, 1963.

Thomas O. Wilkinson, *Professor of Sociology,* B.A., North Carolina, 1945; M.A., Duke, 1940; Ph.D., Columbia, 1957.

William J. Wilson, *Assistant Professor of Sociology,* B.A., Wilberforce University, 1958; M.A., Bowling State University, 1961; Ph.D., Washington State, 1965.

David W. Yaukey, *Assistant Professor of Sociology,* B.A., Oberlin, 1949; M.A., State College of Washington, 1950; Ph.D., Washington, 1956.

All applicants for admission to graduate work in Sociology are expected to be conversant with the basic concepts in the field. With respect to this requirement, an entering student may be asked to remove any deficiencies at the request of the Department.

Students working toward the doctorate in Sociology, in addition to fulfilling the general requirements of the Graduate School for the degree, must include in a program of study the following courses in Sociology: two semesters of sociological theory, two semesters of research methods, and two semesters of statistics. Written comprehensive examinations covering Sociological Theory, Research Methodology, and two areas of substantive interest are required of all students before the doctoral dissertation is undertaken. Upon successful completion of comprehensive examinations, the student will be admitted to candidacy for the Ph.D. degree.

Students working toward the Master of Arts degree in Sociology must satisfy the general requirements of the Graduate School for the degree and must include in a program of study the following courses in Sociology: two semesters of sociological theory, one semester of research methods, and one semester of statistics. An oral examination by the department covering the student's thesis is required. A special program is available for students who desire to work for a Master's degree in Correctional Administration.

SOCIOLOGY

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEM.

A special project in Sociology.
Prerequisite, Sociology 795 or equivalent. *Credit, 3.* The Staff.

712. SOCIAL CHANGE.

Analysis of change as a process, especially the factors making for acceptance or rejection of innovations. Intrasocietal sources of change. Consequences of contacts between societies, with emphasis on underdeveloped areas.
Prerequisite, Sociology 272 or permission of instructor. *Credit, 3.* Mr. King.

714. CRIMINOLOGY.

Criminological theories, past and present with special emphasis on present research trends as they relate to theoretical formulations.
Prerequisite, Sociology 278 or equivalent or permission of instructor.
Credit, 3. Mr. Driver

716. CORRECTIONAL THEORY AND PRACTICE.

An analysis of contemporary approaches to correction. An evaluation of probation, parole, and related problems.
Prerequisites, Sociology 278 and 795. *Credit, 3.*

717. JUVENILE DELINQUENCY.

Theories of causation and treatment of delinquency.
Prerequisite, Sociology 278 or permission of instructor. *Credit, 3*

718. INDUSTRIAL SOCIOLOGY.

A study of the role, status, and function of the worker in the industrial community; the impact of technological change on the community; analysis of selected occupational functions.
Prerequisite, Sociology 254 or Economics 241 or permission of instructor.
Credit, 3. Mr. Tausky.

719. THE SOCIOLOGY OF RELIGION.

The relations of religious ideology and ecclesiastical organization to the total social institutional system. Special attention to the religions of larger civilizations, especially Islam, Buddhism, Medieval Christianity, Gentile Paganism, Protestantism, and Judaism. *Credit, 3.* Mr. Manfredi.

722. SOCIOLOGY OF EDUCATION.

Educational characteristics of an industrial population; comparative social structures and their school systems; educational selection and social stratification; educational development as effect and cause of social change; the internal organization and culture of schools and universities.

Prerequisites, one graduate course in sociological theory and one course in research methods. *Credit, 3.* Miss Sussmann.

729. SOCIOLOGY OF SMALL GROUPS.

Survey of sociological theory and research of small groups. Dynamics of leadership patterns, role theories, organization-disorganization theories, decision making, internal process and sociometric structuring. The relevance of small group theory and research to concepts of the inclusive social system.

Credit, 3. Mr. O'Rourke.

731. SOCIAL GERONTOLOGY.

Implications of aging for society and the individual. Position of the aged in non-industrialized and industrialized societies. Changing roles of older people in the American family and the community.

Prerequisite, Sociology 257 or permission of instructor. *Credit, 3.* Mr. King.

732. SOCIOLOGY OF MEDICINE.

A survey of theory and research concerned with medical care as a social institution. The relation of social factors to illness, and social processes involved in medical education. *Credit, 3.* Mr. Piedmont.

759. SOCIAL STRATIFICATION.

A consideration of the major contemporary writers and their contribution to this area. Research techniques in the analysis of social class and social mobility are examined.

Prerequisite, Sociology 259 or equivalent or permission of instructor.

Credit, 3. Mr. Gordon.

762. DEMOGRAPHY.

An analysis of the demographic transition from peasant-agriculturalism to urban-industrialism. Emphasis is given to the consequences of this transition for patterns of settlement and for fertility, mortality, and migration. Special studies are made of the demographic characteristics of non-industrialized nations as factors in their potential development.

Prerequisite, Sociology 561 or equivalent or permission of instructor.

Credit, 3. Mr. Wilkinson.

763. FERTILITY AND SOCIETY.

A review of past and present trends in fertility in Western and non-Western culture. Attention is given to problems of measurement, to interrelations between fertility and other social and economic variables, and to the quantitative and qualitative implications of contemporary research.
Prerequisite, Sociology 561 or equivalent or permission of instructor.
Credit, 3. Mr. Yaukey.

764. POPULATION CHARACTERISTICS AND SOCIO-ECONOMIC CHANGE.

Analysis of relationship between selected demographic characteristics and socio-economic changes, with special attention to the sociological uses of statistical information on the world's countries.
Prerequisite, Sociology 561 or equivalent or permission of instructor.
Credit, 3. Mrs. Golden.

772. POPULATION OF INDIA AND PAKISTAN.

Trends in population growth and its distribution among various social strata. An assessment of the relative influence of fertility, mortality, migration, social organization, and cultural values on growth patterns.
Prerequisites, Sociology 561 and 795. *Credit, 3.* Mr. Driver.

781. HISTORY OF SOCIOLOGICAL THEORY.

A survey of literature from classical times to the Utilitarians.
Prerequisite, Sociology 282 or permission of instructor.
Credit, 3. Mr. Manfredi.

782. SOCIOLOGICAL THEORY.

The development of sociological theory beginning with Auguste Comte.
Prerequisite, Sociology 282 or permission of instructor.
Credit, 3. Mr. Manfredi.

783. CONTEMPORARY SOCIOLOGICAL THEORY.

A consideration of the literature from 1900 to the present.
Prerequisite, Sociology 282 or permission of instructor.
Credit, 3. Mr. Gordon.

784. CONTEMPORARY SOCIOLOGICAL THEORY.

A consideration of the literature from 1900 to the present.
Prerequisite, Sociology 282 or permission of instructor. *Credit, 3.* Mr. Wilson.

795. RESEARCH METHODS.

Logical analysis of sociological inquiry; survey of major research techniques and examination of principal methodological problems in sociology.
Credit, 3. Mr. Park.

796. RESEARCH METHODS.

Research techniques in sociology, including: formulating research objectives; collecting, processing and analyzing data for a project organized around the problems of measurement in sociology.
Prerequisites, Sociology 547 and 795. *Credit, 3.* Mr. Park.

797. SURVEY DESIGN AND ANALYSIS.

Design and analysis of descriptive and explanatory sample surveys. Special attention to the problems of longitudinal studies of studies designed to evaluate the effects of a complex experience.
Prerequisite, Sociology 795. *Credit, 3.* Miss Sussmann.

798. TECHNIQUES OF DATA COLLECTION IN SOCIAL RESEARCH.

Study of the validity and reliability for various purposes of a number of observational techniques, including: the interview; the paper and pencil questionnaire; content analysis and participant observation.
Prerequisite, Sociology 795. *Credit, 3.* Miss Sussmann.

799. INTERNSHIP.

Supervised training and practice in the administration of a state correctional institution or organization. Students chosen for this training will serve with one of the following: Women's Reformatory (Framingham), Men's Reformatory (Concord), The Bureau of Classification (Department of Correction), Youth Service Board (Department of Education), The United Prison Association (Boston) or other agencies approved by the department. A minimum of three months (40-hour weeks) is required and will normally take place the summer following completion of the major part of the student's course work.
Prerequisites, Sociology 592, 714, and 717. *Credit, 3.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 6*

900. THESIS, Ph.D. DEGREE. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

547. ELEMENTARY STATISTICS.

Basic statistical principles and techniques with special reference to application in sociology. *Credit, 3.* Mr. Park.

548. SOCIAL STATISTICS.

An introduction to principles of multivariate techniques, including sociology and related fields.
Prerequisite, Sociology 547 or equivalent. *Credit, 3.* Mr. Park.

551. URBAN SOCIOLOGY.

A comparative analysis of cities and urbanization with special reference to demographic characteristics of urban populations, urban ecology, and urban social structure. *Credit, 3.* Mrs. Golden.

552. RURAL AND PEASANT SOCIETIES.

A study of rural and peasant societies from the standpoint of their population and institutions, their emerging needs, and their relation to mass society. *Credit, 3.*

556. RACE RELATIONS.

The social, economic, and political aspects of racial problems in the U. S., with particular reference to the Negro and major ethnic groups. Problems resulting from contact of races in Asia, Africa, and South America.

Credit, 3. Mr. Gordon.

557. THE FAMILY.

The development of the customs of courtship and marriage of the contemporary American family; basic causes of changes and trends of the family including mate selection, marriage laws, marital prediction husband-wife relations, and the role of the child. *Credit, 3.* Mr. King.

558. SOCIAL INTERACTION.

A study of the processes leading to the socialization of the group member, with emphasis on role properties, play, control models, power definitions and

Credit, 3. Mr. Piedmont.

561 POPULATION PROBLEMS.

The physical and social factors which influence population change through births, deaths, and migration, with special emphasis on the population problems of underdeveloped areas in the world today. *Credit, 3.* Mr. Wilkinson.

570. SOCIAL STRUCTURE OF INDIA.

The origins, distribution, and cultural traits of the major groups in India. Special attention given to marriage, family, and caste patterns, and their relation to and positions in the economic and political system. *Credit, 3.* Mr. Driver.

575. SOCIAL PROBLEMS.

The incidence, distribution, and interrelations among the major types of social tensions in human societies. Research projects and field trips required.

Credit, 3. Mr. Stanfield.

585. COMPLEX ORGANIZATIONS.

An analysis of the processes leading to the formation and maintenance of complex social structures. Consideration will be given to the works of major theorists from Weber and Durkheim to Etzioni and Argyris with special emphasis on the structures and functions of selected public and private bureaucracies.

Credit, 3. Mr. Tausky.

592. INTRODUCTION TO SOCIAL WELFARE.

Contemporary problems of social welfare administration, principles of social work practice, and an examination of federal, state, and local community programs.

Credit, 3.

ANTHROPOLOGY

All applicants for admission to graduate work in Anthropology are expected to be conversant with the basic concepts in the field. Entering students who lack such background will be asked to remove any deficiencies.

The candidate for a Master of Arts in Anthropology will select one of the following three areas in which to concentrate his course work (at least 6 credits) and research for his thesis: (1) Archaeology and Linguistics, (2) Physical Anthropology, and (3) Social and Cultural Anthropology. In addition the candidate will be expected to demonstrate his knowledge of general anthropology by passing a qualifying examination by the end of his second semester of graduate work in the department and to acquire knowledge of at least two major ethnographic areas of the world (at least 9 credits). All candidates will be required to take two graduate seminars in anthropological theory and to enroll in Anthropology 800 (Thesis, Master's Degree).

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

836. INDIVIDUAL AND SOCIETY.

A cross-cultural consideration of the relationship between the individual and his society with attention to theories, methods and empirical findings as reported in the literature of the behavioral sciences.

Prerequisite, Anthropology 664 or permission of instructor.

Credit, 3. Mr. Stanfield.

837. THEORY IN SOCIAL ANTHROPOLOGY.

Theoretical problems which have had a lasting place in anthropological thought; the nature of culture, cultural dynamics and stability, and the transmission of culture as discussed by leading writers.
Prerequisite, Anthropology 664 or permission of instructor.

Credit, 3. Mr. Fortier.

839. SEMINAR: COMPARATIVE SOCIAL SYSTEMS.

A seminar devoted to individual study and discussion of types of social systems in non-literate and peasant societies; and consideration of relevant anthropological theory.
Prerequisite, Anthropology 837. *Credit, 3.* Mr. Fraser.

800. MASTER'S THESIS. *Credit, 6-9.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For major or minor credit)

660. WORLD ARCHAEOLOGY.

An introduction to the history, methods and theory of archaeology, with an outline of the main characteristics of the prehistoric record, emphasizing social aspects and evolutionary significance.
Two class hours, one 2-hour laboratory period.
Prerequisite, permission of instructor. *Credit, 3.*

664. PROBLEMS IN ANTHROPOLOGY.

A consideration in detail of current anthropological thought in regard to specific problems chosen from physical anthropology, archaeology and cultural anthropology.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

665. WORLD ETHNOGRAPHY.

The current cultures of representative societies from Africa, Oceania, North America, South America, and Asia viewed in relation to historical and environmental influences.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

667. ETHNOLOGY OF AFRICA.

A limited consideration of the history, physical types, social organization and culture of Africa south of the Sahara with special consideration of several diverse cultures.
Prerequisite, permission of instructor *Credit, 3.*

668. OLD WORLD PREHISTORY.

A survey of the prehistoric cultures of Europe, Asia, and Africa, with emphasis on the Paleolithic, Neolithic, and early metal-using periods.
Prerequisite, Anthropology 103, 104, or permission of instructor. *Credit, 3.*

673. PEOPLES OF SOUTHEAST ASIA.

An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role in the development of modern Southeast Asian states.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

674. CULTURES OF THE FAR EAST.

A survey of the culture-history and ethnography of representative peoples of East Asia; peasant sub-cultures of traditional and contemporary China, Japan, and Korea.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fortier.

676. THE ETHNOLOGY OF SOUTH AMERICA.

This course will analyse the prehistoric, colonial and contemporary cultures of South America, focusing on the Indian, European and Negro peoples, and how they have related to each other over the past three centuries.
Prerequisite, permission of instructor. *Credit, 3.*

677. SUMMER FIELD SCHOOL IN ARCHAEOLOGY.

This course offers practical training in archaeology. Prehistoric and Colonial sites will be excavated, and instruction will be given in archaeological methods and techniques.
Prerequisite, Anthropology 660 or equivalent. *Credit, 6.*

679. CULTURAL DYNAMICS AND APPLIED ANTHROPOLOGY.

A consideration of theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Fraser.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

550. SOCIAL SCIENCE — AFRICA, SOUTH OF THE SAHARA.

An introductory study of recent political, economic, and social developments in the principal countries in Africa, south of the Sahara.
Prerequisites, at least two courses in one or more of the following fields: Government, Economics, Sociology. *Credit, 3.*

569. SOCIAL SCIENCE — INDIA AND SOUTH ASIA.
An introductory study of recent political, economic, and social developments in India and the countries of South Asia.
Prerequisites, at least two semester courses in one or more of the following fields: Government, Economics, Sociology, Anthropology. . *Credit, 3.* Mr. Driver.

SPEECH

GRADUATE FACULTY

Arthur E. Niedeck, *Head of Department of Speech and Professor of Speech,* B.A., Ithaca College, 1930; M.A., Cornell, 1942.

Doris E. Abramson, *Assistant Professor of Speech,* B.A., Massachusetts, 1949; M.A., Smith College, 1951.

Cosmo A. Catalano, *Assistant Professor of Speech,* A.B., Allegheny College, 1950; M.F.A., Yale, 1953.

Inez E. Hegarty, *Associate Professor of Speech,* A.B., Mount Holyoke, 1941; M.A., 1943; Ph.D., Wisconsin, 1951.

Harry Mahnken, *Assistant Professor of Speech,* A.B., Geneva College, 1951; M.F.A., Carnegie Institute of Technology, 1955.

The Department of Speech offers two major programs for the Master's degree. The M.F.A. may be earned in dramatic art and the M.A. in speech and hearing.

Options leading toward the Master of Arts degree are available in speech pathology, audiology and teacher of the deaf preparation. The latter is presented in cooperation with the Clarke School for the Deaf, Northampton, Massachusetts. Federal grants are available for qualified students in the program.

Students may fulfill certification requirements of the American Speech and Hearing Association, Conference of the Executives of Schools for the Deaf, and the Massachusetts State Department of Education in these areas.

1. General Admission Requirements:
   a. Basic requirement for admission to the Graduate School.
   b. Students presenting at least twelve hours of Speech (i.e.), Speech 281, 284, 283, 282 or their equivalents and nine hours in Psychology or Education may be accepted as regular graduate students in Speech.

c. Students presenting at least three hours in Speech (i.e.), Speech 281, 282, or 283 and a major in Psychology or Education are eligible for admission as special graduate students in Speech.

2. Basic Requirements:

a. Thirty hours of graduate courses, including twenty-four hours in the major field. Psychology or Education may be chosen as the minor field.

b. A thesis will be required.

c. There will be no foreign language required.

COURSES OPEN TO GRADUATE STUDENTS ONLY
(For either major or minor credit)

781. VOICE PROBLEMS.

A study of voice disorders, organic and functional; symptoms and principles and techniques of therapy and diagnosis.
Prerequisites, Speech 284 and 282 or equivalents. *Credit, 3.* Miss Hegarty.

782. CLINICAL PRACTICUM.

Supervised clinical practice with children and adults with various speech and hearing disorders; group and individual therapy techniques.
Prerequisites, Speech 281, 284, 282 or equivalents.
Credit, 3-6 each semester. The Staff.

783. EXPERIMENTAL PHONETICS.

Study and analysis of phonetic elements of language, emphasis on laboratory instrumentation and research techniques.
Prerequisites, Speech 281 and 284 or equivalents. *Credit, 3.* The Staff.

800. MASTER'S THESIS. *Credit, 3-9.* Miss Hegarty.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

501. PUBLIC SPEAKING.

The study and application of principles governing the composition and delivery of public speeches.
Three class hours. *Credit, 3.* The Staff.

581. PHONETICS.

A scientific study of the sounds of English; descriptive analysis of individual vowels and consonants. Study of the International Phonetic Alphabet; training in auditory discrimination.
Three class hours. *Credit, 3.* Miss Hanifan and Mrs. Brush.

582. INTRODUCTION TO SPEECH PATHOLOGY.

A study of the causes, functional and organic, of speech problems among children and adults; principles of diagnosis and therapy.
Observation; field trips.
Three class hours.
Prerequisite,Psychology 101. *Credit, 3.* Miss Hegarty.

583. INTRODUCTION TO CLINICAL PRACTICE.

Training in basic diagnostic and therapeutic techniques for various speech handicaps; emphasis on articulation defects, delayed speech and stuttering, supervised practice required.
Two class hours, one 2-hour laboratory period.
Prerequisites, Speech 281 and 282. *Credit, 3.* Mrs. Brush.

584. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISM.

A study of the anatomy and physiology of the speech and hearing mechanism; consideration of phonation, resonance, articulation and audition.
Three class hours.
Prerequisite, Speech 282. *Credit, 3.* Miss Hegarty.

585. AUDIOLOGY.

A study of the symptoms and causes of hearing loss; special attention to diagnostic test procedures. Supervised practice in audiometric testing.
Observation; field trips.
Three class hours.
Prerequisite, Speech 282. *Credit, 3.* The Staff.

586. REHABILITATION OF THE ACOUSTICALLY HANDICAPPED.

Training in the techniques of speech therapy, auditory training, and speech reading for children and adults with hearing impairments.
Laboratory practice under supervision.
Two class hours, one 2-hour laboratory period.
Prerequisite, Speech 585. *Credit, 3.* The Staff.

588. ADVANCED CLINICAL PRACTICE.

Advanced training in clinical practice under supervision; special consideration of organic speech disorders. Opportunity for supervised clinical practice at Lemuel Shattuck and other hospitals.
Two class hours, one 2-hour laboratory period.
Prerequisite, Speech 283. *Credit, 3.* Miss Hanifan.

589. SEMINAR IN SPEECH PATHOLOGY.

Individual student reports on selected topics in the field of Speech Pathology.
Three class hours.
Prerequisite, Speech 282. *Credit, 3.* Miss Hegarty.

Options leading toward the MASTER OF FINE ARTS degree are available in acting, directing and scene design.

All candidates for the M.F.A. degree with a major in Dramatic Art must demonstrate a theatre proficiency which in the opinion of the dramatic art faculty is commensurate with their particular level of education and development. Other requirements for the degree are listed on Page

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, up to 18.*

742. HISTORIC COSTUME FOR THE STAGE.

A study of the historic periods of costume design and the adaptation of costume for use on the stage. Some emphasis will be placed upon silhouette, color, texture and social significance of the historical costume. *Credit, 3.* The Staff.

744. STYLES OF ACTING.

A study of the various presentational and pre-modern styles of acting. Emphasis will be placed upon the Classical, Elizabethan, Restoration, and Musical Comedy styles.
Prerequisite, permission of the instructor. *Credit, 3.* The Staff.

749. DRAMATIC FORM AND STRUCTURE.

A study of the theoretical foundations of dramaturgy as reflected by the writings of dramatists and critics from the beginnings of theatre to the present day.
Prerequisite, permission of the instructor. *Credit, 3.* The Staff.

758. REHEARSAL AND PERFORMANCE.

Practical experience and application of learned classroom theory to all phases of theatre production. Candidates may receive up to eight hours credit toward the degree. *Credit, 2.* The Staff.

759. SEMINAR IN THEATRE.

Advanced study and practice in the complex problems of the modern theatre. Emphasis will be placed upon the study of Acting, Directing, Scenic and Costume Design and the problems in coordinating the engineering and mechanical aspects of production and lighting in the modern theatre.
Prerequisite, Permission. This course may be repeated for up to 12 hrs.
Credit, 2. The Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

541. INTRODUCTION TO SCENE DESIGN.

The study of the aesthetics, fundamentals and facets of scene design through lectures, class projects and practical laboratory work.
Prerequisites, Speech 140 and 141, or permission of instructor.
Credit, 3. The Staff.

546. FUNDAMENTAL THEORIES OF PLAY DIRECTING.

The study of the principal theories of play direction with emphasis on the Director as an interpretative artist; a study of the audience and the play in terms of the nature of the dramatic and the theatrical.
Prerequisites, Speech 245, or permission of instructor. *Credit, 3.* Mr. Mahnken.

547. HISTORY OF THEATRE OF WESTERN CIVILIZATION I.

The study of the History of the Theatre of Western Civilization from its beginnings to 1642; an investigation of the Classical, Medieval and Renaissance Theatres with emphasis on the origins and development of Drama, Spectacle, Theatre Production and Theatre Architecture. *Credit, 3.* The Staff.

548. HISTORY OF THEATRE OF WESTERN CIVILIZATION II.

A continuation of Speech 547 with emphasis on the 18th and 19th centuries, the Continental, English, American, and Modern Theatre. *Credit, 3.* The Staff.

550. VOICE AND DICTION AND ORAL INTERPRETATION.

Training and drill in correct production of speech, practice in fundamentals of vocal interpretation. *Credit, 3.* Miss Abramson.

574. FUNDAMENTAL THEORIES OF ACTING.

The study of the principal theories of acting; the investigation and application of the principal historical and contemporary theories of character analysis, development and performance.
Prerequisite, Speech 243, or permission of the instructor.
Credit, 3. Mr. Catalano.

STATISTICS

GRADUATE FACULTY

Gail B. Oakland, *Head, Program in Statistics and Professor of Statistics,* B.A., University of Saskatchewan, 1933; M.A., Minnesota, 1939; Ph.D., University of Aberdeen, Scotland, 1956.

Om P. Bagai, *Assistant Professor of Statistics,* B.A., Punjab University, 1948; M.A., 1950; Ph.D., University of British Columbia, 1960.

Richard A. Damon, Jr., *Professor of Biometrics,* B.S., Massachusetts, 1947; M.S., Minnesota, 1949; Ph.D., 1951.

Jerome L. Myers, *Associate Professor of Psychology,* B.A., Syracuse, 1953; M.A., Wisconsin, 1955; Ph.D., 1957.

James E. Norman, Jr., *Assistant Professor of Statistics,* B.S., Alabama, 1957; M.A., 1960; Ph.D., Virginia Polytechnic Institute, 1965.

Robert W. Wagner, *Associate Dean of the School of Arts and Sciences and Professor of Mathematics,* B.A., Ohio University, 1934; M.A., Michigan, 1935; Ph.D., 1937.

Students taking the master of arts in statistics must meet the degree requirements of the Graduate School. Although desirable, previous work in statistics is not essential for graduate study in statistics. A sound background of supporting mathematics is of greater importance. Thus majors in statistics will receive their statistical training as graduate students. Their undergraduate work will consist largely of mathematics and other related fields.

List of Courses

Statistics 551, *Elementary Statistics*
Statistics 555, 556, *Introductory Statistics*
Statistics 561, *The Design of Experiments (Methods)*
Statistics 662, *The Design of Experiments (Theory)*
Statistics 571, *Sample Surveys*
Statistics 572, *Sample Theory and Methods*
Statistics 581, *Multivariate Analysis (Methods)*
Statistics 682, *Multivariate Analysis (Theory)*
Statistics 692, *Frequency Distributions*
Statistics 701, 702, *Statistical Tests and Decision Procedures*
Statistics 725, 726, *Estimation Theory and Hypothesis Testing*
Statistics 841, 842, *Recent Developments in Statistics*

Statistics 880, *Seminar*

Statistics 551, 555, and 556 *are for minor credit only.*

Statistics 561, 662, 571, 572, 581, 682, 692, *are for major credit as are the courses in the 700 and 800 series.*

The candidate will consult with a member of the Statistics Faculty in preparing a program of study. A total of 30 graduate credit hours is required; of which not more than 6 credit hours may be taken in other departments. On approval, courses of a mathematical nature can be substituted for an additional 6 credit hours of statistics. The following courses would be required for a Master's degree in statistics: twelve credit hours from 561, 662, 571, 572, 581, 682, 692 and twelve credit hours from 701, 702, 726, 841, 842. A sample program could consist of 21 graduate hours from courses 662, 572, 682, 701, 702, 841, 842, and 880, and the remaining 6 credit hours from other departments with an additional three credit hours of a course of a mathematical nature.

Students specializing in statistics are advised to have a sound minor in a field of application. This minor can be chosen from courses equivalent to those required for undergraduate majors. Cognate courses are needed to supply a basis for mature thinking. Students should choose cognate courses from such fields as genetics, animal and plant breeding, sociology, psychology, engineering, econometics, and market research, etc. Statistics leans very heavily on mathematics, and most of the prerequisites and corequisites will come from such mathematical courses as: probability, numerical analysis, introductory modern analysis, and differential equations.

The statistical specialist must have a knowledge of modern computing methods, their capabilties and limitations. Familiarity with computers is essential for advanced work in statistics. Students are required to program a problem and obtain its solution on a computer.

The candidate is expected to obtain experience in statistical applications. A minor role in consulting work or an internship in an organization where statistics can be applied provides experience in this direction.

COURSES OPEN TO GRADUATE STUDENTS ONLY

701, 702. STATISTICAL TEST AND DECISION PROCEDURES.
Power of a test, O. C. Curves, Parametric tests; F, Hotelling's T, Multiple comparisons, Bartlett's Non-parametric tests: Chi-square, Kolmogorov-Smirnov, order statistics, ranking.
Prerequisite or corequisite, Statistics 662. *Credit, 3 each semester.*

725, 726. ESTIMATION THEORY AND HYPOTHESIS TESTING.

Maximum likelihood, types of estimators, properties of estimators, 2 sample problem, k sample problem.
Prerequisites or corequisites, Statistics 662 and 682. *Credit, 3 each semester.*

841, 842. RECENT DEVELOPMENTS IN STATISTICS.

The course material is selected from such modern areas of statistical thought as: stochastic processes, counting, gaussian and stationary processes, spectral distribution functions, birth and death processes, monte carlo, Box's optimizing processes.
Prerequisite, consent of instructor. *Credit, 3 each semester.*

880. SEMINAR.

Research papers by staff and students; invited lectures by prominent statisticians.
Credit, 1, 2, or 3.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

561. DESIGN OF EXPERIMENTS (METHODS).

Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields.
Prerequisite, Statistics 551, or 556. *Credit, 3.*

562. DESIGN OF EXPERIMENTS (THEORY).

Conceptual basis of experimental designs, especially randomized blocks, latin squares, factorial and sequential, incomplete blocks, and experiments with attributes.
Prerequisite, Statistics 556. *Credit, 3.*

571. SURVEY SAMPLING.

The theory and practice of sampling, optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, the problem of non-response.
Prerequisite, Statistics 551 or 556. *Credit, 3.*

572. SAMPLING THEORY AND METHODS.

Problems and methods of sampling, production and quality control, acceptance sampling OC and ASN curves, types and properties of estimators.
Prerequisite, Statistics 551 or 556. *Credit, 3.*

581. MULTIVARIATE ANALYSIS (METHODS).

Applications of the theory in Statistics 682 to actual problems; it may involve research studies by the students, critiques of publish research, or analysis of other bodies of data.
Prerequisite, Statistics 551 or 556. *Credit, 3.*

682. MULTIVARIATE ANALYSIS (THEORY).

Correlations and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions.
Prerequisite, Statistics 556. *Credit, 3.*

692. FREQUENCY DISTRIBUTIONS.

Bastic probability, frequency functions, transformation of variates, generating functions, normal and related distributions, binomial, multinomial, hypergeometric, Poisson, exponential, logarithmic and other distributions including Pearson's system.
Prerequisites, Statistics 556 and Mathematics 241 (or concurrently). *Credit, 3.*

COURSES FOR MINOR CREDIT ONLY
(No graduate credit for students majoring in Statistics)

551. ELEMENTARY STATISTICS.

The analysis of variance, the design of experiments, simple surveys, multiple regression, non-parametric tests.
Prerequisite, Statistics 121. *Credit, 3.*

555, 556. INTRODUCTORY STATISTICS.

Parallel courses to Statistics 121 and 551 but with calculus prerequisite.
Corequisite, Mathematics 174 or 185. *Credit, 3.*

WILDLIFE AND FISHERIES BIOLOGY

GRADUATE FACULTY

Arnold D. Rhodes, *Head of Department of Forestry and Wildlife Management and Professor of Forestry,* B.S., New Hampshire, 1934; M.F., Yale, 1937.

Robert B. Brander, *Assistant Professor,* B.S., Michigan, 1961; M.S., Ph.D., Minnesota, 1965.

Charles F. Cole, *Associate Professor of Fisheries Biology,* B.A., Cornell, 1950; Ph.D., 1957.

Frederick Greeley, *Associate Professor of Wildlife Management,* B.A., Kenyon College, 1941; M.S., Wisconsin, 1949; Ph.D., 1954.

James A. McCann, *Associate Professor of Fisheries Biology,* B.S., Massachusetts, 1956; M.S., Iowa State, 1958; Ph.D., 1960.

Roger J. Reed, *Assistant Professor of Fisheries Biology,* B.S., Pittsburgh, 1951; M.S., 1953; Ph.D., 1956.

William G. Sheldon, *Professor of Wildlife Management,* B.A., Yale, 1933; M.S., Cornell, 1947; Ph.D., 1948.

Bernard C. Wentworth, *Assistant Professor of Wildlife Management,* B.S., Maine, 1957; M.S., 1960, Massachusetts, Ph.D., 1963.

David K. Wetherbee, *Associate Professor of Wildlife Management,* B.A., Clark University, 1950; M.A., 1952; Ph.D., Connecticut, 1959.

Most applicants for admission to graduate work in wildlife and fisheries biology must have completed a Bachelor's degree in the biological sciences. Occasional exceptions are made for applicants from other fields, provided they make up their deficiencies in basic biology as part of their graduate program.

Graduate students pursue courses of study directed toward acquiring proficiency in independent research in either wildlife or fisheries field. Work in fisheries involves both fresh water and marine environments. Courses may be taken in the department and in related fields. A research thesis is normally required. Graduate students may conduct research under the supervision of the Cooperative Wildlife and Fishery Units and are eligible for support from the Units provided by the Massachusetts Division of Fisheries and Game, the Massachusetts Division of Marine Fisheries, and the United States Bureau of Sport Fisheries and Wildlife.

Undergraduate students who receive their Bachelor's degree in fisheries or wildlife at the University of Massachusetts are urged to pursue graduate work at other universities, many of which also have Cooperative Research Units.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN WILDLIFE OR FISHERIES BIOLOGY.
Credit, 3 per semester. Maximum credit, 6. The Staff.

701, 702. SEMINAR IN WILDLIFE AND FISHERIES BIOLOGY.
Review and discussion of the literature in Wildlife and Fisheries Biology, including such subjects as population dynamics and manipulation, law and administration, Afro-Eurasian problems, influence of land-use, Arctic environments and others.
Credit, 3 per semester. Maximum credit, 6. The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

561. PRINCIPLES OF WILDLIFE BIOLOGY.

Fundamental ecology and principles of Wildlife Management, with emphasis on population characteristics and responses. *Credit, 3.* Mr. Greeley.

562. TECHNIQUES OF WILDLIFE BIOLOGY.

Methods of collecting and interpreting data in Wildlife Management, with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals. *Credit, 3.* Mr. Brander.

563. MANAGEMENT OF WETLAND WILDLIFE.

Life histories, identification and habitat requirements of waterfowl and marshland furbearing animals; management of wetland habitats.
1966-67 and each alternate year. *Credit, 3.* Mr. Brander.

564. MANAGEMENT OF UPLAND WILDLIFE.

Life histories, identification and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats.
1965-66 and each alternate year. *Credit, 3.* Mr. Greeley.

565. TECHNIQUES OF FISHERIES BIOLOGY.

Principles and techniques of fishery management, stressing population and growth dynamics, and field procedures. *Credit, 3.* Mr. Cole.

566. PHYSIOLOGY OF FISHES.

Study of physiological functions relative to the environment of fishes. The adaptations of local species to particular habitats will be studied in the field and laboratory.
1965-66 and each alternate year. *Credit, 3.* Mr. Cole.

568. SURVEY OF FISHERIES RESOURCES.

Review of the sport and commercial fisheries of the United States, with special emphasis on crustaceans, molluscs and fishes. Coastal field trips by arrangement. *Credit, 3.* Mr. Cole.

COURSES IN OTHER DEPARTMENT FOR WHICH MAJOR CREDIT MAY BE GIVEN

When appropriate for the student's program of instruction and research, and with the consent of the student's advisor, major credit will be given for certain courses in the following subject-matter areas: Agricultural and Food Economics, Botany, Education, Entomology and Plant Pathology, Forestry, Statistics, and Zoology.

ZOOLOGY

GRADUATE FACULTY

Donald Fairbairn, *Head of Department and Professor of Zoology,* B.A., Queens University, Canada, 1938; Ph.D., Rochester, 1942.

Everett Anderson, *Professor of Zoology,* B.A., Fisk University, 1949; M.A., 1951; Ph.D., State University of Iowa, 1955.

Lawrence M. Bartlett, *Professor of Zoology,* B.S., Massachusetts, 1939; M.S., 1942; Ph.D., Cornell, 1949.

William R. Harvey, *Associate Professor of Zoology,* A.B., Tufts, 1950; B.Ed., Edinburgh, Scotland, 1951, A.M., Harvard, 1954; Ph.D., 1957.

Bronislaw M. Honigberg, *Professor of Zoology,* B.A., California at Berkeley, 1943; M.A., 1946; Ph.D., 1950.

Yoshihiro Kato, *Assistant Professor of Zoology,* B.S., Tokyo University, 1948; M.S., California at Berkeley, 1956; Ph.D., Washington University, 1959.

David J. Klingener, *Assistant Professor of Zoology,* B.A., Swarthmore, 1959; M.A., Michigan, 1961; Ph.D., 1964.

Arthur P. Mange, *Assistant Professor of Zoology,* B.S., Cornell, 1954; M.S., Wisconsin, 1958; Ph.D., 1963.

John G. Moner, *Associate Professor of Zoology,* B.A., Johns Hopkins, 1949; M.A., Princeton, 1951; Ph.D., 1953.

William B. Nutting, *Professor of Zoology,* B.S., Massachusetts State, 1940; M.S., Massachusetts, 1948; Ph.D., Cornell, 1950.

Harold Rauch, *Professor of Zoology,* B.S., Queens College, 1944; M.S., Illinois, 1947; Ph.D., Brown, 1950.

John L. Roberts, *Associate Professor of Zoology,* B.S., Wisconsin, 1947; M.S., 1948; Ph.D., California at Los Angeles, 1952.

Larry S. Roberts, *Assistant Professor of Zoology,* B.S., Southern Methodist University, 1956; M.S., Illinois, 1958; D.Sc., Johns Hopkins, 1961.

H. Duncan Rollason, Jr., *Associate Professor of Zoology,* A.B., Middlebury, 1939; M.A., Williams, 1941; A.M., Harvard, 1943; Ph.D., 1949.

Theodore D. Sargent, *Assistant Professor of Zoology,* B.S., Massachusetts, 1958; M.S., Wisconsin, 1960; Ph.D., 1963.

James G. Snedecor, *Professor of Zoology,* B.S., Iowa State, 1939; Ph.D., Indiana University, 1947.

Dana P. Snyder, *Associate Professor of Zoology,* B.S., Illinois, 1947; M.S., 1948; Ph.D., Michigan, 1951.

Paul A. Swenson, *Associate Professor of Zoology,* B.S., Hamline University, 1947; Ph.D., Stanford, 1952.

Facilities are provided for students intending to complete the requirements for the Degree, Master of Science, or Doctor of Philosophy. A minimum of 20 credits of biology is required for admission to graduate standing; applicants who cannot satisfy this requirement may be admitted as special students. Candidates for the Master's degree must satisfy Department and Graduate School foreign language requirements in one of German, French or Russian. Any two of these languages are required of doctoral candidates.

The degree, Master of Science, is awarded to students who satisfactorily meet the requirements of the Graduate School and who present a thesis or a minimum of six and a maximum of nine credits in Zoology 700. An oral examination is required of all candidates.

Each candidate for the degree, Doctor of Philosophy, follows a course of study acceptable to him and to his guidance committee. Before a thesis is submitted he must demonstrate general competence by means of written, followed by oral, examinations.

Zoology 850 (Seminar) is required of all graduate students. A minimum of 3 or 5 credits is usually required of candidates for the Degree Master of Science, or Doctor of Philosophy, respectively. Additional credits may be taken or required by arrangement with the student's advisor.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 1-9.* The Staff.

702 (II). GENERAL CYTOLOGY.

The morphological features of cells in relation to their function. Lectures, seminar reports and individual laboratory work.
Prerequisite, Zoology 523. *Credit, 3.* Mr. Rollason.

708 (I). ELECTRON MICROSCOPY.

Lectures and laboratory on the electron microscope and methods of specimen preparation.
Prerequisite, permission of instructor. *Credit, 3.* Mr. Anderson.

710 (II). FINE STRUCTURE AND FUNCTION OF CELLS.

Lectures, discussions, readings and reports on fine structure of cells and dynamic morphology.
Prerequisites, Zoology 523, 660. *Credit, 3.* Mr. Anderson.

720 (II). EXPERIMENTAL EMBRYOLOGY.

Physiology, biochemistry, and ultrastructure of development with reference to gametogenesis, fertilization, cleavage, induction, differentiation, regeneration, and metamorphosis. Emphasis on control mechanisms.
Prerequisites, Zoology 525, Chemistry 160. *Credit, 3.* Mr. Harvey, Mr. Kato.

730 (II). PHYSIOLOGICAL GENETICS.

The nature of the gene and its action in the developmental and physiological processes of the organism.
Prerequisites, Zoology 540 and permission of instructor. *Credit, 3.* Mr. Rauch.

740 (I). ADVANCED INVERTEBRATE ZOOLOGY.

Morphology, habits and life cycles of aquatic invertebrates. Laboratory, discussion periods, field trips.
Prerequisite, Zoology 571. *Credit, 3.* Mr. Nutting.

744 (II). HELMINTHOLOGY.

Host-parasite relationships, systematics, morphology, and life histories of metazoan animal parasites with emphasis on helminths.
Laboratory on research techniques.
Prerequisites, Zoology 583, 571 and permission of instructor.
Credit, 3. Mr. L. S. Roberts.

750. (I). ANIMAL BEHAVIOR.

A consideration of the biological bases of animal behavior, with an analysis of the methods and objectives of current research.
Two 2-hour lecture-discussion periods.
Prerequisites, Vertebrate and invertebrate zoology, or physiological psychology and permission of instructor. *Credit, 3.* Mr. Sargent.

780 (II). ADVANCED CELLULAR AND COMPARATIVE PHYSIOLOGY.

Detailed study of one or more of the following topics: physiology of the cell growth cycle, radiation biology and regulatory mechanisms in cells and higher animals. In 1966 the topic to be discussed is Photobiology.
Prerequisites, Zoology 660 and 670.
Credit, 2-4. Mr. Swenson, Mr. J. L. Roberts, Mr. Moner.

784 (I). ENDOCRINOLOGY.

The importance of the endocrines in their control over normal functions (growth, metabolism, reproduction, etc.) in a variety of animals.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 666. *Credit, 3.* Mr. Snedecor.

850 (I) (II). SEMINAR.

In each semester a topic from each of the following fields is chosen for discussion: Cytology and Genetics; Ecology and Vertebrate Biology; Physiology and Biochemistry; Invertebrate Biology and Parasitology. *Credit, 1 each semester.* The Staff.

800. THESIS, MASTER'S DEGREE. *Credit, 10.*

900. THESIS, Ph.D. DEGREE.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

521 (I) (II). COMPARATIVE VERTEBRATE ANATOMY.

Structure and phylogeny of the vertebrates. Laboratory work will illustrate evolutionary trends and specializations and provide experience in dissection.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101. *Credit, 3.* Mr. Snyder, Mr. Klingener.

523 (I) (II). HISTOLOGY.

The structure of cells, tissues and organs as related to function, with emphasis on the mammal; introduction to microtechnique.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101. *Credit, 3.* Mrs. Rollason.

525 (I) (II). DEVELOPMENTAL BIOLOGY.

Introduction to descriptive, comparative, and experimental embryology, with consideration of biochemical and biophysical approaches to problems of development.
Two class hours, one 3-hour laboratory.
Prerequisite, Zoology 521. *Credit, 3.* Mr. Harvey, Mr. Kato.

540 (I) (II). PRINCIPLES OF GENETICS.

Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics and evolution.
Three class hours.
Prerequisites, Zoology 101, Chemistry 112 or 114.
Credit, 3. Mr. Rauch, Mrs. Shepard.

542 (II). GENETICS LABORATORY.

Laboratory experiments illustrating transmission genetics, including linkage and gene location.
One 3-hour laboratory period.
Prerequisite, Zoology 450. *Credit, 1.* Mr. Rauch, Mr. Mange, Mrs. Shepard.

546 (I). POPULATION GENETICS.

Introduction to the principles of population genetics; the population approach to the origin of species and the study of human genetics.
Three class hours.
Prerequisites, Zoology 540 and permission of instructor.
Credit, 3. Mr. Mange.

571 (II). INVERTEBRATE ZOOLOGY.

A survey of invertebrate animals based upon evolutionary and phylogenetic considerations.
Lectures, discussion periods, laboratory.
Prerequisite, Zoology 521 or permission of instructor.
Credit, 3. Mr. Nutting, Mr. L. S. Roberts.

575 (II). BIOLOGY OF PROTOZOA.

Morphology and physiology of Protozoa, with emphasis on the contributions made on the basic problems of biology through the study of these organisms.
One class hour, one 2-hour and one 3-hour laboratory periods.
Prerequisites, Zoology 101 and permission of instructor.
Credit, 3. Mr. Honigberg.

583 (I). GENERAL PARASITOLOGY.

Morphology, life cycles, and physiology of protozoan and helminth parasites, with emphasis on broad aspects of parasitism.
Two class hours, two 2-hour laboratory periods.
Prerequisites, Zoology 101, Chemistry 112 or 114. *Credit, 4.* Mr. Honigberg.

600 (I). VERTEBRATE ZOOLOGY.

History, relationships, patterns of distribution, classification, and ecology, with major emphasis on the fishes.
One class hour, two 2-hour laboratory periods, field trips.
Prerequisite, Zoology 101. *Credit, 3.* Mr. Andrews.

602 (II). ICHTHYOLOGY.

The morphology, ecology and relationships of fishes, and their distribution in space and time.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 521 or 600, or permission of instructor.
Credit, 3. Mr. Andrews.

606 (II). ORNITHOLOGY.

Avian biology with emphasis on structural and functional adaptations, and particularly behavioral patterns. Laboratory includes field trips.
Two class hours, one 3-hour laboratory period.
Prerequisite, Zoology 101. *Credit, 3.* Mr. Bartlett, Mr. Sargent.

608 (II). MAMMALOGY.

Evolution, distribution, classification and ecology of mammals. Laboratory includes field trips, preparation of study material, and identification of local fauna.
Two class hours, one 3-hour laboratory period.
Prerequisites, Zoology 521 or 600 and permission of instructor.
Credit, 3. Mr. Snyder.

635 (II). LIMNOLOGY.

Study of inland waters, including geological, physical, chemical and biological aspects.
Two class hours, two 3-hour laboratories or field trips.
Prerequisites, Botany 100, Zoology 101, Chemistry 112, and permission of instructor. *Credit, 4.* Mr. Ludlam.

637 (I). ECOLOGY.

Theoretical and experimental examination of phenomena such as inter- and intra-specific population relationships, productivity, energetics, and community structure.
Two class hours, one 3-hour laboratory.
Prerequisites, Zoology 101, Mathematics 124 or permission of instructor.
Credit, 3.

660 (I). GENERAL AND CELLULAR PHYSIOLOGY.

Modern trends in physiology with emphasis on the chemical and physical properties of cells, including protoplasmic organization, cellular metabolism, permeability, bioelectric phenomena, muscle contraction, radiation biology, and cellular regulatory mechanisms.
Three class hours, one 3-hour laboratory period.
Prerequisites, one year biology and organic chemistry.
Credit, 4. Mr. Swenson, Mr. Moner.

666 (II). VERTEBRATE PHYSIOLOGY.

Function of organs and organ systems in vertebrates.
Three class hours, one 3-hour laboratory period.
Prerequisite, Zoology 660 or Chemistry 520 or 524. *Credit, 4.* Mr. Snedecor.

670 (II). COMPARATIVE PHYSIOLOGY.

Physiological principles involved in adaptations of animals to their environment; emphasis in the laboratory on experimental methods used to study adaptive mechanisms.
Three class hours, one 3-hour laboratory period.
Prerequisite, Zoology 660. *Credit, 4.* Mr. J. L. Roberts.

INDEX

STOCKBRIDGE SCHOOL OF AGRICULTURE
University of Massachusetts

1966/1968 BULLETIN

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University of Massachusetts

STOCKBRIDGE SCHOOL

OF AGRICULTURE

The University of Massachusetts is both a State University and a Land Grand College and as such has been established by Acts of Congress and of the Legislature of Massachusetts.

The two year course at the University of Massachusetts is known as the Stockbridge School of Agriculture, named after an early president of the University. Included herein are descriptions of the various courses offered, information concerning expenses, enrollment and regulations. In the back of the catalogue will be found a form for application.

The University reserves, for itself and its departments, the right to withdraw or change the announcements made in its catalogue.

UNIVERSITY BULLETIN Amherst, Massachusetts

TABLE OF CONTENTS

CALENDAR 1965-1966

First Semester

September	9	Thursday	Registration.
	10	Friday	First classes.
October	12	Tuesday	Holiday.
	30	Saturday	Mid-term marks close.
November	11	Thursday	Holiday.
	12	Friday	Thursday class schedule will be followed.
	24	Wednesday	Thanksgiving recess begins after last class.
	29	Monday	Classes resume.
December	1	Wednesday	Counseling Day, no classes.
	18	Saturday	Christmas recess begins after last class.
January	3	Monday	Classes resume.
	8	Saturday	Last day of classes.
	10	Monday	Final examinations begin.
	13	Thursday	Last day of final examinations.

Second Semester

January	31	Monday	Registration.
February	1	Tuesday	First classes.
	22	Tuesday	Holiday.
March	19	Saturday	Mid-term marks close.
	19	Saturday	Spring recess begins after last class.
	28	Monday	Classes resume.
April	9	Saturday	Placement begins for certain freshmen.
	19	Tuesday	Holiday.
May	4	Wednesday	Counseling Day, no classes.
	24	Tuesday	Last day of classes.
	25	Wednesday	Final examinations begin.
	28	Saturday	Last day of final examinations.
June	5	Sunday	Commencement.

CALENDAR 1966-1967

First Semester

September	14	Wednesday	Registration.
	15	Thursday	First classes.
October	12	Wednesday	Holiday.
	29	Saturday	Mid-term marks close.
November	9	Wednesday	Friday class schedule will be followed.
	11	Friday	Holiday.
	23	Wednesday	Thanksgiving recess begins after last class.
	28	Monday	Classes resume.
December	6	Tuesday	Counseling Day, no classes.
	21	Wednesday	Christmas recess begins after last class.
January	3	Tuesday	Classes resume.
	11	Wednesday	Last day of classes.
	12	Thursday	Final examinations begin.
	16	Monday	Last day of final examinations.

Second Semester

January	31	Tuesday	Registration.
February	1	Wednesday	First classes.
	22	Wednesday	Holiday.
March	18	Saturday	Mid-term marks close.
	25	Saturday	Spring recess begins after last class.
	25	Saturday	Placement begins for certain freshmen.
April	3	Monday	Classes resume.
	19	Wednesday	Holiday.
May	4	Thursday	Counseling Day, no classes.
	18	Thursday	Last day of classes.
	19	Friday	Final examinations begin.
	23	Tuesday	Last day of final examinations.
	28	Sunday	Commencement.

TRUSTEES OF THE UNIVERSITY

Organization of 1965

MEMBERS OF THE BOARD	*Term Expires*
Dennis Michael Crowley *of Boston*	1966
Martin Sweig *of Winthrop*	1966
Frank Learoyd Boyden *of Deerfield*	1967
George L. Pumphret *of Dorchester*	1967
Harry Dunlap Brown *of North Chatham*	1968
John William Haigis, Jr. *of Greenfield*	1968
Most Reverend Christopher Joseph Weldon *of Springfield*	1969
Fred C. Emerson *of Agawam*	1969
Edmund J. Croce *of Worcester*	1969
Calvin H. Plimpton *of Amherst*	1969
Hugh Thompson *of Milton*	1969
Joseph P. Healey *of Arlington*	1970
Frederick Sherman Troy *of Boston*	1970
Robert D. Gordon *of Lincoln*	1971
Louis Martin Lyons *of Cambridge*	1971
Mrs. Caroline Rowland *of Boston*	1972
John J. Maginnis *of Worcester*	1972

MEMBERS EX OFFICIO

His Excellency John A. Volpe, *Governor of the Commonwealth.*
John William Lederle, *President of the University.*
Alfred L. Frechette, *Commissioner of Public Health.*
Owen B. Kiernan, *Commissioner of Education.*
Charles Henry McNamara, *Commissioner of Agriculture.*
Harry C. Solomon, *Commissioner, Department of Mental Health.*

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Frank Learoyd Boyden *of Deerfield, Chairman.*
Robert J. McCartney *of Amherst, Secretary.*
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OSWALD TIPPO, Ph.D. *Provost.*

KENNETH WILLIAM JOHNSON, B.S. *Treasurer of the University.*

ARLESS A. SPIELMAN, Ph.D. *Dean of the College of Agriculture, Director of the Experiment Station and Director of the Extension Service.*

HUGH MONTGOMERY, B.S. in L.S. *Librarian of the University.*

WILLIAM FRANKLIN FIELD, Ph.D. *Dean of Students.*

ROBERT WILCOX GAGE, M.D. *Director of Health Service.*

FRED PAINTER JEFFREY, M.S. *Director of the Stockbridge School of Agriculture and Associate Dean of the College of Agriculture.*

HELEN CURTIS, A.M. *Dean of Women.*

ROBERT STODDART HOPKINS, JR., M.Ed. *Dean of Men.*

LYNN E. SANTNER, B.A. *Staff Assistant, Placement and Financial Aid Services.*

ROBERT JOHN MORRISSEY, M.S. *Director of Placement and Financial Aid.*

STOCKBRIDGE ADVISORY COMMITTEE

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John W. Denison
Richard C. Foley
George B. Goddard
Robert B. Hoadley
Gordon S. King
Donald E. Lundberg
Donald R. Marion
Louis F. Michelson
Harold E. Mosher
Edward S. Pira
Frank E. Potter
Joseph Troll
Alden P. Tuttle

FACULTY OF INSTRUCTION

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GEORGE N. AGRIOS, Ph.D. *Assistant Professor of Entomology*	Fernald Hall
STEPHEN I. ALLEN, A.M. *Assistant Professor of Mathematics*	Machmer Hall
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JAMES F. ANDERSON, M.S. *Instructor in Plant and Soil Science*	French Hall
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ALLEN V. BARKER, Ph.D. *Assistant Professor of Plant and Soil Science*	Bowditch Hall
ELLSWORTH W. BELL, M.S. *Acting Head of Agricultural and Food Economics*	Draper Hall
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Assistant Professor of Food Science and Technology

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Assistant Professor of Agricultural and Food Economics

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Professor and Head of Department of Physical Education for Women

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Assistant Professor of Agricultural Engineering

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Assistant Professor of Food Science and Technology

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Commonwealth Head of Department of Food Science and Technology

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Professor of Veterinary and Animal Science and Head of Department

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Professor of Forestry

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THEODORE W. LEED, Ph.D. *Professor of Agricultural and Food Economics*	Draper Hall

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Professor of Food Science and Technology

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Assistant Professor of Home Economics

LOUIS F. MICHELSON, Ph.D. — Stockbridge Hall
Assistant Professor of Plant and Soil Science

HAROLD E. MOSHER, M.L.A. — Clark Hall
Associate Professor of Landscape Architecture

ARTHUR E. NIEDECK, M.A. — Bartlett Hall
Professor of Speech and Head of Department

T. MICHAEL PETERS, Ph.D. — Fernald Hall
Assistant Professor of Entomology

EDWARD S. PIRA, M.S. — Agricultural Engineering Building
Assistant Professor of Agricultural Engineering

FRANK E. POTTER, Ph.D. — Flint Laboratory
Associate Professor of Food Science and Technology

PAUL N. PROCOPIO, M.S. — Wilder Hall
Professor of Landscape Architecture

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Professor of Recreation Leadership and Head of Department

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Instructor in Public Health

LAWRENCE D. RHOADES, B.S. — Draper Hall
Associate Professor of Agricultural and Food Economics

ARNOLD D. RHODES, M.F. — Holdsworth Hall
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Professor of Veterinary and Animal Science

J. ROBERT SMYTH, JR., Ph.D. — Stockbridge Hall
Professor of Veterinary and Animal Science

FRANKLIN W. SOUTHWICK, Ph.D. — French Hall
Professor of Plant and Soil Science, and Head of Department

RICHARD A. SOUTHWICK, M.S. — Stockbridge Hall
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Associate Professor of Plant and Soil Science

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WALTER D. WEEKS, Ph.D. — French Hall
Associate Professor of Plant and Soil Science

EARLE D. WHITNEY, B.S. — Clark Hall
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LESTER F. WHITNEY, Ph.D. — Agricultural Engineering Building
Associate Professor of Agricultural Engineering

KAROL S. WISNIESKI, M.P.H. — Public Health Building
Assistant Professor of Public Health

ALBERT L. WRISLEY, JR., M.A. — Chenoweth Laboratory
Assistant Professor of Food Science and Technology

JOHN M. ZAK, M.S. — Stockbridge Hall
Assistant Professor of Plant and Soil Science

ERVIN H. ZUBE, M.L.A. — Wilder Hall
Professor of Landscape Architecture and Head of Department

GENERAL INFORMATION

The Stockbridge School of Agriculture is a part of the College of Agriculture at the University of Massachusetts. Graduates receive the Associate Degree. The School was founded in 1918 and has over 4,500 alumni. The successful careers of graduates are the best proof available as to the value of this kind of concentrated and technical education.

The entering student is required to select one of the following eleven programs of study. Since in a two-year program it is difficult to transfer from one major to another, entering students should choose the major which comes closest to their interests, abilities and future goals. A careful study of the curricula and job opportunities listed for each major will help to insure a proper selection. If additional information or advice is needed, the Director of the Stockbridge School or the Head of the Department concerned should be consulted.

ENTRANCE REQUIREMENTS

High School graduates are eligible to apply and must have taken the Scholastic Aptitude Test given by the College Entrance Examination Board. Preference is given to students with good preparation in English, Mathematics, and Science, and a particular effort is made to select applicants who have demonstrated a strong motivation in their major field of interest.

How to apply

Fill out application blank on page 83, printing or typing all information required. Be sure to check the course you wish to elect. Mail this form to the Director of the Stockbridge School.

Registration

For registration dates see calendar in front of catalogue.

Instruction

Courses are taught by the University staff. In addition to teaching by lecture and discussion there is a strong emphasis on practical laboratory work. The combined advantages of university instruction and a university plant with all its varied resources are thus made available to Stockbridge students. Freshmen majoring in Arboriculture and Park Management, Floriculture, Fruit and Vegetable Crops, Landscape Operations, and Turf Management, are assigned to summer placement jobs on or about April 1, which gives them approximately five months of field experience. Freshmen majoring in Agricultural Business Management, Animal Science, Dairy Technology, Food Distribution, Restaurant and Hotel Management, and Wood Utilization, do not leave for summer placement until the last week of May following their final examinations. These students, therefore, spend about three months in the field.

Transferring to the University

It is possible for superior students to transfer to the University following graduation from Stockbridge. Each case is considered individually by the Dean of Admissions and transfer prior to earning the Associate Degree is not encouraged. The following procedures and policies apply to transfers to Departments in the College of Agriculture — not to those transferring to other schools and colleges of the University.

A. Requirements

1. A student may be recommended for transfer if his cumulative Stockbridge average is 3.0 or better.
2. The applicant must have earned not less than a C in English S-4 — ENGLISH COMPOSITION and in Mathematics S-4 — ELEMENTARY COLLEGE ALGEBRA.
3. The applicant must have taken the Senior Scholastic Aptitude Test given by the College Entrance Examination Board.
4. The applicant must be recommended by his department head.

B. Procedure

1. The applicant should arrange an interview with the Director of the Stockbridge School. Transfer application blanks are available in the Director's Office.
2. It is the responsibility of the applicant to visit with his department head and arrange for an evaluation letter to be sent to the Director of the Stockbridge School.
3. The Director of the Stockbridge School, in consultation with members of the Stockbridge School Advisory Council, will recommend or not recommend to the Dean of Admissions.
4. The Dean of Admissions will notify the applicant of his acceptance or rejection.

C. Evaluation of Stockbridge Record

1. The Head of the Department to which the student is transferring will determine (a) the number of semester hours of transfer credit allowed — this may vary considerably from less than 30 to as many as 45, and (b) how much additional credit will be needed to qualify for the B.S. degree. It is required that the department head file a report of these findings in the Office of the Registrar.

SCHOLARSHIP REGULATIONS

Absence from Classes

1. Attendance at all lectures, laboratories, and class trips is expected of all students.
2. Each instructor establishes his own attendance rules and the Director will support whatever rules are established.
3. All students are expected to report promptly to the University Infirmary when ill. If treated by an outside physician, bring a statement from him if an excuse for absence from class is expected.

Grading System

Grades are computed on a quality point system as follows:

Grade	*Interpretation*	*Quality points per semester hour*
A	Excellent	4
B	Good	3
C	Average	2
D	Passing but not satisfactory	1
F	Failure	0
Inc.	All required work not turned in or permission granted to repeat final examination	—

Semester Grade Point Average

To compute the semester grade point average, the total points earned will be divided by the total credits carried. Credits carried are defined as total credits earned and failed. Grade point averages will be recorded to one decimal place. For example, averages from 2.65 to 2.74 will be recorded as 2.7. A student with an Inc. will not have his semester quality point average computed until this mark has been converted to a letter grade except in those cases where obvious dismissal would be involved.

Cumulative Average

To compute the cumulative grade point average, the total points earned will be divided by the total credits carried — the sum of total credits earned and failed. If a student fails a course and then repeats it, quality points will be computed on the basis of the new grade.

Dismissal

The Stockbridge Advisory Committee meets regularly with the Director to review academic performance of students. Dismissal for academic reasons is based on regulations administered by this committee. A student will be dismissed if his *cumulative* quality point average is less than 1.5 at the end of the first semester, 1.75 at the end of the second semester, or 2.0 at the end of the third semester.

Graduation Requirements

A cumulative quality point average of at least 2.0 is required for graduation. At-

tendance at graduation is required of all seniors before the diploma will be awarded.

No students will be graduated unless all bills due either to the University or to private individuals, business concerns, or a fraternity have been paid on or before the Wednesday preceding graduation exercises.

Seniors who have taken out University loans will have their diplomas held as collateral until these are paid in full. This in no way interferes with the privilege of graduation.

EXPENSES

As a state institution, the University of Massachusetts offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

1. A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a bona fide residence in the Commonwealth with the intention of continuing to maintain it as such.
2. The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation, the student in addition to the requirements of these regulations respecting residence shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present in addition to the certification of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian.
3. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University.
4. The residence of a wife shall follow that of the husband.
5. The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University.
6. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

Expenses are approximately $1000 per year for the normally economical student. The following estimate of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly college-related and does not include

amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year.

Variation in Course Charges

There is a difference in charges for the freshman year depending on the length of the placement period.

Summary of Expenses Estimated:	*FIRST YEAR (1½ Semesters)*	*SECOND YEAR (2 Semesters)*	*SECOND YEAR (2 Semesters)*
Tuition (Residents of Mass.)	$150.00	$200.00	$200.00
Room in University Residence Hall	150.00	200.00	200.00
Board at University Commons (5-day week)*	275.00	370.00	370.00
Student Activities Fee	34.00	34.00	34.00
Athletic Fee	23.00	30.00	30.00
Physical Education Equipment Fee	5.00	5.00	—
Student Union Fee	15.00	20.00	20.00
Student Health Fee	30.00	40.00	40.00
Student Medical Insurance — 12 months' Coverage (optional)	18.00	18.00	18.00
Books, Stationery, and Other Supplies (estimate)	100.00	125.00	125.00
	$800.00	$1,042.00	$1,037.00

**A weekend board plan is available at a cost of approximately $40.00 per semester. This plan covers all six weekend meals for one semester, holiday weekends excluded.*

Estimated cost of required field trips during the two years $15.00-$50.00

Tuition

Residents of Massachusetts are charged $100 per semester. Tuition per semester for non-residents or non-citizens of the United States is $300. Massachusetts residents are required to file a statement signed by either town or city clerk stating that the applicant (in case he is voting age) or the applicant's parent is a legal resident.

Rooms for Men

All men except commuters, married students, or those living at the Stockbridge Fraternity (Alpha Tau Gamma) are required to live in University residence halls.

If residence hall facilities are scarce late applicants may have to find a room in a private home in Amherst.

Rooms for Women

All women except commuters or married students must live in University residence halls. Under the supervision of the Dean of Women, life in each residence hall is directed by a council of student leaders, advised by a full-time housemother, so that conditions are conducive to good study and living habits.

NOTE

In all residence halls, whether for men or women, the student must supply a study lamp, a metal waste basket, bed linen, pillow and blankets. Residence halls are open at 10:00 a.m. on the day preceding freshman registration.

Board

All freshmen living in residence halls as well as senior women in residence halls must board at the University Commons. Those living at Alpha Tau Gamma — whether freshmen or seniors — may board at the fraternity. Senior men living in residence halls may take their meals at the Commons or make other arrangements if they choose to do so. Preparation of food in rooms is not permitted under any circumstances.

Student Activities Fee

This fee, authorized by vote of the undergraduate students with the approval of the Board of Trustees, provides each student with the "Collegian," the student newspaper; "Stosag," School yearbook; student government, class and other activities.

Athletic Fee

Funds received from this charge are used to support comprehensive men's and women's intercollegiate programs as well as fine intramural programs.

Physical Education Equipment Fee

Income from this fee is used for the purchase of all clothing issued to male students for use in the required physical education program, intramural athletics and general recreation.

Student Union Fee

Funds received from this charge are used to support the Student Union and meet the operating costs of its various activities.

Health Services Fee

Funds received from this charge are used to support the medical, psychiatric and health services provided by the staff of the Infirmary.

Medical-Surgical Insurance

This is an *optional* plan intended to supplement the care received by students at the Infirmary. It provides hospital, medical and surgical care on a twelve-month basis for injuries or illness during the school year, holidays, summer vacation and other times when the student is away from Amherst. Students who register for the fall semester have only one opportunity to enter or reject this program each year; at the time of payment of the fall semester bill. It is also offered on the spring semester bill for new spring registrants only. Married students desiring family coverage under the plan now in existence at the University are advised to contact the Student Health Services.

Admission (Matriculation) Payment

New students will be expected to make an advance payment of $15 to the Treasurer of the University as soon as they are notified by the Director that they are accepted for admission. This will be considered as first payment on registration fees which will be due at time of matriculation in the fall. It is not refundable and will be considered as payment for admission and registration expense if the student does not matriculate.

Scholarship Payments

It is the responsibility of all scholarship holders to see that the University is adequately notified prior to the time fee bills are prepared. Known scholarships are shown on the fee bills. If such items are not shown, deductions may not be made from the bill until satisfactory evidence has been presented to the Treasurer of the University by the donor.

Refund of Student Payments

Prepaid tuition and fees will be refunded to students withdrawing as follows:

A. Before registration	100%
B. Within the first two weeks from the date of registration	80%
C. Within the third week	60%
D. Within the fourth week	40%
E. Within the fifth week	20%
F. After fifth week, no refund.	
Prepaid board — pro rata refund.	
Prepaid room rent — no refund.	

Payment Due Dates

In accordance with University policy, all charges for tuition, fees, board and room rent in University Residence Halls are due and payable approximately twenty-one days prior to the date of registration of each semester. Bills will be rendered in advance with due date shown; payment may best be made by mail. Students may not register until all University charges are paid.

Late Registration

Any student who does not complete his registration, including payment of semester charges, on the regular registration days will be required to pay a fee of $5.00.

Laboratory Charges

Some departments have laboratory charges which range from two to six dollars per course. These charges must be paid at the University Store before the student is admitted to the course.

Student Cars

Permission to possess and use motor vehicles while attending the Stockbridge School is usually granted to commuting students, the physically handicapped, married students living with spouse, students presenting extenuating circumstances for the operation of a motor vehicle as a necessity, seniors, and students 25 years of age or over.

Permission to possess or operate a motor vehicle in the Amherst area* will normally be denied to the following:

1. Freshman students under the age of 25 years.
2. Students on probation for academic or disciplinary reasons (except commuting students and married students living with spouse).
3. Students who received in excess of 4 citations for violations of the University of Massachusetts Automobile Regulations during the previous academic year.

COMMUTING STUDENTS are defined as those who normally must daily travel a distance of over one mile from their local residence address to the campus center (Student Union).

PHYSICALLY HANDICAPPED or disabled students include only those whose locomotive ability is so seriously impaired that they would be prevented from meeting regular class appointments without motor vehicle assistance. Certification of such handicap, by the University Health Officer, must be presented to the University Police.

**In addition to the town of Amherst and its environs, this area includes Pelham, Leverett, Shutesbury, Sunderland, Belchertown and Hadley.*

All unmarried students under the age of 21 must submit a signed Parental Consent Form.

If not living on campus, but in the Amherst area, off-street parking must be available to the student and regularly used by him for overnight parking.

Students may apply for permission to possess and use a motor vehicle in advance of their arrival in the Amherst area, and will be informed by mail whether such application has been approved or denied. Approved applicants will receive a vehicle registration form which is to be completed and presented to the University Police at the time of registration.

Within forty-eight hours (Sundays and holidays excepted) of arrival on campus the registration certificate proving ownership of vehicle, completed vehicle registration form, valid driver's license, student I.D. card, and proof of required motor vehicle liability insurance (proof shall consist of the insurance policy, an official abstract of the policy coverage, or a letter from the insurance agency setting forth the coverage) should be presented to the University Police.

REGISTRATION OF MOTOR VEHICLES — All motor vehicles operated by students on the campus or other lands of the University must be registered with the University Police and display current University registration insignia.

An eligible student may register only a motor vehicle which is owned by himself, his parent, or his spouse.

In accordance with the University of Massachusetts Traffic Rules and Regulations approved by the Board of Trustees, no vehicle shall be registered for operation on the campus or other lands of the University unless the person requesting registration has met the motor vehicle liability policy or bond requirements for the operation and use of motor vehicles upon the ways of the Commonwealth or in any place therein to which the public has a right of access. In addition, each registrant must have guest coverage and property damage liability coverage in the amount of at least five thousand dollars.

Failure to register or falsification of registration information (illegal possession or use of a motor vehicle) subjects a student to a fine, denial of future registration, and possible disciplinary action.

Registration of a motor vehicle does not of itself confer any parking privileges. Parking will generally be restricted to specific areas on the periphery of the campus between the hours of 7:00 a.m. and 6:00 p.m., such areas to be desig-

nated in accordance with the local residence or special requirements of the student, and available parking space.

OPERATION OF MOTOR VEHICLES — All students who contemplate the use and possession of motor vehicles while attending the Stockbridge School should familiarize themselves with the provisions of the University of Massachusetts Traffic Rules and Regulations. Copies are available at the University Police Department, and the Office of the Director of the Stockbridge School.

All motor vehicles must be equipped with adequate mufflers.

Motor scooters, or other gasoline powered cycles, may not be operated or parked with 150 feet of any classroom or library building.

Motor vehicles which are used to transport students and their belongings to campus at the beginning of a semester, unless authorized to be registered and retained, must be returned to the home of the student not later than the first weekend after classes begin.

Books and Supplies

For the convenience of students, the University maintains a store service in the Student Union building. Here all textbooks may be purchased at cost plus transportation charges. Students are informed at the first class session in each course what books are required and must secure individual copies according to order list sent in by instructor.

Part-Time Employment

Students desiring financial aid from the University in the form of part-time employment, are required to file applications with the Placement and Financial Aid Services. Applications received prior to May 15 of each year receive first preference for jobs available. Incoming freshmen are not encouraged to work the first semester unless a dire need exists.

These application forms are used to determine the comparative need and qualifications of the applicants. No student is eligible for part-time work unless he or she has filed the required form and has been certified as deserving by the Placement and Financial Aid Services staff. Application forms may be secured at the office of Placement and Financial Aid Services, Machmer Hall.

Required Placement Training

The placement training period between the first and second year usually enables a student to earn from $500 to $1000 depending upon his skill and general ability, and the type of work. This will pay a part of the second year expenses.

Prospective students should understand that the above estimates cover expenses which may be called strictly Stockbridge expenses, and that there are other financial obligations voluntarily assumed by students which they should expect to meet. Total cost for a full academic year runs between $1400 and $1500. Freshmen with only one and one-half semesters in residence require from $1050 to $1200. Estimates for clothing, laundry, entertainment and travel are included in these cost figures.

Loans

BARTLETT LOAN FUND

This fund was established by the F. A. Bartlett Tree Expert Company of Stamford, Connecticut. It is available for short term loans to students majoring in Arboriculture and Park Management. Apply at the Director's Office in Stockbridge Hall.

RESTAURANT AND HOTEL MANAGEMENT LOAN FUND

Money to establish this fund was donated by the University Stewards Club. Restaurant and Hotel Management majors may borrow from it on a short term basis. Apply at the Director's Office in Stockbridge Hall.

STOCKBRIDGE EMERGENCY LOAN FUND

This loan fund has been built up by class gifts over the years — classes of 1951, 1952, 1953, 1955, 1956, 1957, 1958, 1959, and 1961. It provides loans for short periods of time, one week to one month, to any student in an emergency situation. There are no interest charges and application should be made in the office of the Director.

THE VINCENT GOLDTHWAIT LOAN FUND

This fund was established by Dr. Joel E. Goldthwait, U. of M. 1885, of Boston, as a memorial to his son who died in 1922 during his junior year at Harvard. Its purpose is to aid worthy students in financial difficulties. Amounts in excess of $200 are rarely granted and most loans range from $50 to $150.

A regular promissory note must be executed, endorsed by parent or guardian, and repayment may be made within any reasonable period after graduation up to one year. There is no interest charge.

All requests for such aid should be made in person to the Director of Placement and Financial Aid Services who is responsible for the administration of all loans. He will also describe other loan arrangements upon request.

SCHOLARSHIPS — AWARDS — STIPENDS

Prospective senior students should file scholarship applications with the Placement and Financial Aid Services (Machmer Hall) by March 15 of the freshman year. Entering students who wish to apply for a scholarship should write to the Stockbridge Office for directions as to how to apply. The deadline for receiving applications is March 15.

OSCAR G. ANDERSON MEMORIAL FUND
Stipends to worthy students of good character and in need of assistance for the purchase of textbooks necessary for courses in Fruit Growing. Selection of the student is made by the staff in Plant and Soil Science.

ASCENSION FARM SCHOOL SCHOLARSHIPS
Trust funds from the Ascension Farm School Corporation of Great Barrington were given to the University trustees in 1952 the income from which shall be used to provide for the "education and training in agriculture of boys resident in Western Massachusetts," as stated in its original charter. This makes possible the award of scholarships to men students residing in Hampden, Hampshire, Franklin, and Berkshire counties with special consideration to be given applicants from the last named county.

BOSTON MARKET GARDENERS' ASSOCIATION SCHOLARSHIP
An annual scholarship of $100 to be awarded to a deserving student majoring in Fruit and Vegetable Crops.

BOSTON STEWARD'S CLUB SCHOLARSHIPS
Annual scholarships of $250 - $500 are awarded to deserving students majoring in Restaurant and Hotel Management. Students must be recommended by the University Scholarship Committee and approved by the Boston Steward's Club.

LOTTA CRABTREE SCHOLARSHIPS
By special arrangement with the Lotta Crabtree Foundation trustees of Boston, a number of scholarships are available to Stockbridge students.

FARM BUREAU SCHOLARSHIP
The Hampshire County and the Berkshire County Farm Bureaus each offer a $100 scholarship to a Massachusetts farm boy or girl to assist in obtaining a higher education.

THE MARGARET FITZ BARNES SCHOLARSHIP
A $100 scholarship awarded annually to a young man or young woman interested in Landscape Operations who is in need of financial aid and has been accepted or is enrolled in the Stockbridge School of Agriculture.

FLORICULTURE CLUB SCHOLARSHIPS
$100 awards to freshmen or seniors majoring in Floriculture.

FLORISTS' AND GARDENERS' CLUB OF WESTERN MASSACHUSETTS SCHOLARSHIP
An annual scholarship of $100 to be awarded to a senior student (man or woman) in the Stockbridge School who is majoring in Floriculture or Landscape Operations.

GOLF COURSE SUPERINTENDENTS ASSOCIATION OF AMERICA SCHOLARSHIPS
Three $300 scholarships given annually to students majoring in Turf Management.

CHARLES H. HOOD DAIRY FOUNDATION SCHOLARSHIPS
The sum of $834 in support of three full tuition and academic fee scholarships to Animal Science students — two seniors and one freshman.

HOWARD D. JOHNSON COMPANY SCHOLARSHIPS
For students majoring in Restaurant and Hotel Management.

NEW ENGLAND HOTEL-MOTEL AND RESTAURANT EDUCATIONAL FOUNDATION SCHOLARSHIPS
Tuition scholarships available to students majoring in Restaurant and Hotel Management.

NEW YORK FARMERS SCHOLARSHIP
A $250 award to the senior with the highest cumulative average.

V. A. RICE SCHOLARSHIP FUND
A $100 scholarship for a worthy student majoring in Animal Science.

SAGA FUND GRANTS
Tuition grants for students majoring in Restaurant and Hotel Management.

SHERATON CORPORATION OF AMERICA SCHOLARSHIPS
For students majoring in Hotel and Restaurant Management.

STOSO SCHOLARSHIPS
$100 scholarships awarded to outstanding members of the freshman and senior classes.

STOUFFER FOODS CORPORATION SCHOLARSHIPS
For students majoring in Restaurant and Hotel Management.

WILBUR H. H. WARD SCHOLARSHIPS
The Wilbur H. H. Ward Fund is administered by a board of trustees independent of the University. Applicants for these scholarships should write to Mrs. Marian R. Erush, Stockbridge Hall, University of Massachusetts, Amherst, Mass. Only Hampshire County residents are eligible.

STUDENT ACTIVITIES

Student Union Building
The Student Union is available to all students for recreational purposes. Among other things it includes a large ballroom for dinners and movies, the University Store, offices for student activities, meeting rooms, lounges, and dining rooms.

Stoso
STOSO is the Stockbridge Service Organization designed to aid the Stockbridge School of Agriculture in any administrative or social events whereupon help is requested. The ultimate objective of this organization is to better the relations between the Stockbridge School and the four-year students of the University of Massachusetts.

Senate
In the Senate each major, club, and organization is represented, enabling each student to have a voice in the school's student government. All of its activities are coordinated through committees.

Its functions are many and varied, but are always directed toward improving the academic and social affairs of the students. Professor Tuttle serves as advisor.

Shorthorn
The *Shorthorn* is the recognized Stockbridge School newspaper. It was first published in 1961 and has since been published weekly and is mailed to faculty members and distributed among the students.

Stosag
Stosag is the Stockbridge yearbook. It is written and edited by a volunteer staff with Dr. Goddard serving as advisor.

Judiciary
Here is an annually student-elected committee comprised of six students (three freshmen and three seniors) who act for the student body under the University of Massachusetts Handbook rules and regulations. The Judiciary recommends to the Director.

Fraternity
There is one social fraternity, Alpha Tau Gamma, with membership limited to Stockbridge students. Dr. Michelson serves as faculty advisor.

Progress Banquet

A Progress Banquet is held once a year, usually in March at which time scholastic and athletic awards are announced.

Bowditch Speaking Contest

Seniors in the Stockbridge School are entitled to compete in the annual Nathaniel A. Bowditch Speaking Contest which is held in March. Cash prizes of $25, $15, and $10, are provided by the Massachusetts Society for the Promotion of Agriculture.

Animal Husbandry Club

The Animal Husbandry Club is an organization whose main purpose is to promote, improve, and increase the interest of students in the field of Animal Science. The Club is composed of Stockbridge and University students and is open to active membership to all students who are interested in Animal Science.

Arboriculture and Park Management Club

The Arboriculture Club was formed in 1946 with the purpose of helping the senior and freshman classes to become better acquainted. It also affords an opportunity for the students in this course to keep abreast of developments in the field by including guest speakers in the monthly programs. The guest speakers usually represent professionals in all phases of Arboriculture and related fields.

Dairy Technology Club

The Dairy Technology Club meets the first and third Wednesday of each month. It is composed of Dairy Technology and Animal Science majors from the Stockbridge School and the University.

Floriculture Club

The Floriculture Club is a student organization designed for the social enjoyment and educational advancement of its members and is open to both two and four-year students of the University. Members for the most part have interests in Commercial Floriculture. Programs are directed toward a deeper understanding of this field and acquiring practice and dexterity in certain fundamental techniques that are a definite necessity to today's horticultural businessman, either florist or landscaper. These techniques are developed through active participation in activities such as the production and sale of corsages for various school functions. These activities add to a member's knowledge of general management, including waste elimination, profits, markups and production.

Food Distribution Club

The Food Distribution Club was formed to help the members gain knowledge of the phases of food distribution through the participation in field trips, the use of guest speakers or other available means. The Club also helps to establish contacts in the food industry to aid in securing jobs after graduation.

Forestry Club

The Forestry Club of the University of Massachusetts has four basic objectives: first, to integrate studies with social activities; second, to promote interest in forestry through public appreciation, awareness, and recognition of the forestry profession; third, to promote good student-faculty relationships, and finally, to coordinate efforts of forestry students at this institution.

Membership is open to currently enrolled undergraduate, graduate, or special students at the University of Massachusetts, students in the Stockbridge School of Agriculture and members of the University staff.

Future Farmers of America

The Stimson-Heald Collegiate F.F.A. Chapter is an associate chapter of the organization at the University of Massachusetts which is chartered by the Massachusetts Association of Future Farmers.

Horticulture Club

The Horticulture Club consists of Stockbridge and University students, primarily students majoring in Olericulture and Pomology; but membership is not limited to these majors. The Horticulture Club is based upon and operates in the best interests of its members, and increasing interests in the various phases of fruit and vegetable growing with emphasis upon modern scientific agricultural methods.

University of Massachusetts Innkeepers Club

Open to class members who have paid their dues at the beginning of each semester and the Club consists of both University and Stockbridge students. Meetings are usually held twice a month at the Student Union.

Landscape Operations Club

The Landscape Operations Club serves those students majoring in Landscape Operations and those interested in landscaping and ornamental horticulture. Regular meetings are held at which topics of interest are discussed. Outside speakers from nurseries, chemical companies, etc., supplement the factual information of courses with their practical experiences.

Poultry Science Club

The Poultry Science Club is an organization designed to give interested students more practical knowledge of the poultry industry and to provide them with the opportunity of meeting informally with members of the department staff.

Turf Management Club

At the present time the Turf Management Club, at the Stockbridge School of Agriculture, consists of two-year turf majors. Originally the Club was organized in 1957 by Henry J. Homan from New London, New Hampshire, a senior of the two-year school. Mr. Homan was also the first editor of *Turf Clippings,* an annual turf magazine in which articles of interest in turf were written by members of the School.

The object of the Turf Management Club is to promote a better understanding of the fundamentals of Agrostology, to recognize the position of the golf course superintendent, and to form a bond of interest between the freshmen and seniors of the two-year school, the alumni of the Stockbridge Turf major, and the Winter School.

Judging Teams

All Stockbridge students are eligible to compete for places on various judging teams which compete with other two-year schools in the New England and New York area. The contest is usually held in April and includes teams in poultry, dairy products, livestock and dairy cattle.

Scholastic Society

A Stockbridge Honorary Scholastic Society called "LEAR" was established in 1935 to encourage high scholarship. Students whose record for the first three semesters is 3.4 quality points or better, are elected to membership in the society each March. Engraved certificates are awarded to members of the graduating class who have achieved this distinction.

Athletics and Physical Education

The School has its own separate athletic program with regular schedules in soccer, basketball, hockey, and riflery. The official insignia is the letter S for soccer, basketball and hockey, and the letter S with crossed rifles for riflery.

The soccer, basketball, and hockey teams play mostly with preparatory school teams in the area. The rifle team engages in postal matches with collegiate teams throughout the country, and in shoulder-to-shoulder matches with college freshman teams in the New England area.

All freshmen are required to take Physical Education three hours each week. The passing of Physical Education is a requirement for graduation. Men are required to pay a $5.00 Physical Education fee. Women do not pay a fee but must purchase a gymnasium suit at a cost of $7.50.

STUDENT RELATIONS

The customary high standards of honor, self-respect, and consideration for the rights of others constitute the standards of student deportment.

Any student known to be guilty of dishonest conduct or persistent violation of rules must be reported by the instructor to the director.

The privileges of the Stockbridge School may be withdrawn from any student at any time if such action is deemed advisable.

It should be understood that the Stockbridge School, acting through its director or any administrative officer designated by him, distinctly reserves the right not only to suspend or dismiss students, but also to name conditions under which students may remain in the institution.

Similarly, also, it applies to participation in student activities. Though this will ordinarily be governed by the rules as already laid down, yet if in the judgment of Stockbridge authorities a student is neglecting his work on account of these activities, the privilege of participating in them may be withdrawn for such time as is considered necessary. Moreover, it may be withdrawn as a punishment for misconduct.

SERVICES TO STUDENTS

HEALTH SERVICE

Medical care is provided through the University Health Services. The center of activities is the modern and well-equipped Infirmary where there are facilities for complete out-patient care, available during regular hours daily. Included are services of a staff of physicians, nurses, technologists, and counselors, who are prepared to furnish necessary care at any time. Services are augmented by modern X-ray, laboratory, and physiotherapy facilities.

In addition, the Infirmary contains 80 beds, with modern equipment for the care of bed patients.

All students are assessed a student health fee which currently has been set at $20.00 per semester. In return for this fee, each student is entitled to receive:

(A) Unlimited out-patient visits during usual hours of the Out-patient Department.

(B) Emergency care whenever indicated. Dormitory calls are discouraged. It is felt that only in very few situations is it not advisable for a student to be brought to the Infirmary where much more adequate care is available.

(C) Unlimited service within the capacity of the Health Services staff whenever rendered on the campus; no additional charge is made for any such service. In the case of serious emotional illness, the services of the mental hygienist may have to be limited in consideration of the needs of other students.

(D) Medication is provided from the Infirmary supplies. It is intended that a charge will be made only for basic medications which students have been taking prior to entrance (insulin, etc.), those unusually expensive medications taken for long periods (steroids, etc.), and those ordered specifically for an individual student (allergy materials, etc.).

(E) X-ray and laboratory examinations are available at the Infirmary as ordered by the staff physicians.

(F) Unlimited bed-patient care in the Infirmary as long as registered as a student, when such care is directed by the staff physician.

A supplementary insurance program is available at an unusually favorable rate. This will provide for major surgical care, medical or surgical hospital and

physician's care when not in Amherst, out-patient x-ray service not available through the Infirmary, and ambulance service. All students will be billed for this insurance and all are urged to accept it without requesting waiver.

It is the aim of the Health Services to promote optimum health throughout the University and to minimize for each student the possibility of loss of time for reasons of health. In addition to providing medical care, the Health Services attend to all matters of health and safety of the University Community. Many of its activities are basically preventive in nature. In this connection it is urged that all students avail themselves of the help of the Health Services Staff as soon as even a minor need is evident. Many major disabilities are prevented by timely attention to apparently minor ailments.

GOODELL LIBRARY

The Goodell Library forms the central unit of the University Library and contains the largest portion of the book collections of the University, which now exceed 350,000 books and periodicals. A central card catalog lists all books to be found in the University. The agricultural and scientific collections are especially strong in the literature of entomology, botany, chemistry, horticulture, land architecture, soil science and animal husbandry. In addition there are extensive collections in literature, history, economics and sociology. There are over 3000 current periodical titles (popular, literary, and scientific) subscribed to by the Library. The publications of the several state agricultural experiment stations are well represented in the collections. The Library is also a depository for a large portion of the publications of the United States Government, including Department of Agriculture publications.

The Library hours during regular term time are Mondays through Fridays, 8:00 A.M. to 10:00 P.M.; Saturdays, 8:00 A.M. to 5:00 P.M.; and Sundays and holidays, 2:00 P.M. to 10:00 P.M. Additional service is provided at the Reserve Desk until 12:00 midnight, Sundays through Thursdays.

Goodell Library is named in memory of Henry Hill Goodell, President of the University from 1886 to 1904 and Librarian from 1886 to 1889.

An addition to the library has been completed recently and provides large reading areas to seat about 1,000 students. The book stack has space for 460,000 volumes in addition to the 200,000 volume capacity of the older Goodell building. The reference collection and circulation desk of the University Library are now housed on the 5th level of the new addition. A special microfilm reading area and rooms for special collections are also provided.

OPPORTUNITIES FOR WOMEN

Approximately three to five percent of the Stockbridge students are women — for the most part majoring in Animal Science, Floriculture and Restaurant and Hotel Management. Graduates with strong determination and a liking for their vocation have made successful careers. Others, even though they have not made a career in the field of their major, have developed a lasting interest or hobby in something they both like and understand.

EMPLOYMENT AFTER GRADUATION

The Stockbridge School does not guarantee employment following graduation to students registered in any of its courses, but through the Placement and Financial Aid Services and through departmental sources it has an opportunity to recommend students for a large number of positions. A record is kept of each student's work and experience and of his success in positions for which he has been recommended after he has finished his course. Opportunities for trained men and women, especially those who have had experience are good.

A student desiring a recommendation from the University must meet the following conditions: —

(1) He must be of good character.
(2) His previous record must be good.
(3) His work in all courses must be satisfactory.

Students who have not previously had a considerable amount of practical experience cannot, as a rule, be recommended for positions of responsibility. This is especially true of the better positions for which managers or superintendents are wanted.

SUMMER PLACEMENT

The Director in cooperation with the various departments is in charge of arranging summer placement jobs for all freshmen. It cannot be guaranteed that every student will be placed but in normal times jobs are found for all.

Positions are secured that will enable the student to gain practical experience in his particular field. Wage rates vary in different localities but the student may expect to earn a reasonable amount. However, the purpose of the placement job is to gain experience rather than to expect a high monetary return.

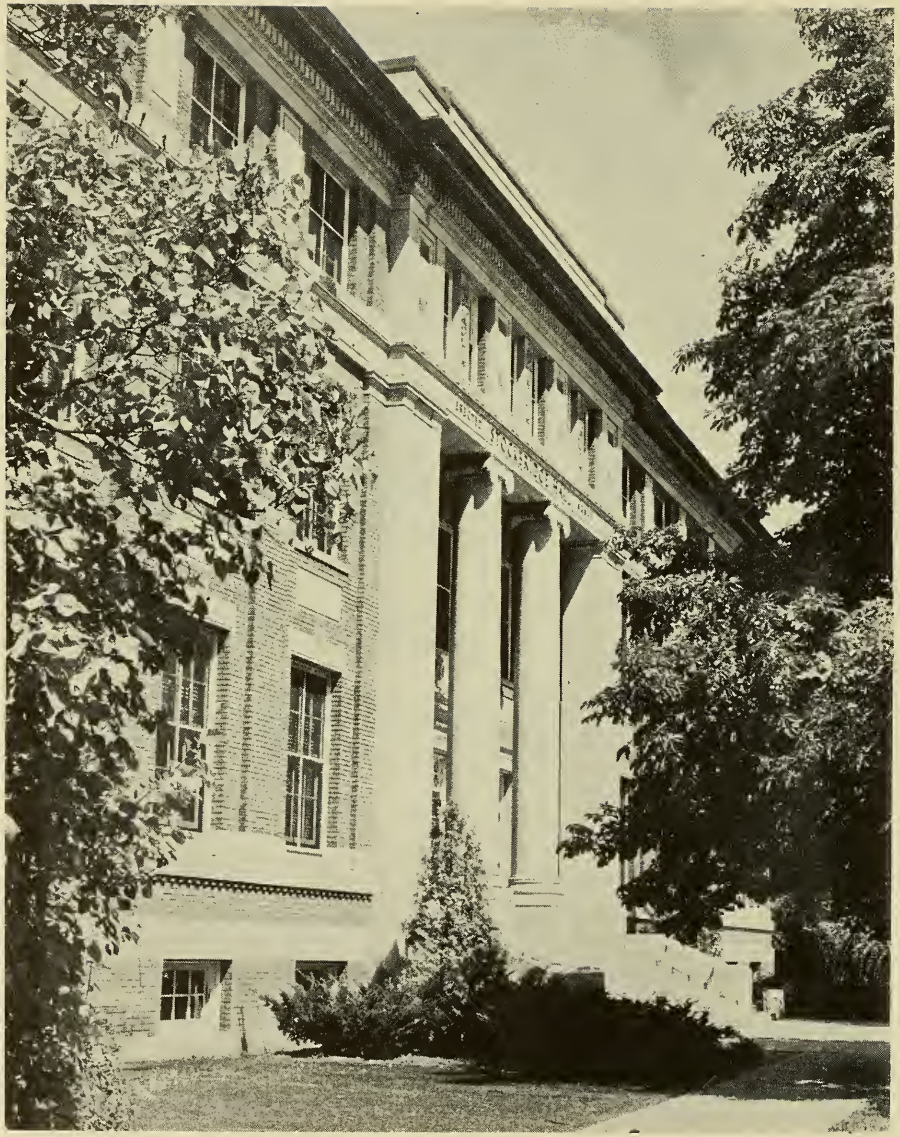
It is urged that all freshmen arrange an interview with the Director prior to the Christmas vacation so that his qualifications and the type of work he wishes to do may be determined. No final arrangements for placement training may be made prior to consulting with the Director.

Students are required to complete the training period without unnecessary absences. No job transfers are to be made without the permission of the Director nor may a position be given up until the Director has been notified.

A monthly report must be furnished on the form supplied and submitted not later than the fifth of each month. Students must complete in a satisfactory manner all reports as required by the various departments and those failing to complete all placement requirements are not permitted to take the work of the second year.

RELIGIOUS ACTIVITIES

Nearby churches welcome student attendance at Sunday services. Chaplains representing the major faiths — Catholic, Jewish, and Protestant — have offices on campus. A large and attractive Newman Center was built in the area of the main entrance to the campus in 1963.



DESCRIPTION OF COURSES

AGRICULTURAL AND FOOD ECONOMICS

Acting Head of Department: Professor Ellsworth W. Bell.

Professor Leed, Associate Professor Fitzpatrick, Associate Professor Rhoades, Assistant Professor Bragg, Assistant Professor Callahan, Assistant Professor Lee, Assistant Professor Marion, Assistant Professor Spindler.

AGRICULTURAL BUSINESS MANAGEMENT AND FOOD DISTRIBUTION
There is a growing demand for well-trained people to fill managerial positions in all types of businesses oriented to the agricultural and food industries. The Department of Agricultural and Food Economics offers two options for students interested in obtaining the basic training leading to such positions. These options are Agricultural Business Management and Food Distribution. In each option, the student combines course work in economics and business management with specialized and technical training in the food or agricultural sciences. First semester courses are the same for both options, and students of either option are allowed to transfer to the other, any time previous to the third semester.

ENTRANCE QUALIFICATIONS
Applicants should have good records in English, General Sciences and Mathematics.

ENROLLMENT LIMITATION
Enrollment is limited, the accepted students being selected on the basis of scholastic preparation, initiative and intelligence. Experience in the field of specialization is also valuable.

FOOD DISTRIBUTION CLUB
This is a student organization which carries on a program of professional and social activities. It also provides a means for acquainting students with prospective employers who participate in club activities.

TRANSFER TO THE UNIVERSITY
The Department also offers a four-year program in Food Distribution. Stockbridge students who maintain a B average or better may apply for transfer. Passing of suitable examinations and the offering of a background of high school

courses required for University admission are also required. (See Optional Courses).

Agricultural Business Management

A two-year program in Agricultural Business Management leads to management opportunities in agriculturally oriented companies. Courses are designed to develop conceptual skills in such business management disciplines as communication, decision-making, profit accountability, human relations, marketing and production. Elective courses provide an opportunity to gain technical knowledge of agricultural products and production.

EMPLOYMENT OPPORTUNITIES

Graduates of this program, depending upon their choice of electives, would find employment opportunities leading to management positions with agricultural business firms such as: Feed, Seed, Fertilizer, Chemical and Farm Supply Manufacturers and Distributors; Credit Firms; Farm Machinery Dealers; and Processors and Distributors of Agricultural Products such as Fruit, Vegetable, Dairy, Poultry, Livestock and Nursery Products.

AGRICULTURAL BUSINESS MANAGEMENT

FIRST YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
A&F Economics S-3 (Accounting Principles)	4
Bacteriology S-1 (Bacteriology and Community Hygiene)	3
English S-3 (Report Writing)	2
Psychology S-4 (Applied General Psychology)	3
Physical Education S-1 (a,b)	-

Second Semester	
(Fifteen Weeks Resident Instruction followed by Three Months Placement Training)	*Crs.*
A&F Economics S-2 (World's Food Supply)	2
A&F Economics S-12 (Marketing Management and Salesmanship)	3
OR	
A&F Economics S-22 (Dairy Marketing)	3
Mathematics S-4 (Elementary College Algebra)	3
Speech S-2	2
Physical Education S-2 (a,b)	-
Electives	6

AGRICULTURAL BUSINESS MANAGEMENT

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
A&F Economics S-19 (Marketing Economics)	3
R&H Management S-13 (Personnel Management)	3
Electives	6-9

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-10 (Business Law)	3
A&F Economics S-14 (Business Resources and Operation Seminar)	3
English S-4 (English Composition)	3
Electives	7-9

To obtain technical training in the food and agricultural sciences, students may elect up to 24 credit hours from the courses offered by the various departments in the College of Agriculture. These courses may be selected by the student, with consent of his advisor, from one or more departments according to the student's interests and needs. By careful selection of elective courses, the student may acquire intensive training in one technical field or a more general training in several fields.

Food Distribution

Continual increases in the size and complexity of food distribution firms creates increasing demands for well trained management personnel. The Food Distribution curriculum is designed to provide students with a background appropriate for such positions, based upon training in the food sciences and business management. Specialized courses in merchandising, operations and management make application of technical knowledge to the particular problem of operating a retail food store. Much of the subject matter in these specialized courses, is based upon the results of tests and studies made by the University of Massachusetts, in cooperation with food wholesalers and retailers throughout New England. Many outstanding leaders from the food industry in New England and the Northeast are heard as guest lecturers, and several field trips are taken to visit food distribution facilities.

EMPLOYMENT OPPORTUNITIES

The program is primarily intended to provide the retail food industry with store-level personnel who will make competent department and store managers with a minimum of work experience, and who may ultimately, attain middle and top

management positions. Some graduates may elect to work toward such specialized areas as personnel, advertising, labor relations, training, etc. The training received is also basic to positions with businesses in other phases of food distribution that require a thorough understanding of food retailing, including work with food wholesalers, food brokers, food manufacturers, equipment suppliers, and in government positions with inspection and regulatory agencies.

FOOD DISTRIBUTION

FIRST YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
A&F Economics S-3 (Accounting Principles)	4
Bacteriology S-1 (Bacteriology and Community Hygiene)	3
English S-3 (Report Writing)	2
Psychology S-4 (Applied General Psychology)	3
Physical Education S-1 (a,b)	-

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-2 (World's Food Supply)	2
A&F Economics S-8 (Accounting Principles)	4
A&F Economics S-12 (Marketing Management and Salesmanship)	3
English S-4 (English Composition)	3
Speech S-2	2
Physical Education S-2 (a,b)	-
2/ 1/ Elective (one)	3

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
A&F Economics S-17 (Food Marketing Economics)	3
A&F Economics S-19 (Marketing Economics and Research)	3
Food Science and Technology S-1 (Dairy and Poultry Products)	3

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-18 (Food Store Management)	3
A&F Economics S-20 (Food Distribution Problems)	2
Food Science and Technology S-2 (Fundamentals of Food Preservation)	3
Food Science and Technology S-8	

Mathematics S-4 (Elementary College Algebra)	3	(Meats and Meat Products)	3
R&H Management S-13 (Personnel Management)	3	1/ 2/ Elective (one)	3

1/ Agricultural Engineering S-14 (Food Packaging and Handling) (Offered in even numbered years.)

2/ P&S Science S-32 (Produce Merchandising) (Offered in odd numbered years.)

AGRICULTURAL AND FOOD ECONOMICS S-1. (PRINCIPLES OF ECONOMICS) I. AND II.
A study of basic economic principles applied to the business firm, farm, household and the market.
3 class hours. *Credit, 3.* Mr. Callahan, Mr. Fitzpatrick.

AGRICULTURAL AND FOOD ECONOMICS S-2. (WORLD'S FOOD SUPPLY) II.
Economic geography of world's food supply with special emphasis on Africa, South East Asia, Soviet Union and North America.
2 class hours. *Credit, 2.* Mr. Jeffrey.

AGRICULTURAL AND FOOD ECONOMICS S-3. (ACCOUNTING PRINCIPLES) I. and II.
Deals with systematic recording, classifying, analyzing and interpreting business transactions. Emphasis is on comprehension of available financial data and potential use in management decisions.
3 class hours and 1 2-hour laboratory period. *Credit, 4.* Mr. Spindler.

AGRICULTURAL AND FOOD ECONOMICS S-4. (ELEMENTS OF BOOKKEEPING) II.
An eight week course for Turf freshmen designed to acquaint the student with fundamentals of the double-entry system of bookkeeping.
3 class hours and 2 2-hour laboratory periods. *Credit, 3.* Mr. Callahan.

AGRICULTURAL AND FOOD ECONOMICS S-8. (ACCOUNTING PRINCIPLES) II.
Topics studied include payrolls, taxes, partnerships, corporations, cost systems, budgeting and statement analysis. Stressed are principles, disciplined logic, and broader business knowledge to improve management decisions. (Student cost for a field trip may approximate $5.00.)
3 class hours and 1 2-hour laboratory period. *Credit, 4.* Mr. Spindler.

AGRICULTURAL AND FOOD ECONOMICS S-10. (BUSINESS LAW) II.
This course will cover contracts, sales, property law, and the uniform commercial code. Case Examples are used to illustrate principles involved.
3 class hours. *Credit, 3.* Mr. Rhoades.

AGRICULTURAL AND FOOD ECONOMICS S-12. (MARKETING MANAGEMENT AND SALESMANSHIP) II.
A management oriented analysis of marketing functions performed by agricultural business firms. Emphasizes development of a background for problem solving and decision-making by marketing managers.
2 class hours and 1 2-hour discussion period. *Credit, 3.* Mr. Marion.

AGRICULTURAL AND FOOD ECONOMICS S-13. (BUSINESS MANAGEMENT) I. and II.
Course content emphasizes the relationship of economics to business ownership, organization and operation in the United States.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Bragg, Mr. Callahan.

AGRICULTURAL AND FOOD ECONOMICS S-14. (BUSINESS RESOURCES AND OPERATIONS SEMINAR) II.
Using basic skills such as communications, accounting, marketing and human relations that were learned in other courses, the student will gain experience in problem solving and decision-making within the restraints imposed by the firm's resources and environment. Cases and problems are used.
3 class hours. *Credit, 3.* Mr. Bragg.

AGRICULTURAL AND FOOD ECONOMICS S-15. (FARM BUSINESS MANAGEMENT) I.
Economic principles, management tools, and analysis methods are applied to practical business management problems of dairy, poultry, and other livestock farms.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Lee.

AGRICULTURAL AND FOOD ECONOMICS S-16. (AGRICULTURAL BUSINESS MANAGEMENT) II.
Economic principles, management tools, and analysis methods are applied to practical business management problems of firms producing agricultural products.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Lee.

AGRICULTURAL AND FOOD ECONOMICS S-17. (FOOD MARKETING ECONOMICS) I.
Principles and concepts of retail food store merchandising. Includes analysis of factors affecting consumer purchasing: store layout and design, product location, space allocation, and inventory control, pricing, margins, promotion, etc. (One field trip is required at an approximate cost of $5.00 per student).
2 class hours and 1 2-hour discussion period. *Credit, 3.* Mr. Marion.

AGRICULTURAL AND FOOD ECONOMICS S-18. (FOOD STORE MANAGEMENT) II.
Principles of retail food store operation and management for maximum efficiency

and productivity of: capital, facilities, equipment and personnel. Budgeting, analysis of operating data, establishing policies and standards, employee training, etc. (One field trip is required at an approximate cost of $5.00 per student).
2 class hours and 1 2-hour discussion period. *Credit, 3.* Mr. Marion.

AGRICULTURAL AND FOOD ECONOMICS S-19. (MARKETING ECONOMICS AND RESEARCH) I.
Basic principles of marketing and marketing facilities with particular application to food products. Elements of marketing research are considered, emphasizing consumer research and evaluation of consumer acceptance.
3 class hours. *Credit, 3.* Mr. Fitzpatrick.

AGRICULTURAL AND FOOD ECONOMICS S-20. (FOOD DISTRIBUTION PROBLEMS) II.
Discussions by guest lecturers from the food industry on management problems. Papers are assigned on important problems in food distribution.
3 class hours. *Credit, 2.* Mr. Marion, Mr. Leed.

AGRICULTURAL AND FOOD ECONOMICS S-22. (DAIRY MARKETING) II.
Basic principles of marketing management are applied to the distribution of dairy products. The influence of class pricing, state and federal regulations and the market structure on the firm are studied. (One field trip is required at an approximate cost of $5.00 per student).
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Bragg.

OPTIONAL COURSES
Special sections of English and Mathematics will be arranged for students who wish additional course work in these fields. They are designed to prepare students for transfer to four-year programs but are not limited to this use.

ANIMAL SCIENCE

Head of Department: Professor Thomas W. Fox. Professor W. G. Black, Professor Foley, Professor Smith, Professor Smyth, Assistant Professor Borton, Assistant Professor Lyford, Mr. Denison.

A major program of study in the Department of Veterinary and Animal Sciences. Animal Science in the Stockbridge School includes Beef Cattle, Dairy Cattle, Laboratory Animals, Light Horses, Poultry, Sheep and Swine. Students may elect the Laboratory Animal Management Option in their senior year.

OBJECTIVES

The curriculum in Animal Science is designed to prepare students for careers in the broad field of the animal, dairy and poultry sciences: (1) by providing the students with an understanding of the fundamental biological and biochemical

principles involved in the development of more efficient animals and birds, and more acceptable and useful animal products; (2) by presenting an opportunity in the various laboratories to apply those principles in selecting, breeding, feeding and managing the different classes of livestock, poultry and laboratory animals; (3) by supplementing the major course offerings with supporting courses in Agricultural and Food Economics, Agricultural Engineering, Plant and Soil Science, Entomology, Food Science and Technology, Mathematics, Microbiology and Veterinary Science; (4) by improving communication skills through courses in English and Speech.

THE U. M. FARMS, LIVESTOCK AND POULTRY FACILITIES

The University farms include land and buildings on the west side of the campus supporting four breeds of dairy cattle, two breeds of beef cattle, two breeds of sheep, Morgan horses and crossbred meat-type hogs. This livestock will eventually be transferred to a new farm being developed at South Deerfield approximately 7 miles north of the campus. The new Poultry Research and Teaching Center at the Tillson Farm on the east side of the campus scheduled for completion in 1966 will maintain a flock of 1,500 adult chickens plus turkeys, ducks, geese and quail.

These new facilities at Tillson and South Deerfield plus classrooms and laboratories on the main campus will provide the department and the students with the most modern equipment for all aspects of laboratory work.

CAREER OPPORTUNITIES

Since World War II the demand for graduates of the Department of Veterinary and Animal Sciences has exceeded the supply by a substantial margin in all areas. The demand continues strong for foremen, herdsmen and managers of dairy, livestock and poultry production enterprises as well as for technicians in artificial breeding units, dairy herd improvement associations and animal research laboratories.

In businesses allied to agriculture there is a steady demand for fieldmen with breed associations, farm cooperatives and farm credit associations. The drug, farm machinery, feed and fertilizer industries recruit annually on campus for sales and service representatives, as do some of the livestock, milk, poultry and egg marketing organizations.

Stockbridge students with superior academic records and satisfactory test scores are encouraged by the Department to go on for a B.S. degree by transferring to the University of Massachusetts, or to some other college or university.

ANIMAL SCIENCE

FIRST YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
Animal Science S-1 (Introductory Animal Science)	3
Dairy Technology S-1 (General Dairying)	3
Mathematics S-1 (General Course)	2
OR	
Mathematics S-4 (Elementary College Algebra)	3
P&S Science S-33 (Soil Management)	3
Practical Science S-7 (Primarily Chemistry)	3
Physical Education S-1 (a,b)	-

Second Semester (Fifteen Weeks Resident Instruction followed by Three Months Placement Training)	*Crs.*
Agricultural Engineering S-7 (Structures and Utilities)	3
Animal Science S-2 (Principles of Livestock Feeding)	3
Animal Science S-8 (Animal Biology)	3
Animal Science S-10 (Poultry Management)	3
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
Entomology S-12 (Livestock and Forage Crop Insects)	2
Physical Education S-2 (a,b)	-

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-15 (Farm Management)	3
Animal Science S-3 (Animal Breeding)	3
Animal Science S-7 (Marketing Animal Products)	3
Food Science and Technology S-5 (Animal and Poultry Products)	3
Veterinary Science S-1 (Animal Diseases)	3
Electives: (May elect one)	

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
Animal Science S-4 (Livestock Production)	3
Animal Science S-6 (Dairy Cattle Management)	3
P&S Science S-36 (Field Crops)	3
Speech S-2	2
Elective (one required)	
Electives: (Elect one)	
Agricultural Engineering S-9 (Drainage and Irrigation)	3
A&F Economics S-10 (Business Law)	3

A&F Economics S-3 (Accounting Principles)	4
Agricultural Engineering S-3 (Machinery)	3
Bacteriology S-1 (Bacteriology and Community Hygiene)	3
Animal Science S-12 (Special Problems in Poultry)	3

LABORATORY ANIMAL MANAGEMENT

Students electing the Laboratory Animal Management option will take the same courses as the Animal Science majors during the first year. However, they will be given an intensive course of instruction for junior animal technicians sponsored by the New England branch of the Animal Care Panel before going out on placement training.

SENIOR YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-3 (Accounting Principles)	4
Animal Science S-3 (Animal Breeding)	3
Animal Science S-11 (Laboratory Animal Management)	3
Bacteriology S-3 (Food Sanitation)	3
Veterinary Science S-1 (Animal Diseases)	3
Electives: (May elect one)	
Animal Science S-7 (Marketing Animal Products)	3
Food Science and Technology S-5 (Animal and Poultry Products)	3

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-10 (Business Law)	3
Animal Science S-4 (Livestock Production)	3
Animal Science S-6 (Dairy Cattle Management)	3
Animal Science S-13 (Laboratory Animal Management-continued)	3
Speech S-2	2
Electives: (Elect one)	
Agricultural Engineering S-13 (Refrigeration, Heating and Air Conditioning)	3
English S-3 (Report Writing)	2

ANIMAL SCIENCE S-1. (INTRODUCTORY ANIMAL SCIENCE) I.

An introduction to the broad field of animal agriculture, its role in the national economy and in international relations. The course will emphasize the application of the animal sciences in the production of more efficient animals and more acceptable animal products.

2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Foley.

ANIMAL SCIENCE S-2. (PRINCIPLES OF LIVESTOCK FEEDING) II.
The application of the fundamental principles of animal nutrition to the feeding and management of the various classes of livestock including poultry. A modern feed manufacturing plant will be visited.
3 class hours. *Credit, 3.* Mr. Lyford.

ANIMAL SCIENCE S-3. (ANIMAL BREEDING) I.
An examination of the theoretical and practical aspects of breeding better livestock including physiology of reproduction and the genetic principles governing selection. A one-day field trip is required (approximate cost $5.00).
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Borton.

ANIMAL SCIENCE S-4. (LIVESTOCK PRODUCTION) II.
Beef, sheep, swine and horse production in the United States with emphasis on those systems of livestock management particularly adapted to New England conditions. Four students will be selected to compete in the Northeastern Agricultural Schools Judging Contest. A one-day field trip is required (approximate cost $5.00).
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Borton.

ANIMAL SCIENCE S-6. (DAIRY CATTLE MANAGEMENT) II.
An analysis of current practices and problems in dairy herd management with emphasis on those most directly related to profitable dairy farming. A one-day field trip is required (approximate cost $5.00).
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Foley.

ANIMAL SCIENCE S-7. (MARKETING ANIMAL PRODUCTS) I.
A survey of market requirements, marketing methods and price interrelationships of animal, dairy and poultry products.
3 class hours. *Credit, 3.* Mr. Denison.

ANIMAL SCIENCE S-8. (ANIMAL BIOLOGY) II.
Principles of animal biology with emphasis on the cell and its metabolism, and the comparative anatomy and physiology of those mammals and birds of interest to animal science majors.
3 class hours. *Credit, 3.* Mr. Black

ANIMAL SCIENCE S-10. (POULTRY MANAGEMENT) II.
A survey of the importance of the poultry industry and its relationship to other animal and food industries. Current practices and management systems in the production of eggs and poultry meat will be studied.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Denison.

ANIMAL SCIENCE S-11. (LABORATORY ANIMAL MANAGEMENT) I.
Management of animal colonies in the research laboratory. The course will include animal identification, record keeping, animal handling and sanitation, special feeding and breeding systems.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* The Department.

ANIMAL SCIENCE S-12. (SPECIAL PROBLEMS IN POULTRY) II.
An intensive analysis of current problems in the poultry industry in the United States. Students will select a problem of special interest and present a suggested solution. A two-day field trip is required (approximate cost $15.00).
3 class hours. *Credit, 3.* Mr. Denison.

ANIMAL SCIENCE S-13. (LABORATORY ANIMAL MANAGEMENT CONTINUED) II.
Methods for handling animals for nutritional, pharmaceutical and physiological experiments. Preparation of animals for operative procedures including post-operative care.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* The Department.

VETERINARY SCIENCE S-1. (ANIMAL DISEASES) I.
Conservation of the health of animals is the keystone of successful animal production. This course acquaints students with the causes, development, control, eradication, and prevention of diseases of economic importance to the livestock and poultry industries.
3 class hours. *Credit, 3.* Mr. Smith.

ARBORICULTURE AND PARK MANAGEMENT

Head of Department: Professor Ervin H. Zube. Professor King, Mr. Whitney.

This program permits a student to enter into two closely related and expanding professions.

ARBORICULTURE

Arboriculture, the care of shade and ornamental trees, is becoming more important in Massachusetts as the citizens realize the necessity of trees in every day life. It includes tree planting; large tree moving; diagnosis and treatment of tree disease, defects, and mechanical injuries; identification and control of tree insect pests; fertilizing; pruning and repair of storm or otherwise damaged trees; and removal of dead or undesirable trees.

This growing appreciation of the value of trees has led to the development of organizations to supply tree maintenance service. These firms desire trained men. All Massachusetts towns are required to elect tree wardens. At present there are over three thousand men actively engaged in municipal and private tree care in Massachusetts and the future is almost unlimited on a state basis. Nationally, over 800 million dollars is spent annually on shade and ornamental trees to supply these needs.

The University offered the first course in the country on shade tree care in 1895, and now offers one of the few complete two-year courses in arboriculture in

the United States. Annually in March, a Conference of one week's duration for tree wardens, arborists and utility men is held on the campus. The programs of the conferences are of interest to students in this course.

The University campus of 700 acres has a wide variety of trees of all ages with which the student becomes acquainted, and serves as a laboratory for problems similar to those one will have to meet in practice. The research laboratory in shade tree diseases for the state is also located on the campus.

The Massachusetts Arborists Association and the Massachusetts Tree Wardens and Foresters Association have approved this course as a basic training program.

PARK MANAGEMENT

The student will be prepared for various aspects of park management, general forest management, and other phases of land use. Park formation and expansion to meet public needs is a growing field and there is need for trained men. Many phases of Park Management and Arboriculture are not only related but interchangeable.

GENERAL

All freshman students must attend an orientation course, Arboriculture S-0, for one week prior to the starting of school. Eight hours a day will be devoted to this.

Field trips will be required during the two years at an estimated cost of $40.00. A placement training period is required between the freshman and senior years.

JOB OPPORTUNITIES

Operators, foremen and salesmen for arboriculture firms, utility line clearance foremen, deputy tree wardens or tree wardens in towns and cities, tree care in estates, parks, state highways, turnpike authorities, college campuses or grounds of public institutions, or developing one's own service organization for the practice of arboriculture.

The phase of land use known as Park Administration and Management offers numerous opportunities with municipal, county, state, and national groups dealing with parks. Many town and city governments are combining Park and Tree Departments where personnel are needed who have an understanding of Arboriculture and Park Management.

An accident insurance policy will be required of all prospective students. Such a policy will be available at the University at time of registration.

ARBORICULTURE AND PARK MANAGEMENT

FIRST YEAR

Arboriculture S-O (Orientation — Field Training). One week prior to school opening. *No credit.*

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
Arboriculture and Park Management S-1 (Principles and Practices)	4
Landscape Operations S-1 (Tree Identification)	4
P&S Science S-21 (Introductory Botany)	3
P&S Science S-35 (Soil Management and Plant Nutrients)	3
P&S Science S-41 (Basic Factors, Construction and Maintenance of Fine Turf Areas)	3
Speech S-1	2
Physical Education S-1 (a,b)	-

Second Semester	
(Eight Weeks Resident Instruction followed by Five Months Placement Training)	*Crs.*
Agricultural Engineering S-1 (Power Units)	2
Arboriculture and Park Management S-2 (Principles and Practices)	2
Entomology S-4 (Insects and Related Pests)	2
P&S Science S-14 (Plant Propagation)	2
Plant Pathology S-2 (Plant Diseases)	2
Recreation S-1 (Introduction to Recreation)	2
Physical Education S-2 (a)	-

SECOND YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
Arboriculture and Park Management S-5 (Park and Tree Problems)	3
OR	
Arboriculture and Park Management S-7 (Tree and Park Problems)	3
Forestry S-1 (Forest Measurement)	4
Landscape Operations S-7 (Topographical Mapping)	3

Second Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
Arboriculture S-10 (Herbicides)	1
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
Landscape Operations S-8 (Grading and Construction)	3
Electives (3 of 6)	
A&F Economics S-3 (Accounting Principles)	4

Psychology S-4 (Applied General Psychology) 3

Electives (2 of 4)

Entomology S-5 (Horticultural Insects) 3

Plant Pathology S-3 (Forest and Shade Tree Pathology) 3

Wildlife Management S-2 (Management of Wildlife) 2

Mathematics S-4 (Elementary College Algebra) 3

Agricultural Engineering S-7 (Structures and Utilities) 3

Arboriculture S-8 (Private Tree Business, Tree Laws) 3

Landscape Operations S-12 (Shrub Identification) 4

Park Management S-2 (Administration and Personnel) 3

P&S Science S-4 (Orchard Pruning) 3

ARBORICULTURE AND PARK MANAGEMENT S-1. (PRINCIPLES AND PRACTICES) I.
A study of tree care. Laboratory periods devoted to field practices and park layout problems. Professional organizational literature required. Laboratory charge $4.00.
2 class hours and 1 3-hour laboratory period.
Credit, 4. Mr. King and Mr. Whitney.

ARBORICULTURE AND PARK MANAGEMENT S-2 (PRINCIPLES AND PRACTICES) II.
Continuation of S-1. Laboratory charge $2.00.
2 class hours and 1 3-hour laboratory period. *Credit, 2.* Mr. King.

ARBORICULTURE AND PARK MANAGEMENT S-5. (PARK AND TREE PROBLEMS) I.
History and Philosophy of parks in the United States and tree problems related to park organizations. For those students desiring primarily park management. Laboratory charge $4.00.
1 class hour and 1 4-hour laboratory period. *Credit, 3.* Mr. King.

ARBORICULTURE AND PARK MANAGEMENT S-7. (TREE AND PARK PROBLEMS) I.
Programs and surveys dealing with tree, park and utility problems. For those students desiring primarily arboriculture. Laboratory charge $4.00.
1 class hour and 1 4-hour laboratory period. *Credit, 3.* Mr. King.

ARBORICULTURE S-8. (PRIVATE TREE BUSINESS, TREE LAWS) II.
Aspects of private tree companies, laws and ordinances concerning trees.
1 4-hour class period. *Credit, 3.* Mr. King.

ARBORICULTURE S-10 (HERBICIDES) II.
Phases of weed control related to the profession.
1 class hour. *Credit, 1.* Mr. King.

PARK MANAGEMENT S-2 (ADMINISTRATION AND PERSONNEL) II.
Basic problems of administration, financing of parks and land use philosophy. 2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Whitney.

DAIRY TECHNOLOGY

Head of Department: Professor William B. Esselen. Professor Hankinson, Associate Professor Potter, Assistant Professor Evans.

A major program of study in the Department of Food Science and Technology.

The two-year course in dairy technology provides the student with an understanding of the handling and processing of milk and its products from the time the milk leaves the cow until it reaches the consumers' table. Students electing this course are preparing themselves for future work in the processing of dairy products and its related fields.

All dairy technology courses are given in Flint Laboratory. The building is well equipped with adequate facilities to provide classroom instruction in dairy processing. Commercial scale operations exist in processing milk and ice cream.

JOB OPPORTUNITIES

Skilled workers in wholesale and retail dairy plants including laboratory technicians, pasteurizer operators, ice cream mix makers, freezer operators, cheesemakers, salesworkers, and by-products manufacturers; also dairy equipment and supply salesmen and fieldmen. Such training supplemented with sufficient practical experience may lead to positions such as assistant plant superintendents and plant managers.

Field trips will be required during the two years at an estimated cost of $20 per student.

While working in the dairy laboratories, white suits and rubber footwear are required at an estimated cost of $10.

DAIRY TECHNOLOGY

FIRST YEAR

First Semester		*Second Semester*	
(Fifteen Weeks Resident Instruction)	*Crs.*	(Fifteen Weeks Resident Instruction followed by Three Months Placement Training)	*Crs*
A&F Economics S-1 (Principles of Economics)	3		
Animal Science S-1 (Introductory Animal Science)	3	Agricultural Engineering S-12 (Utilities and Food Facilities)	2

Bacteriology S-1 (Bacteriology and Community Hygiene)	3
Dairy Technology S-1 (Principles of Dairy Technology)	3
Mathematics S-1 (General Course)	2
Practical Science S-7 (Primarily Chemistry)	3
Physical Education S-1 (a,b)	-
Dairy Technology S-2 (Sensory Evaluation)	1
Dairy Technology S-4 (Fluid Milk Industry)	4
Dairy Technology S-10 (Concentrated Products)	3
English S-1 (Business English)	2
Practical Science S-8 (Primarily Physics)	3
Physical Education S-2 (a,b)	-

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
Agricultural Engineering S-13 (Refrigeration, Heating and Air Conditioning)	3
Dairy Technology S-3 (Frozen Products)	4
Dairy Technology S-5 (Dairy Bacteriology)	4
Dairy Technology S-7 (Seminar)	1
Speech S-1	2

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-22 (Dairy Marketing)	3
Agricultural Engineering S-16 (Dairy Equipment)	3
Dairy Technology S-6 (Cultured Products)	3
Dairy Technology S-8 (Sanitation Standards)	2
Food Science and Technology S-2 (Fundamentals of Food Preservation)	3
Elective	3

DAIRY TECHNOLOGY S-1. (PRINCIPLES OF DAIRY TECHNOLOGY) I.
An introduction to the various phases of the dairy products processing industry with emphasis on the composition and properties of milk as related to dairy products. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Hankinson.

DAIRY TECHNOLOGY S-2. (SENSORY EVALUATION) II.
The principles and practice of grading and evaluating dairy products based upon flavor and other sensory product characteristics. Laboratory charge $2.00.
1 2-hour laboratory period. *Credit, 1.* Mr. Potter.

DAIRY TECHNOLOGY S-3. (FROZEN PRODUCTS) I.
The modern methods of manufacturing ice cream and related products as influenced by ingredients of the mix, processing, and packaging.
2 class hours and 2 3-hour laboratory periods. *Credit, 4.* Mr. Potter.

DAIRY TECHNOLOGY S-4. (THE FLUID MILK INDUSTRY) II.
A study in the various phases of the fluid milk industry including sanitary production, procurement, processing and distribution of fluid milk products.
2 class hours and 2 2-hour laboratory periods. *Credit, 4.* Mr. Evans.

DAIRY TECHNOLOGY S-5. (DAIRY MICROBIOLOGY) I.
A study in the application of microbiological principles and laboratory techniques to the quality control of milk and dairy products. Laboratory charge $2.00.
2 class hours and 2 2-hour laboratory periods. *Credit, 4.* Mr. Evans.

DAIRY TECHNOLOGY S-6. (CULTURED PRODUCTS) II.
A study in the production of quality cultured dairy products including care of starters and manufacture of buttermilk, sour cream and major cheese varieties.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Evans.

DAIRY TECHNOLOGY S-7. (Seminar) I.
Survey of current dairy technology publications and reports.
2 class hours. *Credit, 1.* Mr. Hankinson.

DAIRY TECHNOLOGY S-8. (SANITATION STANDARDS) II.
A consideration of federal, state and local sanitation requirements in relation to the various phases of the dairy industry.
1 class hour and 1 2-hour laboratory period. *Credit, 2.* Mr. Evans.

DAIRY TECHNOLOGY S-10. (CONCENTRATED PRODUCTS) II.
The principles involved in the production of butter, concentrated, and dried dairy products.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Potter.

LANDSCAPE OPERATIONS

Head of Department: Professor Ervin H. Zube. Professor Procopio, Associate Professor Mosher, Assistant Professor Hamilton, Mr. Whitney.

The constantly increasing interest in more intensive development of both public and private grounds has created a demand for men trained to handle the varied problems in landscape construction and maintenance. This curriculum is designed to acquaint the student with these phases of landscape operations and to give him the basic knowledge and the most recent developments in those areas of learning on which the solutions to these problems depend.

The courses within the department deal with the study of drafting-room practices and field techniques necessary for the landscape development of grounds, including the measuring and grading of land surfaces, construction of walks, drives, terraces and walls and the laying out of such landscape elements. Additional courses deal with identification of woody plants, their use in landscape

development and the programming of their handling and maintenance on grounds and in nurseries.

Courses in other departments deal with plant growth, soils, fertilizers and plant pests; with the identification and maintenance of herbaceous plants and turf grasses; with fruit growing; with shade tree maintenance; and with plant propagation. Courses in business English, speech and elementary accounting round out the student's training.

In addition to the formal course work the student is expected to spend the five months between his first and second years as an employee of a person or firm in some phase of landscape operations. This placement period normally is from the first of April to the first of September. While on placement the student is required to compile certain reports which will call his attention to the relevant aspects of landscape operations.

Financial obligations over and above those listed under General Information include drafting equipment, amounting to approximately $25.00, and field trips with a total estimated cost of $30.00.

JOB OPPORTUNITIES

Alumni of this department hold positions as plant propagators, foremen or superintendents for nurseries; gardeners, foremen or superintendents on private estates, public parks, cemeteries, botanical gardens and various other public and private institution grounds; foremen with landscape contractors and real estate developers; owners of their own landscape firms, nurseries and garden centers; salesmen for seed and nursery concerns.

LANDSCAPE OPERATIONS

FIRST YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
Landscape Operations S-1 (Tree Identification)	4
Mathematics S-1 (General Course)	2

Second Semester (Eight Weeks Resident Instruction followed by Five Months Placement Training)	*Crs.*
Entomology S-4 (Insects and Related Pests)	2
Landscape Operations S-4 (Landscape Maintenance)	1
P&S Science S-2 (Plant Science)	2
P&S Science S-34 (Plant Nutrients)	2

OR

Mathematics S-4 (Elementary College Algebra)	3
P&S Science S-1 (Plant Science)	3
P&S Science S-33 (Soil Management)	3
P&S Science S-41 (Basic Factors, Construction and Maintenance of Fine Turf Areas)	3
Physical Education S-1 (a,b)	-
P&S Science S-42 (Application of Basic Factors to Practical Turf Problems)	2
Plant Pathology S-2 (Plant Diseases)	2
Physical Education S-2 (a)	-

SECOND YEAR

First Semester

(Fifteen Weeks Resident Instruction)	*Crs.*
Arboriculture and Park Management S-1 (Principles and Practices-Lectures only)	2
Entomology S-5 (Horticultural Insects)	3
Landscape Operations S-7 (Topographical Mapping)	3
Landscape Operations S-13 (Small Property Development)	3
P&S Science S-15 (Plant Propagation)	3
Speech S-1	2

Second Semester

(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
Arboriculture and Park Management S-2 (Principles and Practices-Lectures only)	2
Landscape Operations S-8 (Grading and Construction)	3
Landscape Operations S-10 (Nursery Practices and Management)	3
Landscape Operations S-12 (Shrub Identification)	3
P&S Science S-20 (Herbaceous Perennial and Annual Plants)	3

LANDSCAPE OPERATIONS S-1. (TREE IDENTIFICATION) I.
Study of evergreen and deciduous trees used in landscape work, their distinguishing characters and culture, with special reference to nursery and planting practice.
2 class hours and 2 2-hour laboratory periods. *Credit, 4.* Mr. Hamilton.

LANDSCAPE OPERATIONS S-3. (TREE AND SHRUB IDENTIFICATION) I.
Study and identification of evergreen and deciduous trees and shrubs used in landscape work.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Mosher.

LANDSCAPE OPERATIONS S-4. (LANDSCAPE MAINTENANCE) II.
This course is in preparation for placement and takes up the programming for

such horticultural practices as pruning, planting, winter protection, and pest control, as related to gardens and nurseries.
2 class hours. *Credit, 1.* Mr. Mosher.

LANDSCAPE OPERATIONS S-7. (TOPOGRAPHICAL MAPPING) I.
Practice in the use of simple surveying instruments as tapes, compasses, and levels used in the measurement of land surfaces, and the application of these instruments in landscape construction. Laboratory charge $2.00.
1 class hour and 2 2-hour laboratory periods.
Credit, 3. Mr. Whitney

LANDSCAPE OPERATIONS S-8. (GRADING AND CONSTRUCTION) II.
Continuation of Landscape Operations S-7, including problems in landscape grading, establishing grades and setting stakes for landscape development from working drawings. Laboratory charge $2.00.
1 class hour and 2 2-hour laboratory periods.
Credit, 3. Mr. Whitney

LANDSCAPE OPERATIONS S-10. (NURSERY PRACTICES AND MANAGEMENT) II.
Nursery management procedures and the programming of nursery practices are studied through the development of a nursery program and visits to several nurseries. Field trips, including the Nurserymen's Short Course at the Waltham Field Station are required. Estimated total cost $25.00. Open to Landscape Operations majors only.
1 class hour and 1 4-hour laboratory period. *Credit, 3.* Mr. Mosher.

LANDSCAPE OPERATIONS S-12. (SHRUB IDENTIFICATION) II.
Study of shrubs and woody vines, both evergreen and deciduous, to enable the student to recognize the plants used in ornamental plantings and to familiarize him with the handling of these plants both in nursery practice and landscape work.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Hamilton.

LANDSCAPE OPERATIONS S-13. (SMALL PROPERTY DEVELOPMENT) I.
This course investigates the current trends in landscape development of small properties. Special attention will be focused on planting design. Open to Landscape Operations majors only.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Procopio.

PLANT AND SOIL SCIENCE

Head of Department: Professor Franklin W. Southwick. Professor Boicourt, Professor Colby, Professor Drake, Professor Thomson, Professor M. Weeks, Associate Professor Lord, Associate Professor Troll, Associate Professor Vengris, Associate Professor W. Weeks, Assistant Professor Baker, Assistant Professor

Barker, Assistant Professor Bramlage, Assistant Professor Goddard, Assistant Professor Jester, Assistant Professor Maynard, Assistant Professor Michelson, Assistant Professor R. Southwick, Assistant Professor Tuttle, Assistant Professor Zak, Mr. Anderson.

Major programs of study in the Department of Plant and Soil Science are: FLORICULTURE, FRUIT and VEGETABLE CROPS and TURF MANAGEMENT.

FLORICULTURE — FRUIT AND VEGETABLE CROPS

The production and marketing of flowers, fruits and vegetables are major industries in Massachusetts. A wide range of job opportunities in the specialized areas of training are provided to Stockbridge School students who major in either the Floriculture or the Fruit and Vegetable Crops Sections.

Excellent facilities for instruction are available in commercial type greenhouses and well equipped laboratories. Adequate land and modern equipment are available at the Horticulture Research Center Farm in Belchertown, the South Deerfield Farm and on the University campus. In addition, a number of excellent nearby commercial operations are utilized in providing the student with practical information on operation and management problems.

The courses offered emphasize the basic principles of plant growth which underlie sound cultural practices and the economic principles which bear upon the marketing procedures and the business side of the specialized interest of the student.

TURF MANAGEMENT

There is an immediate need for skilled supervisors and assistants to park, cemetery and recreation area superintendents. Municipal and private golf clubs expect their superintendents to be trained in turf maintenance. Every city and large town offers splendid opportunities for the private business horticulturist who is especially well trained to "take care of the lawn."

As the many proposed memorial parks, play fields, public buildings and golf courses are being constructed and completed, the demand for specialists in turf maintenance will be increased and the number of replacements needed annually will be large.

This course is arranged and taught in such a manner that a student who has completed the work will be well qualified to accept a position as assistant or the actual superintendency of a small park, cemetery, or golf course, or to establish a business in his community.

Laboratory and field exercises give practical experience and demonstrations. Good equipment is supplemented by loans from manufacturers and supply

houses, and professional men will visit the classes to give of their experiences. The supporting courses are strong and have been carefully chosen for their close alliance to the problems of turf maintenance and general estate work.

Each student's placement training and special interest will be considered in his chosen field, whether it be park, golf course, or private business. Every student will be required to keep a record of work done, results obtained, and observations made during the placement training period, for use during the senior year.

Field trips will be required in a number of courses during the two years at an estimated cost to the student from $15.00 to $25.00.

JOB OPPORTUNITIES

For Floriculture majors excellent job opportunities for men and women are available as skilled workers in commercial greenhouses and on private estates; as wholesale and retail florists; in floral arrangement work; designers and decorators in retail stores; as salesmen for florists and home garden supplies; as sales agents or operators of garden centers and in many instances the opportunity to start in business for themselves.

For Fruit and Vegetable Crop majors there is a wide variety of jobs, including skilled workers on fruit and vegetable farms as foremen, operators or owners; employees on private estates and institutions; salesmen for various supplies, equipment and machinery companies; private and state produce inspection work; wholesale and retail sales with various market agencies and in many business and industry operations dealing with produce.

Students who major in Turf Management readily find jobs as assistants to superintendents and as superintendents of golf courses, cemeteries, commercial nurseries and landscape service companies as well as golf course construction companies and equipment supply dealers.

FLORICULTURE

FIRST YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
Landscape Operations S-3 (Tree and Shrub Identification)	3
P&S Science S-3 (Greenhouse Management)	4

Second Semester	
(Eight Weeks Resident Instruction followed by Five Months Placement Training)	*Crs*
Entomology S-4 (Insects and Related Pests)	2
Landscape Operations S-4 (Landscape Maintenance)	1
P&S Science S-2 (Plant Science)	2

P&S Science S-21 (Introductory Botany)	3
P&S Science S-33 (Soil Management)	3
Speech S-1	2
Physical Education S-1 (a,b)	-
P&S Science S-6 (Greenhouse Construction and Heating)	2
P&S Science S-8 (Annual Plants)	2
P&S Science S-10 (Foliage Plants)	1
P&S Science S-34 (Plant Nutrients)	2
Physical Education S-2 (a)	-

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
P&S Science S-11 (Commercial Floriculture)	3
P&S Science S-13 (Floral Design)	3
P&S Science S-15 (Plant Propagation)	3
Plant Pathology S-4 (Florists' Crops Diseases)	3
*Electives (Elect 1)	
A&F Economics S-3 (Accounting Principles)	4
Entomology S-7 (Florists' Crops Insects)	3
Mathematics S-4 (Elementary College Algebra)	3

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
Agricultural Engineering S-12 (Utilities and Food Facilities)	3
P&S Science S-20 (Herbaceous Perennial and Annual Plants)	3
P&S Science S-22 (Floriculture Literature and Problems)	2
*Electives (Elect 2)	
A&F Economics S-8 (Accounting Principles)	4
A&F Economics S-12 (Marketing Management and Salesmanship)	3
P&S Science S-16 (Horticultural Marketing)	3
P&S Science S-24 (Floral Design)	3
P&S Science S-26 (Commercial Floriculture)	3

**Courses other than those listed may be elected with permission of the department advisor.*

FRUIT AND VEGETABLE CROPS

FIRST YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*

Second Semester (Eight Weeks Resident Instruction followed by Five Months Placement Training)	*Crs.*

A&F Economics S-1 (Principles of Economics)	3
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
P&S Science S-1 (Plant Science)	3
P&S Science S-5 (Deciduous Orchards)	3
P&S Science S-7 (Commercial Vegetable Production)	3
P&S Science S-33 (Soil Management)	3
Physical Education S-1 (a,b)	-
Entomology S-4 (Insects and Related Pests)	2
P&S Science S-2 (Plant Science)	2
P&S Science S-4 (Orchard Pruning)	2
P&S Science S-12 (Greenhouse Vegetables)	2
P&S Science S-34 (Plant Nutrients)	2
Plant Pathology S-2 (Plant Diseases)	2
Physical Education S-2 (a)	-

SECOND YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
Agricultural Engineering S-13 (Refrigeration, Heating and Air Conditioning)	3
Entomology S-5 (Horticultural Insects)	3
Mathematics S-1 (General Course)	2
OR	
Mathematics S-4 (Elementary College Algebra)	3
P&S Science S-9 (Small Fruits)	3
P&S Science S-17 (Systematic)	3
Speech S-1	2

Second Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-16 (Agricultural Business Management)	3
Agricultural Engineering S-1 (Power Units)	3
P&S Science S-16 (Horticultural Marketing)	3
P&S Science S-18 (Fruit Pest Control)	3
P&S Science S-28 (Commercial Vegetable Culture)	3
P&S Science S-30 (Orchard Management)	4

TURF MANAGEMENT

FIRST YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*

Second Semester	
(Eight Weeks Resident Instruction followed by Five Months Placement Training)	*Crs*

English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
Landscape Operations S-3 (Tree and Shrub Identification)	3
P&S Science S-33 (Soil Management)	3
P&S Science S-37 (Basic Factors and Uses of Turf Areas)	3
Speech S-1	2
Physical Education S-1 (a,b)	-
A&F Economics S-4 (Elements of Bookkeeping)	3
Entomology S-6 (Turf Insects)	1
P&S Science S-38 (Construction and Maintenance of Turf Areas)	2
Plant Pathology S-2 (Plant Diseases)	2
Recreation S-1 (Introduction to Recreation)	2
Physical Education S-2 (a)	-

SECOND YEAR

First Semester

(Fifteen Weeks Resident Instruction)	*Crs.*
Agricultural Engineering S-1 (Power Units)	3
Agricultural Engineering S-9 (Drainage, Irrigation and Soil Conservation)	3
Arboriculture and Park Management S-1 (Principles and Practices-Lectures only)	2
English S-3 (Report Writing)	2
Landscape Operations S-7 (Topographical Mapping)	3
P&S Science S-39 (Turf Maintenance as a Business)	3

Second Semester

(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-10 (Business Law)	3
Agricultural Engineering S-3 (Machinery)	3
Arboriculture and Park Management S-2 (Principles and Practices-Lectures only)	2
Landscape Operations S-8 (Grading and Construction)	3
P&S Science S-20 (Herbaceous Perennial and Annual Plants)	3
P&S Science S-40 (Practical Turf Problems)	3
*Electives	
*A&F Economics S-12 (Marketing Management and Salesmanship)	3
*Mathematics S-4 (Elementary College Algebra)	3

*Elective with permission of department advisor.

PLANT AND SOIL SCIENCE S-1. (PLANT SCIENCE) I.
A study of the classification and structure of plants.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Tuttle.

PLANT AND SOIL SCIENCE S-2. (PLANT SCIENCE) II.
A study of the physiological functions in plants with particular emphasis on the influence of environmental factors on these processes.
3 class hours. *Credit, 2.* Mr. Maynard.

PLANT AND SOIL SCIENCE S-3. (GREENHOUSE MANAGEMENT) I.
A study of the factors affecting the growth of plants in greenhouses and how they are related to greenhouse management practices.
3 class hours and 1 2-hour laboratory period. *Credit, 4.* Mr. Jester.

PLANT AND SOIL SCIENCE S-4. (ORCHARD PRUNING) II.
The theory and practice of pruning deciduous fruit plants. Principles and techniques involved in repair grafting and top working are considered.
1 class hour and 2 2-hour laboratory periods. *Credit, 2.* Mr. Anderson.

PLANT AND SOIL SCIENCE S-5. (DECIDUOUS ORCHARDS) I.
Principles and practices involved in the establishment and maintenance of deciduous orchards.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Anderson.

PLANT AND SOIL SCIENCE S-6. (GREENHOUSE CONSTRUCTION AND HEATING) II.
A study of the types of construction of glass and plastic greenhouses. Particular attention is given to location, exposure, heating and ventilation of greenhouses.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Goddard.

PLANT AND SOIL SCIENCE S-7. (COMMERCIAL VEGETABLE PRODUCTION) I.
A study of commercial vegetable farm practices and problems including: propagation, weed control, irrigation, plant nutrition and management.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Thomson.

PLANT AND SOIL SCIENCE S-8. (ANNUAL PLANTS) II.
A study of bedding plants which are commonly used in commercial floriculture and garden center work. Culture, uses, marketing methods and identification are considered.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Jester.

PLANT AND SOIL SCIENCE S-9 (SMALL FRUITS) I.
Principles and practices governing the establishment and management of small fruit plantings.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Anderson.

PLANT AND SOIL SCIENCE S-10. (FOLIAGE PLANTS) II.
A study of the more important foliage plants, the factors governing their produc-

tion, and their use in homes and public buildings.
1 class hour and 1 2-hour laboratory period. *Credit, 1.* Mr. Goddard.

PLANT AND SOIL SCIENCE S-11. (COMMERCIAL FLORICULTURE) I.
The greenhouse production of a variety of important crops is considered in detail. Modern methods of production and management are stressed.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Jester.

PLANT AND SOIL SCIENCE S-12. (GREENHOUSE VEGETABLES) II.
A study of the production of vegetables, mushrooms, and early vegetable plants in greenhouses and other forcing structures.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Tuttle.

PLANT AND SOIL SCIENCE S-13. (FLORAL DESIGN) I.
The principles and techniques used in commercial floristry are discussed and practiced using professional materials and supplies. Various types of arrangements are considered. Laboratory charge $6.00.
2 3-hour laboratory periods. *Credit, 3.* Mr. Jester.

PLANT AND SOIL SCIENCE S-14. (PLANT PROPAGATION) II. ARBORICULTURE AND PARK MANAGEMENT.
A study of the principles of plant propagation, both sexual and asexual, with major emphasis being placed on woody plants.
2 class hours and 2 2-hour laboratory periods. *Credit, 2.* Mr. W. Weeks.

PLANT AND SOIL SCIENCE S-15. (PLANT PROPAGATION) I.
Principles and practices for most methods of plant propagation such as seedage, cuttage, layerage and divisions.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Boicourt.

PLANT AND SOIL SCIENCE S-16. (HORTICULTURAL MARKETING) II.
A study of the marketing procedures and practices of commercial flower, fruit, and vegetable growers.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Tuttle.

PLANT AND SOIL SCIENCE S-17. (SYSTEMATIC) I.
A technical study of the horticultural classification of fruits and vegetables.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Tuttle.

PLANT AND SOIL SCIENCE S-18. (FRUIT PEST CONTROL) II.
A study of pest control methods, materials and equipment used in the production of fruit crops.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Anderson.

PLANT AND SOIL SCIENCE S-20. (HERBACEOUS PERENNIAL AND ANNUAL PLANTS) II.
A study of important plant families and their use as ornamental plants for home, park and business.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Boicourt.

PLANT AND SOIL SCIENCE S-21. (INTRODUCTORY BOTANY) I.
Structure, function and reproduction of plants with primary emphasis on the flowering plants. Laboratory charge $3.00.
2 class hours and 1 3-hour laboratory period.
Credit, 3. Mr. Barker, Mr. Bramlage, Mr. Goddard.

PLANT AND SOIL SCIENCE S-22. (FLORICULTURE LITERATURE AND PROBLEMS) II.
Library reading and study on assigned subjects in the field of Floriculture. Oral and written reports.
1 class hour and 1 2-hour laboratory period. *Credit, 2.* Mr. Goddard.

PLANT AND SOIL SCIENCE S-24. (FLORAL DESIGN) II.
A detailed study of the more intricate commercial floral designs and techniques. Vase arrangements and wedding designs are emphasized. Laboratory charge $6.00.
2 3-hour laboratory periods. *Credit, 3.* Mr. Jester.

PLANT AND SOIL SCIENCE S-26. (COMMERCIAL FLORICULTURE) II.
The greenhouse production of major crops (Carnations, Chrysanthemums, Poinsettias and Lillies) is considered in detail. Modern methods or production and management are stressed.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Goddard.

PLANT AND SOIL SCIENCE S-28. (COMMERCIAL VEGETABLE CULTURE) II.
A study of the production practices and problems involved in growing the individual vegetable crops.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Thomson.

PLANT AND SOIL SCIENCE S-30. (ORCHARD MANAGEMENT) II.
A discussion of recent technical developments as they apply to commercial orcharding in the Northeast. Research literature review is an important part of this course.
3 class hours and 1 2-hour laboratory period. *Credit, 4.* Mr. W. Weeks.

PLANT AND SOIL SCIENCE S-32. (PRODUCE MERCHANDISING) II.
A study of the practices, principles, and regulations involved in the buying, packaging and storing of fruits and vegetables in retail outlets.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Tuttle.

PLANT AND SOIL SCIENCE S-33. (SOIL MANAGEMENT) I.
Every agricultural interest is vitally concerned with the soil, its adaptations and its management for plant production. This course treats of the selection of suitable soils for the special purpose of agriculture, horticulture and floriculture.
Laboratory includes training in the use and interpretation of the maps of the U.S. Soil Survey and in tests of soil texture, organic matter and soil acidity. Prac-

tical field work will be given in judging the crop adaptation and value of soils. Laboratory charge $4.00.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Drake, Mr. Michelson, Mr. R. Southwick, Mr. M. Weeks, Mr. Zak.

PLANT AND SOIL SCIENCE S-34. (PLANT NUTRIENTS) II.
Plant nutrient requirements and the use of fertilizer materials. A study will be made of the functions of mineral nutrients in the plant and the affects of mineral deficiencies. Interpretations of fertilizer formulae analyses and guarantees will be made. The laboratory work will give practice in the identification of fertilizer materials, in the calculation of fertilizer formulas, and in the preparation of fertilizer mixtures.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Michelson.

PLANT AND SOIL SCIENCE S-35. (SOIL MANAGEMENT AND PLANT NUTRIENTS) I.
Combined courses of Plant and Soil Sciences S-33 and S-34 for Arboriculture and Park Management majors. Laboratory charge $4.00.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Michelson.

PLANT AND SOIL SCIENCE S-36. (FIELD CROPS) II.
The lecture hours of this course will be devoted to presentation of the most successful methods of fertilizing, cultivating, harvesting and storing the field crops grown in New England. Special attention will be given to the choice of the best adapted varieties for the production of hay, pasture, corn, potatoes and root crops.

The laboratory work will include the study of corn and potato varieties, identification of grass and weed species, and studies of purity and germination. Field observation of growing crops will be included as the season permits.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. R. Southwick.

PLANT AND SOIL SCIENCE S-37. (BASIC FACTORS AND USES OF TURF AREAS) I.
Starting with an appreciation of the grass plant, the course carries the fine turf grasses from seed through uses. Identification of seed and vegetative growth. The limits of tolerance and factors affecting them are studied and correlated with the adaptation of the species of the user's specifications for various conditions.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Troll.

PLANT AND SOIL SCIENCE S-38. (CONSTRUCTION AND MAINTENANCE OF TURF AREAS) II.
The student will adapt factors determined in the first semester to the practical construction of new turf areas and maintenance of existing turf. Fertilizing, controlling diseases, clipping, watering, etc.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Troll.

PLANT AND SOIL SCIENCE S-39. (TURF MAINTENANCE AS A BUSINESS) I.
This course is primarily for those students desiring to become professional turf growers such as superintendents of golf courses, cemeteries, or parks wherein the various economic factors are studied. Equipment, fungicides, insecticides and herbicides are evaluated. Experiences gained during summer placement are thoroughly discussed.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Troll.

PLANT AND SOIL SCIENCE S-40. (PRACTICAL TURF PROBLEMS) II.
Use of popular and technical journals as a guide to advanced and up-to-date information on turf culture is stressed. Field trips to research stations, sod farms and business organizations serving the turf field develop a broad understanding of turfgrass work. Practical problems on turf and equipment maintenance serve to summarize material of preceding courses for the turf major.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Troll.

PLANT AND SOIL SCIENCE S-41. (BASIC FACTORS, CONSTRUCTION AND MAINTENANCE OF FINE TURF AREAS) I.
At the completion of this course the student should have a knowledge and appreciation of the requirements for the growing of lawns and sports turf.
He will have considered the construction of turf areas; seed identification, selection and sowing; identification of turf grasses and their soil and fertilizer preferences, correct cultural practices and control of turf pests and diseases.
This course is for Arboriculture and Park Management and Landscape Operations majors.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Zak.

PLANT AND SOIL SCIENCE S-42. (APPLICATION OF BASIC FACTORS TO PRACTICAL TURF PROBLEMS) II.
The interrelationships between grasses and their uses, and soil management problems are stressed. This gives the student a more thorough understanding of the nature of practical turfgrass work, the diagnosis and treatment of problem situations.
This course is for Landscape Operations majors only.
1 class hour and 1 2-hour laboratory period. *Credit, 2.* Mr. Vengris.

RESTAURANT AND HOTEL MANAGEMENT

Head of Department: Professor William B. Esselen. Professor in Charge, Restaurant and Hotel Management: Donald E. Lundberg. Assistant Professor Cournoyer, Assistant Professor Wrisley.

The Restaurant and Hotel Management Program in the Stockbridge School was initiated in 1938 at the request of the Massachusetts Hotel Association, New England Club Managers, Boston Stewards Club, and the Massachusetts Res-

taurant Association. The Program is a two-year technical course of study designed to develop students for work as supervisory and management personnel in restaurants, hotels, clubs, and institutional food services.

Application of principles learned in the classroom is encouraged. Case problems and field trips are part of the curriculum. Men prominent in the field are invited to speak in their areas of competence. Practical experience is required during the summer between the freshman and senior years.

Students who receive a B average are eligible for recommendation for transfer to the four year Restaurant and Hotel Management Program which leads to the baccalaureate degree.

Numerous scholarships are available to those students who have completed one semester satisfactorily and are in financial need. See the section on scholarships at the front of the catalogue.

In the past many more positions have been available for qualified graduates than there are graduates of the program. Most of the graduates go with family enterprises or into multi-unit food service operations.

Students are selected on the basis of their performance records, personality, and interest in the field. High school graduation is a prerequisite.

RESTAURANT AND HOTEL MANAGEMENT

FIRST YEAR

First Semester	
(Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-3 (Accounting Principles)	4
Food Science and Technology S-1 (Dairy and Poultry Products)	3
Home Economics S-1 (Basic Food Principles)	3
OR	
R&H Management S-1 (Advanced Foods)	3
Mathematics S-1 (General Course)	2
OR	

Second Semester	
(Fifteen Weeks Resident Instruction followed by Three Months Placement Training)	*Crs.*
A&F Economics S-8 (Accounting Principles)	4
Agricultural Engineering S-12 (Utilities and Food Facilities)	3
Food Science and Technology S-2 (Fundamentals of Food Preservation)	3
Home Economics S-2 (Elementary Nutrition)	2
Practical Science S-8 (Primarily Physics)	3
R&H Management S-2 (Commercial Cookery)	3

Mathematics S-4 (Elementary College Algebra)	
Practical Science S-7 (Primarily Chemistry)	3
R&H Management S-3 (Food Service Management)	3
R&H Management S-5 (Guest Lectures)	1
Physical Education S-1 (a,b)	-
Speech S-2	2
Physical Education S-2 (a,b)	-

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
Agricultural Engineering S-13 (Refrigeration, Heating and Air Conditioning)	3
Bacteriology S-3 (Food Sanitation)	3
Psychology S-4 (Applied General Psychology)	3
R&H Management S-7 (Merchandising)	2
R&H Management S-9 (Managerial Accounting for Hotels and Restaurants)	3
R&H Management S-13 (Personnel Management)	3
R&H Management S-15 (Guest Lectures)	1

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
Agricultural Engineering S-18 (Food Service Space and Equipment Organization)	3
Food Science and Technology S-8 (Meat and Meat Products)	3
English S-1 (Business English)	2
OR	
English S-4 (English Composition)	3
R&H Management S-8 (Laws of Innkeeping)	3
R&H Management S-10 (Seminar)	2
R&H Management S-12 (Restaurant and Hotel Practices)	3

RESTAURANT AND HOTEL MANAGEMENT S-1. (ADVANCED FOODS) I.
(For students who have completed at least one year of formal training or its equivalent in food preparation.)
Planning, costing, and preparing foods for groups; some experimental cooking and testing of kitchen equipment. Laboratory charge $6.00.
1 class hour and 1 4-hour laboratory period. *Credit, 3.* The Department.

RESTAURANT AND HOTEL MANAGEMENT S-2. (COMMERCIAL COOKING) II.
The rationale of the kitchen: the function of kitchen tools and equipment, the cooking and baking processes. Some quantity food preparation. Laboratory charge $6.00.
1 class hour and 1 4-hour laboratory period.
Credit, 3. Mr. Lundberg and Mr. Cournoyer.

RESTAURANT AND HOTEL MANAGEMENT S-3. (FOOD SERVICE MANAGEMENT) III.
The management of the steward's department of a hotel or institution comprising the purchasing, storage, and issuing of foods, beverages, and supplies with the proper records and controls to keep in connection therewith.
3 class hours. *Credit, 3.* Mr. Wrisley.

RESTAURANT AND HOTEL MANAGEMENT S-5 AND S-15. (GUEST LECTURES) I.
Lectures by recognized leaders in the field of hotel and restaurant management.
1 class hour. *Credit, 1.* The Department.

RESTAURANT AND HOTEL MANAGEMENT S-7. (MERCHANDISING) I.
Organization and function of the hotel sales department. Media used most profitably by hotels, resorts, and restaurants. Methods used to obtain public recognition and good will of guests.
2 class hours. *Credit, 2.* Mr. Cournoyer.

RESTAURANT AND HOTEL MANAGEMENT S-8. (LAWS OF INNKEEPING) II.
A consideration of the legal problems of the innkeeper and allied institutions including taxation.
3 class hours. *Credit, 3.* Mr. Cournoyer.

RESTAURANT AND HOTEL MANAGEMENT S-9. (MANAGERIAL ACCOUNTING FOR HOTELS AND RESTAURANTS) I.
Accounting, control, and financial practices related to hotels and restaurants: capital and operational budgeting, analysis of financial statements, theory of control and internal auditing of hotels.
3 class hours. *Credit, 3.* Mr. Wrisley.

RESTAURANT AND HOTEL MANAGEMENT S-10. (SEMINAR) II.
Selected problems in food service management in the form of case studies.
2 class hours. *Credit, 2.* Mr. Wrisley.

RESTAURANT AND HOTEL MANAGEMENT S-12. (RESTAURANT AND HOTEL PRACTICES) II.
Food and beverage cost control systems as related to management decision-making. Pricing policy. The evaluation and financing of investments.
3 class hours. *Credit, 3. Mr. Wrisley.*

RESTAURANT AND HOTEL MANAGEMENT S-13. (PERSONNEL MANAGEMENT) 1.
Motivating and organizing people; analyzing, simplifying, and evaluating the job;

recruiting, selecting and placing employees; training and rating employees; fire and accident prevention.
3 class hours. *Credit, 3.* Mr. Lundberg.

WOOD UTILIZATION

Head of Department: Professor Arnold D. Rhodes. Professor Gatslick, Assistant Professor Hoadley.

*The manufacture and distribution of the material processed from forest-grown trees comprise the field of wood utilization. More specifically it includes consid*eration of such items as lumber, veneer and plywood, ties, poles, pulpwood and *fuelwood, but especially lumber and the many items fabricated from it. In contrast to the "forester" who is concerned mainly with growing forests and with other activities associated with the management of forest and land, the wood utilization graduate works with the wood after the trees are grown and harvested and are ready for conversion into useful products.*

The field of wood utilization is a broad one with many aspects including such activities as primary manufacture of lumber from logs, re-manufacture, air seasoning and kiln drying operations, gluing, machining, and finishing in the fabrication of other products, merchandising of lumber at the wholesale and retail levels, and the preservative treatment of posts, poles and other items. Because of its dense population, the Northeast is a major wood-consuming area and the seat of many wood-distributing and wood-using concerns. The wood utilization graduate is therefore prepared for employment in such enterprises as sawmills, wood processing and fabricating industries, and both wholesale and retail lumber yards and sales organizations.

The curriculum provides a foundation for these fields through basic study of the fundamental nature and properties of wood, with courses dealing with the processing and application of wood for specific areas of use. The program is further *strengthened by appropriate course work in English, mathematics, economics and business practice. Summer placement training between the freshman and senior years offers valuable contact with some phase of the wood-using industries. The Department also provides assistance in job placement for graduates.*

FACILITIES

Located at the Holdsworth Natural Resources Center, the Department has completely modern facilities for classroom instruction and laboratory exercises in the anatomy and properties of wood, together with equipment for machining, drying, finishing and preservation work. In addition, the Department operates a dry kiln on campus and a sawmill at the nearby Mt. Toby Forest. Training at the

University is augmented by field trips to wood-using enterprises in the central Massachusetts area.

PLACEMENT TRAINING

The program of study requires that the student spend the summer between his freshman and senior years in suitable placement training. Although this summer work must involve some aspect of wood utilization, the breadth of the overall field enables the student to choose work in a phase of forest products most nearly consistent with his personal interest. Placement may, however, necessitate working at considerable distances from home and the student should be prepared for this possibility.

ADDITIONAL EXPENSES

In addition to the regular expenses of the school program the student is required to purchase an accident insurance policy (about $18.00), available through the University at the time of registration. Departmental expenses for required field trips and personal laboratory equipment and supplies should not exceed $15.00 per year.

WOOD UTILIZATION

FIRST YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-1 (Principles of Economics)	3
Forestry S-3 (Forest Tree Identification)	3
Mathematics S-3 (Review Mathematics)	3
OR	
Mathematics S-4 (Elementary College Algebra)	3
P&S Science S-1 (Plant Science)	3
Wood Utilization S-1 (Wood Anatomy and Identification)	3
Physical Education S-1 (a,b)	-

Second Semester (Fifteen Weeks Resident Instruction followed by Three Months Placement Training)	*Crs.*
A&F Economics S-3 (Accounting Principles)	4
Agricultural Engineering S-7 (Structures and Utilities)	3
English S-1 (Business English)	2
Speech S-2	2
Wood Utilization S-2 (Lumber Manufacturing and Properties)	5
Physical Education S-2 (a,b)	-

SECOND YEAR

First Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-13 (Business Management)	3
Agricultural Engineering S-1 (Power Units)	3
English S-3 (Report Writing)	2
Wood Utilization S-11 (Forest Products Other Than Lumber)	3
Wood Utilization S-13 (Wood Seasoning and Preservation)	4

Second Semester (Fifteen Weeks Resident Instruction)	*Crs.*
A&F Economics S-8 (Accounting Principles)	4
A&F Economics S-10 (Business Law)	2
A&F Economics S-12 (Salesmanship and Sales Management)	3
Practical Science S-8 (Primarily Physics)	3
Wood Utilization S-12 (Secondary Wood Processing)	5

WOOD UTILIZATION S-1. (WOOD ANATOMY AND IDENTIFICATION) I.
The structure of the wood of commercial American species; importance of anatomical structure to properties and use of wood; identification based on anatomical features.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Hoadley.

WOOD UTILIZATION S-2. (LUMBER MANUFACTURING AND PROPERTIES) II.
The manufacture, processing and grading of lumber; properties of wood involved in the use of lumber; laboratory field trips to local wood-using industries.
3 class hours and 1 4-hour laboratory period. *Credit, 5.* Mr. Hoadley.

WOOD UTILIZATION S-11. (FOREST PRODUCTS OTHER THAN LUMBER) I.
The primary and secondary products of American forests (exclusive of lumber), their manufacture, economic importance and potential.
3 class hours a week. *Credit, 3.* Mr. Gatslick.

WOOD UTILIZATION S-12. (SECONDARY WOOD PROCESSING) II.
Principles and methods of machining, gluing and finishing wood in the secondary wood-manufacturing industries.
3 class hours and 1 4-hour laboratory period. *Credit, 5. Mr. Gatslick*

WOOD UTILIZATION S-13. (WOOD SEASONING AND PRESERVATION) I.
The seasoning and preservative treatment of wood; materials, equipment, and applied techniques.
2 class hours and 1 4-hour laboratory period. *Credit, 4.* Mr. Gatslick.

RELATED SUBJECTS

AGRICULTURAL ENGINEERING S-1. (POWER UNITS) I. and II.
Principles of operation of internal combustion engines and electric motors. Em-

phasis on mobile or portable power units. Agricultural tractors, second semester. Non-crop production units emphasized in first semester. Laboratory charge $3.00.
2 class hours and 1 2-hour laboratory period. *Credit, 2 or 3.* Mr. E. Johnson.

AGRICULTURAL ENGINEERING S-3. (MACHINERY) I. and II.
Principles of equipment and machinery operation, maintenance, selection and minor repair. Agricultural production equipment emphasized in first semester. Non-crop production equipment emphasized in second semester. Prerequisite: Agricultural Engineering S-1. Laboratory charge $5.00.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. C. Johnson.

AGRICULTURAL ENGINEERING S-7. (STRUCTURES AND UTILITIES) I. and II.
Materials and methods of light construction; functional planning; sketching and layout; integral utility planning; water supply; waste disposal; lighting; electric power and environmental control. Prerequisite: Mathematics S-1 or Mathematics S-3. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Collins.

AGRICULTURAL ENGINEERING S-9. (DRAINAGE, IRRIGATION AND SOIL CONSERVATION) I. and II.
Principles of design, management practices and equipment performance as related to planning and layout of systems. Use of the level; preparing layouts in drawings and in the field. Prerequisite: Mathematics S-1. Laboratory charge $2.00.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* Mr. Pira.

AGRICULTURAL ENGINEERING S-12. (UTILITIES AND FOOD FACILITIES) II.
Basic principles of electricity including units, terms and their relationships; distribution, wiring, fusing, materials and system planning. Also principles of electric motors, lighting, water supply and waste disposal. Prerequisite: Mathematics S-1. Laboratory charge $2.00.
1 class hour and 1 2-hour laboratory period. *Credit, 2.* Mr. Pira.

AGRICULTURAL ENGINEERING S-13. (REFRIGERATION, HEATING AND AIR CONDITIONING) I.
Course deals first with basic principles of refrigeration, air flow and temperature and humidity relationships. Principles then applied to selecting equipment and planning systems for refrigeration, ventilation, heating and air conditioning of food facilities. Prerequisite: Agricultural Engineering S-12. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Pira.

AGRICULTURAL ENGINEERING S-14. (FOOD HANDLING AND PACKAGING) II.
Principles, practices, materials of packaging and unitizing foods. Materials handling equipment and systems applied to food distribution; processing plant,

transportation, warehouse and retail stages. System planning and layout. Prerequisite: Agricultural Engineering S-13. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Fitzgerald.

AGRICULTURAL ENGINEERING S-16. (DAIRY EQUIPMENT) II.
For majors in Dairy Technology. Principles and practices involved in the selection, arrangement and operation of equipment for processing, preserving and handling milk products. Instrumentation and process controls; plant layout. Prerequisite: Agricultural Engineering S-13. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Fletcher.

AGRICULTURAL ENGINEERING S-18. (FOOD SERVICE SPACE AND EQUIPMENT ORGANIZATION) II.
Problems of planning, equipping and operating commercial food service facilities. Designs and floor plans for efficient operation and use of space; equipment selection, installation, management and maintenance. Prerequisite: Agricultural Engineering S-13. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Fletcher.

BACTERIOLOGY S-1. (BACTERIOLOGY AND COMMUNITY HYGIENE) I.
Basic fundamentals of microbiology and the problems of applied bacteriology in health, agriculture, and industry. Milk, water supply, sewage disposal, and food production are considered.
3 class hours. *Credit, 3.* Mrs. Reinisch.

BACTERIOLOGY S-3. (FOOD SANITATION) I.
An introduction to basic bacteriological techniques, such as, use of the light microscope, staining methods, estimating bacterial density in water, milk, meats. Lectures, films, and reading assignments are integrated with the laboratory assignments to give the student a basic understanding of the morphological and cultural characteristics of bacteria. The cultural characteristics are related to sound practices of food sanitation. Laboratory charge $4.00.
3 class hours. *Credit, 3.* Mrs. Reinisch.

ENGLISH S-1. (BUSINESS ENGLISH) I. AND II.
Training and practice in writing various types of letters and reports with some review work in fundamentals of grammar and composition.
2 class hours. *Credit, 2.* Mrs. DuBois.

ENGLISH S-3 (REPORT WRITING) I.
A discussion and writing course concerned with planning and setting up different kinds of reports and articles.
2 class hours. *Credit, 2.* Mrs. DuBois.

ENGLISH S-4. (ENGLISH COMPOSITION) I. AND II.
Training in effective composition; readings.
3 class hours. *Credit, 3.* Mrs. DuBois.

ENTOMOLOGY S-4. (INSECTS AND RELATED PESTS) II.
A course for freshmen in landscape operations, floriculture, arboriculture and park management, and horticulture devoted to an introduction to insect recognition, development, damage and control. The course is basic to a further study of specific pests and their control for those who will take Entomology S-5 or S-7. A summer collection of important pests may be required. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 2.* Mr. Peters.

ENTOMOLOGY S-5. (HORTICULTURAL INSECTS) I.
Seniors in horticulture, landscape operations and arboriculture and park management who have completed Entomology S-4, go on to a more detailed study of important pests; their damage, life histories, environment, and distribution and to an understanding of the principles and practical methods of controlling those pests. Laboratory charge $2.00.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Peters.

ENTOMOLOGY S-6. (TURF INSECTS) II.
A course designed to acquaint the student with the principal pests of turf. General introduction to entomology, followed by study of specific pests of turf.
1 class hour and 1 2-hour laboratory period. *Credit, 1.* Mr. Hanson.

ENTOMOLOGY S-7. (FLORISTS' CROPS INSECTS) I.
A study of insect and related pests of greenhouse and garden plants for floriculture majors. It is devoted to recognition of the pests encountered, types of damage, life histories, associations with the environment, and important aspects of their control. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Peters.

ENTOMOLOGY S-12. (LIVESTOCK AND FORAGE CROP INSECTS) II.
The recognition, biology and control of important insect and related pests affecting livestock and forage crops. Studies of specific pests and controls, including the proper use of chemicals, follow a brief consideration of some fundamentals of entomology. Laboratory charge $2.00.
1 class hour and 1 2-hour laboratory period. *Credit, 2.* Mr. Peters.

FOOD SCIENCE AND TECHNOLOGY S-1. (DAIRY AND POULTRY PRODUCTS) I.
A study of the principles involved in the packaging, storage, grading, selection and distribution of dairy and poultry products in relation to food distribution and management. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period.
Credit, 3. Mr. Potter, Dairy and Mr. Denison, Poultry.

FOOD SCIENCE AND TECHNOLOGY S-2. (FUNDAMENTALS OF FOOD PRESERVATION) II.
A survey is made of the causes of food spoilage and the methods used in pre-

serving foods. Sources, preservation and marketing of the major food groups is discussed. Laboratory charge $2.00.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Hayes.

FOOD SCIENCE AND TECHNOLOGY S-5. (ANIMAL AND POULTRY PRODUCTS) I.
Preparation, processing, packaging and marketing of animal products, including poultry and eggs.
Textbook: Ziegler, "The Meat We Eat."
2 class hours and 1 2-hour lecture demonstration period.
Credit, 3. Mr. Buck, Dairy and Mr. Denison, Poultry.

FOOD SCIENCE AND TECHNOLOGY S-8. (MEAT AND MEAT PRODUCTS) II.
Principles of meat evaluation and utilization. Classes and grades inspection, grading, preservation. Laboratories include carcass evaluation, wholesale and retail cutting, identification and manufactured meat products.
A one-day field trip to a large meat packing plant (approximate cost $5.00) is a required part of the course.
Textbook: Ziegler, "The Meat We Eat."
2 class hours and 1 2-hour lecture demonstration period. *Credit, 3.* Mr. Buck.

FORESTRY S-1. (FOREST LAND MANAGEMENT) I.
Principles of multiple-use management of forest land for wood, water, wildlife, and outdoor recreation. Special emphasis is given to forest ecology, silviculture, mensuration and the business aspects of growing wood crops.
2 class hours and 1 4-hour laboratory period. *Credit, 4. The Department.*

FORESTRY S-3. (FOREST TREE IDENTIFICATION) I.
Study of the principal North American forest trees, their botanical classification, distinguishing features, geographical distribution, and more important silvical characteristics.
1 class hour and 2 2-hour laboratory periods. *Credit, 3.* Mr. Rhodes.

HOME ECONOMICS S-1. (BASIC FOOD PRINCIPLES) I.
A study and application of basic scientific principles of food preparation techniques. Laboratory charge $6.00.
2 class hours and 1 3-hour laboratory period. *Credit, 3.* The Department.

HOME ECONOMICS S-2. (ELEMENTARY NUTRITION) II.
A general survey of the fundamental principles of nutrition, nutritive value of foods, the requirements and planning of an adequate dietary for the normal person.
3 class hours. *Credit, 3.* The Department.

MATHEMATICS S-1. (GENERAL COURSE) I.
A thorough drill in those fundamentals which are used in practical arithmetic. Fractions, ratio and proportion, percentage, formulas of area and volume,

graphs, logarithms, and the use of the slide rule will be studied.
2 class hours. *Credit, 2.* The Department.

MATHEMATICS S-3. (REVIEW MATHEMATICS) I.
The simple mathematics used in wood utilization; arithmetic, plane geometry, certain trigonometric functions, use of the slide rule.
3 class hours. *Credit, 3.* The Department.

MATHEMATICS S-4. (ELEMENTARY COLLEGE ALGEBRA) I. and II.
A review of elementary algebra and a more thorough study of such topics as quadratic equations, exponents and radicals and progressions.
3 class hours. *Credit, 3.* The Department.

PHYSICAL EDUCATION FOR MEN. PHYSICAL EDUCATION S-1A, S-1B, S-2A, S-2B. I. and II.
Aim of the course is to inculcate in the student an adequate knowledge of, a sufficient technique in, and a wholesome attitude toward physical education activities through the medium of individual, dual, and team sports. Each student must demonstrate his ability to swim.
3 class hours. *Credit, 0.* The Department.

PHYSICAL EDUCATION FOR WOMEN. PHYSICAL EDUCATION S-1A, S-1B, S-2A, S-2B. I. and II.
Students are required to pass a safety test in swimming. Except for this requirement all unrestricted students may select any activity which is offered. Fall season: archery, field hockey, folk dance, golf, lacrosse, life-saving, modern dance, swimming, tennis, volleyball.
3 class hours. *Credit, 0.* The Department.

PLANT PATHOLOGY S-2. (PLANT DISEASES) II.
A survey course dealing with the nature, cause, and general procedures of plant disease control. The profound influence environment exerts on plant disease, the role played by insects in their transmission, and the major classes of plant pathogens, fungi, viruses and bacteria are briefly considered.
3 class hours. *Credit, 2.* Mr. Agrios.

PLANT PATHOLOGY S-3. (FOREST AND SHADE TREE PATHOLOGY) I.
Nature, cause and control of the principal types of diseases of trees, including decay of forest products, and of standing and structural timbers.
2 class hours and 1 2-hour laboratory period. *Credit, 3.* Mr. Banfield.

PLANT PATHOLOGY S-4. (FLORISTS' CROPS DISEASES) II.
A study of the major diseases of greenhouse and garden plants for floriculture majors. Included are recognition, damages, environmental effects, and control principles. Laboratory charge $2.00.
3 class hours first half of semester.
1 class hour and 2 2-hour laboratory periods second half of semester.
Credit, 3. Mr. Agrios.

PRACTICAL SCIENCE S-7 and S-8. I. and II.
A two semester course in the theory and application of the sciences, chiefly chemistry (first semester) and physics (second semester). The course is designed to give an introduction to scientific thought and phenomena by lectures, demonstrations, assigned readings and problems. Practical applications and problems are stressed.
3 class hours. *Credit, 3.* Mr. Hunting.

PSYCHOLOGY S-4. (APPLIED GENERAL PSYCHOLOGY) I.
3 class hours. *Credit, 3.* The Department.

RECREATION S-1. (INTRODUCTION TO RECREATION) II.
Fundamental concepts, current status, and established principles of recreation as a social force. Field trip.
3 class hours. *Credit, 2.* Mr. Randall.

SPEECH S-1 and S-2. I. and II.
Theory and practice in expository speaking for business and professional purposes.
2 class hours. *Credit, 2.* The Department.

WILDLIFE MANAGEMENT S-2. (MANAGEMENT OF WILDLIFE) I.
Fundamental ecology and principles of wildlife management with emphasis on habitats and management practices.
2 class hours. *Credit, 2.* The Department.

DIRECTORY OF INFORMATION

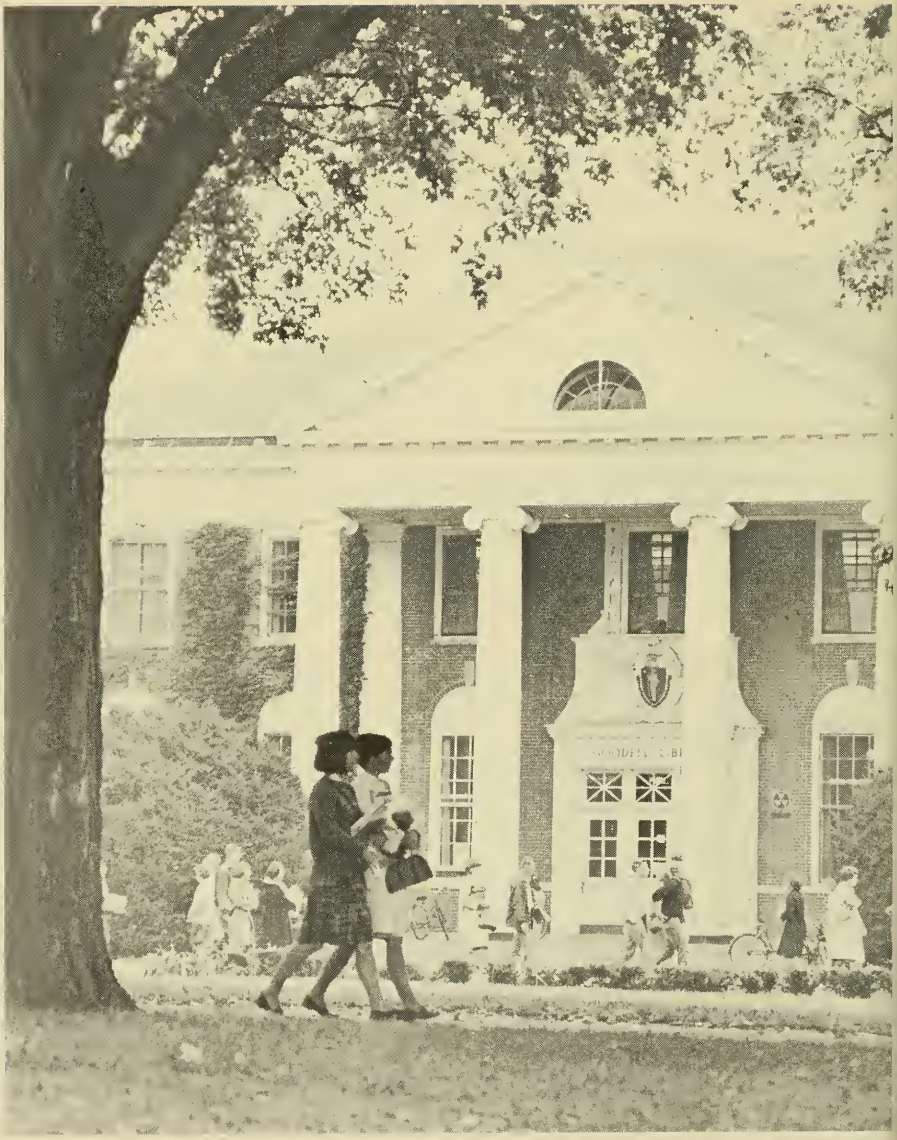
A. THE UNIVERSITY

Those desiring University catalogs giving full information relative to entrance requirements, courses of study, expenses, and questions regarding admission to the university, either to the freshman class or to advanced standing, should write to Dean of Admissions, University of Massachusetts, Amherst, Mass.

B. THE GRADUATE SCHOOL

Questions relating to courses offered leading to graduate degrees should be addressed to Dean of the Graduate School, University of Massachusetts, Amherst, Mass.

Please forward with your application the following: (1) recommendation from your Guidance Director; (2) a letter written in long hand giving your reasons for wanting to attend Stockbridge; (3) a transcript of your secondary school grades; and (4) evidence of having taken the scholastic aptitude test given by the College Entrance Examination Board.



APPLICATION FOR ENROLLMENT IN THE STOCKBRIDGE SCHOOL OF AGRICULTURE

TYPE OR PRINT INFORMATION

Name ..... Date .....

Street Address ..... City or Town .....

State ..... Zip Code ..... Age .....

Name of Secondary School attended .....

City or Town and State ..... Year Graduated .....

Indicate by a check mark the course in which you desire to register. Do not check more than one.

1. Agricultural Business Management
2. Animal Science (including Poultry)
3. Arboriculture and Park Management
4. Dairy Technology
5. Floriculture
6. Food Distribution
7. Fruit and Vegetable Crops
8. Landscape Operations
9. Restaurant and Hotel Management
10. Turf Management
11. Wood Utilization

References: *TYPE OR PRINT INFORMATION*

1. Name ..... Position .....

   Address .....

2. Name ..... Position .....

   Address .....

Mail this blank to FRED P. JEFFREY, Director of the Stockbridge School of Agriculture, UNIVERSITY OF MASSACHUSETTS, AMHERST, MASSACHUSETTS.

1964-1965 Report of the President

University of Massachusetts Bulletin

ABOUT THE COVER:
The rapidity of growth at the University is indicated by recent changes at the southwest corner of the campus, shown here in progress as of mid-May, 1965. The immediate past is represented by the Frank L. Boyden Physical Education Building at left, completed almost two years ago; the present includes the low-rise dormitories in the foreground, built during the year of this report, and the future holds completion of the first of the high-rise dormitories, now scheduled for the Fall of 1966.

VOLUME LVII DECEMBER 1965 NUMBER VII
Published seven times a year by the University of Massachusetts in February, March (2), August, November (2), and December. Second class mail privileges authorized at Amherst, Massachusetts.

Highlights of 1964-65

- **Phi Beta Kappa Chapter established.**
- **Number of courses offered exceeded 1000.**
- **Number of students enrolled exceeded 10,000.**
- **University of Massachusetts/Boston readied for first students.**
- **Worcester site chosen for new Medical School.**
- **Funds for sponsored research exceeded $7,000,000.**
- **One of the largest electronic computers in the northeast installed.**
- **Residential College Plan proven successful.**
- **High-rise housing and dining facilities begun for 5000 additional students.**
- **Modern football stadium built at no cost to the taxpayers.**

To the Board of Trustees

It is an honor and a privilege to submit to you my fifth Annual Report as president of the University of Massachusetts.

With an able and dedicated staff, the University in 1964-65 continued its growth as an institution of higher learning of which our citizens are increasingly proud. Through education, research, and service, the state-wide University works to improve the lot of every resident of the Commonwealth. Yet much remains undone.

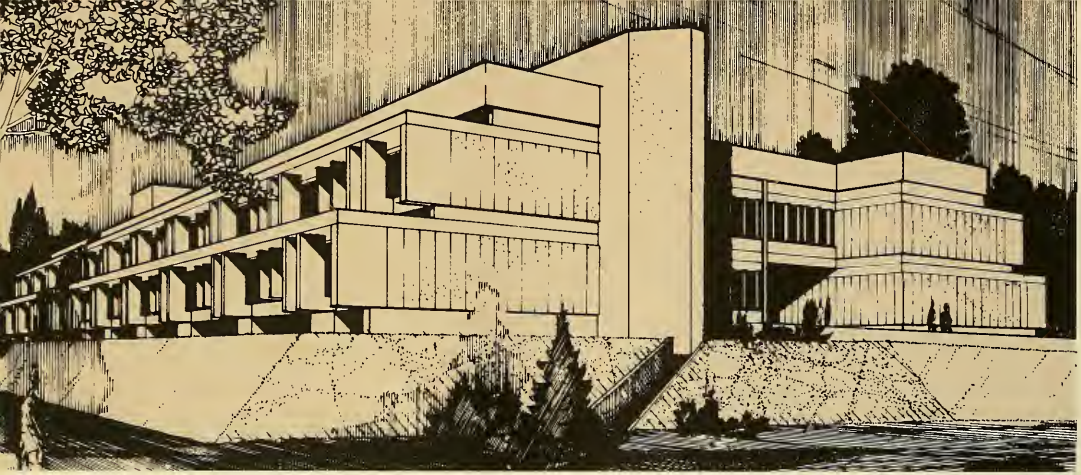
The General Court and the general public now have within their grasp a new opportunity under the Massachusetts Higher Education Plan, to open for all our qualified youth the door to self-fulfillment through education.

I am confident our Commonwealth's tradition of educational leadership will be renewed and strengthened in the space age, through the continuing clear vision and far-sighted support of the Governor and the General Court. Our recent progress is documented in this report. The rate of progress must not slacken, or the race will be lost. It is a race with history.

John W. Lederle

December 31, 1965

John W. Lederle
President



University of Massachusetts / Amherst

New Administration Building

Planned during 1964-65 and now under construction is a 275-by-175-foot building, shown here as the architect's elevation, to house the entire administration of the University of Massachusetts at Amherst.

Location is south of the center of the campus, at the former football field. Completion of the work is scheduled for April, 1967. The building also will house University records and data processing equipment.

University of Massachusetts / Boston

A Thirteen Story Campus

Authorized in June of 1964, the University of Massachusetts/Boston opened its doors to 1200 Freshmen this fall. In 1968-69, an enrollment of 4000 will have been reached.

Within fifteen months of authorization, a quality staff and faculty were assembled, and this building at Stuart and Arlington Streets chosen and remodeled.

This administrative achievement exemplifies the swift action the University can and will take in meeting the growing needs of higher education in the Commonwealth.

The University is undertaking a vigorous search for a permanent site to accommodate additional thousands of students at UM/Boston in years to come.

REPORT OF THE PRESIDENT

"There are few earthly things more splendid than a University.

In these days of broken frontiers and collapsing values —when every future looks somewhat grim, and every ancient foothold has become something of a quagmire, wherever a University stands, it stands and shines; wherever it exists, the free minds of men, urged on to full and fair inquiry, may still bring wisdom into human affairs."

— John Masefield

One cannot report on the year past without looking elsewhere at the same time. Relegating a year to posterity is like crossing a street, in that one first gives an automatic glance in both directions.

Where we as a University have been in the past is already well documented. This report attempts to detail where we stand at the close of the fiscal year 1964-1965, and to clarify both where we are going and what we hope to accomplish for the future.

We are rapidly getting larger. Our enrollment doubled in the six years prior to 1964-1965, reaching 10,497. It is expected to double again in the subsequent six years, reaching 20,300 at Amherst alone by 1971-1972.

Our students and faculty are reaching new levels of intellectual achievement. The young men and women enrolled make higher College Board scores each year.

We have kept tuition unchanged at $200 for Massachusetts residents since 1960, while costs have almost doubled. Although we paid our faculty members less on the average than did 84 other similar institutions in the U.S., we were in the forefront in applying corrective action.

We increased the size and scope of our graduate school in 1964-1965, but undergraduates still comprised more than four-fifths of the total enrollment.

We granted 1617 degrees, compared with 1384 the prior year. We maintained a student-faculty ratio of 15-1, average for the nation. We had 233 foreign students, and 95 per cent of our undergraduates were from Massachusetts. We offered more than 1000 courses, and used State appropriations for less than two thirds of our 30 million dollar operating budget.

We have done well, but we must do better.

Here are a few of the facts which make it plain that our continued success will require redoubled effort:

In 1964-1965, the University admitted 2439 freshmen at Amherst. This represented one fifth of the number of applicants, whose number rose by more than 50 per cent in a single year to 11,869. This means the state University could not fully meet the needs of the young men and women of the Commonwealth. And what of the future?

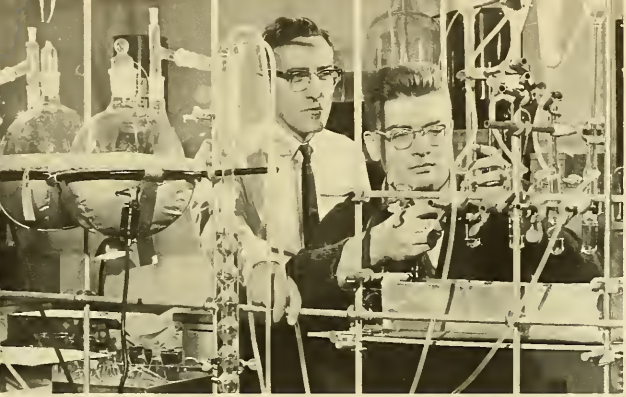
The New England Board of Higher Education estimates that by the fall of 1972 there will be places for a total of 80,200 students in Massachusetts' public and private colleges and universities. At the same time, the Board estimates there will be 114,000 young people seeking admission. Unless bold steps are taken, beyond those already anticipated by NEBHE, there will be no room for more than 30,000 willing and capable minds in Massachusetts' halls of learning.

We must maintain quality while increasing quantity. This is both difficult and expensive, but the need must be met. Our goal must be nothing less than the best possible living and learning environment. Second class means outclassed. Inferior education is worse than a total waste of time.

We must keep tuition low. Holding down tuition remains the best scholarship system in the world.

We must retain the efficiencies and economies gained under the fiscal autonomy act of 1962.

We must keep the focus, despite growth and automation, on individual needs, human betterment, and productive citizenship.



The Real Measure of Growth...the Human Factor

"A University should be a place of light, of liberty, and of learning."
—Disraeli

It is unlikely the ivy ever will cover the University of Massachusetts completely. Every area and every program on the Amherst campus is too active for this, as we search out new ways to teach, to discover, and to serve the best interests of individuals.

For the increasingly mature student here, there is an infectious exhilaration about a University in which everything is growing and constantly being renewed. For the faculty and staff, this is adventure on the highest level, and a fascinating challenge.

Time, one of our most vital resources, is being used to the fullest. Our academic calendar covers the entire year. Aside from necessary recesses and holidays, not a day of the 365 is now idle, including the summer.

We continue our insistence on Saturday classes, and keep our library open to students until midnight. The maximum use of our physical plant allows maximum access to our educational product.

We now offer undergraduates 63 major programs. We have 46 fields leading to the master's degree and 29 leading to the doctorate. Under the growing Four-College Cooperation Program, doctorates are offered in nine areas.

Two of the highlights of the year at Amherst were successes in important educational experiments.

First, the year proved positive value for the new residential college program initiated here in the fall of 1964, with Danforth Foundation funds. This experimental environment, with students and faculty living as well as learning together, allows increased opportunity for individual attention. Many features of the program have now been adopted at our new Southwest Residential Complex.

Second, the year provided the first test of our successful "swing shift" admissions policy, another means of making the utmost use of our existing resources. Under

the new plan, 180 students who would otherwise have been turned away for lack of space began the first semester of the freshman year in July. They then took a late summer vacation in the fall, and 178 joined the regular second semester in February.

In recognition of the University's increasing academic stature, a chapter of Phi Beta Kappa was established on the Amherst campus during the year. We were one of seven institutions granted this recognition, out of 42 applicants.

More than 4500 students attended our Summer Session, which offered more than 200 courses. In addition, there were more than 20,000 persons in attendance at 134 conferences on the campus.

In addition to the Massachusetts Building Authority construction detailed later in this report, a new 1.5 million dollar School of Business Administration building was dedicated during the year.

A new University of Massachusetts Press was established, and its published books have already won high praise.

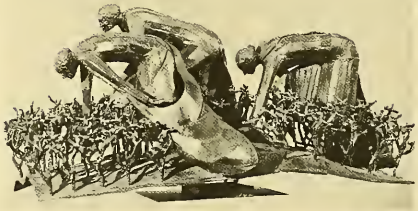
Our program of library expansion—one of the greatest needs of the University today—is progressing toward a minimum goal of one million volumes by 1970.

Our balanced program of extra-curricular student activity continues to grow in proportion to the curricular, and to score notable achievements in the arts, debate, football, ROTC, and theater.

The morale of our students remains high, and they continue to combine a healthy concern with the affairs of the world with an equally healthy acceptance of their roles as responsible members of our academic community.

Most important, we do not forget that our students are our prime reason for being, and that the human values we foster in them are the University's very blood and bone.

First Members of University's Phi Beta Kappa chapter



At Fine Arts Festival- "Cotton Pickers" by Leonard de Longa

University Premiere- Richard Kim's "The Martyred" by Richard Greenbaum

Hasbrouck Laboratory, Amherst

Dr. John Ryan, Chancellor, UM/Boston

Dr. Lamar Soutter, Dean, Medical School

A State-Wide University...

"Each state must design a state-wide system including universities, liberal arts colleges, technical institutes, and two-year colleges in whatever combination best suits its own needs."
—Dr. John W. Gardner

The year 1964-65 witnessed a real breakthrough toward establishment of a truly state-wide University. This has been a gratifying development, and a reaffirmation of our position as the University of all the people of Massachusetts, without sectional limitation.

Two of the most far-reaching achievements of the year relative to public higher education were carved out in the capital of the Commonwealth. These were enactment of the provisions of the Massachusetts Higher Education Plan by the legislature, and establishment of the University of Massachusetts/Boston, now in successful operation.

Preliminary plans were made for establishment of a University of Massachusetts Medical School in Worcester, and our cooperative programs with state and community colleges were strengthened. University support was continued for the agricultural research programs of the Massachusetts Experiment Station at East Wareham and Waltham. Planning continued toward most efficient use of the University's extensive acreage bordering Mount Toby and of its newly acquired Research Farm beside Mount Sugarloaf.

In the belief that more has already been said and written about our success in Boston and our plans for Worcester than this report could approach, the emphasis here is placed on the Massachusetts Higher Education Plan and its implications.

The entire state-wide educational effort beyond high school has been brought more sharply into focus by the new law drafted by the Master Plan Study Commission, under chairmanship of Senator Kevin Harrington and with staff direction by Benjamin Willis.

The University Trustees in February urged adoption of the Harrington-Willis Report. The resultant law, passed in June, offers Massachusetts and its people a real opportunity to restore public higher education in

Corn is one of the subjects of research at the state Experiment Station in Waltham.

Harvest time at the University's Cranberry Research Station, located in East Wareham.

the Commonwealth to a position of national leadership.

In brief, the new law defines the existing segments of the higher education enterprise in the Bay State, and describes the functions of each.

It sets up an Advisory Council on Education, to be appointed by the Governor, which will work on over-all needs of the state. It creates a Massachusetts Board of Higher Education, to be composed of seven members to be nominated from among the public by the Advisory Council, and one member each from the University's Board of Trustees, and the Boards of State Colleges, Community Colleges, and Technical Schools and Institutes.

Coordination and study under the new law will permit growth without waste, and progress without duplication of effort. It avoids rigid controls which tend to stifle educational initiative.

The new law provides the other units of the state-wide system the opportunity for more direct and fruitful cooperation with the University. It contains within itself the seeds of its own future improvement. It illuminates the state-wide system and places it once more in dynamic balance. It states clearly what we must accomplish, and when, and the University of Massachusetts is moving forward under that mandate.

In all this, we must continue to merit and retain the active support of our basic clientele—the taxpayers.

We like to think that our state legislature is gaining the confidence that our state University can be just as good as that of any other state.

We believe that the elected and appointed leaders of a Commonwealth of more than five million population, which is fiftieth in the nation in its per capita support of public higher education, have now discovered that they cannot rely on private institutions alone, however excellent, to do an excellent job for the entire state.

"The very spring and root of honesty and virtue lie in . . . good education."

—Plutarch

Dr. Edward C. Moore,
Dean of the Graduate School

Research and Advanced Education

Research, the study from which new knowledge is derived, has always centered in the great universities. Advanced university education allows the student to pursue his personal search for wisdom and fulfillment a little longer and a little deeper in one corner of our vast stockpile of knowledge.

"Together let us explore the stars, conquer the deserts, eradicate disease, tap the ocean depths, and encourage the arts and commerce."
—John F. Kennedy

As our physical universe is expanding with incomprehensible speed, so is this tremendous accumulation of knowledge and skill. In standing aside from this hectic expansion in the past, we have been left behind.

I am pleased to report that for several years we have been gaining lost ground, and that 1964-65 will stand out for its solid progress toward a greater graduate school for the University of Massachusetts, and toward research facilities beyond mere adequacy.

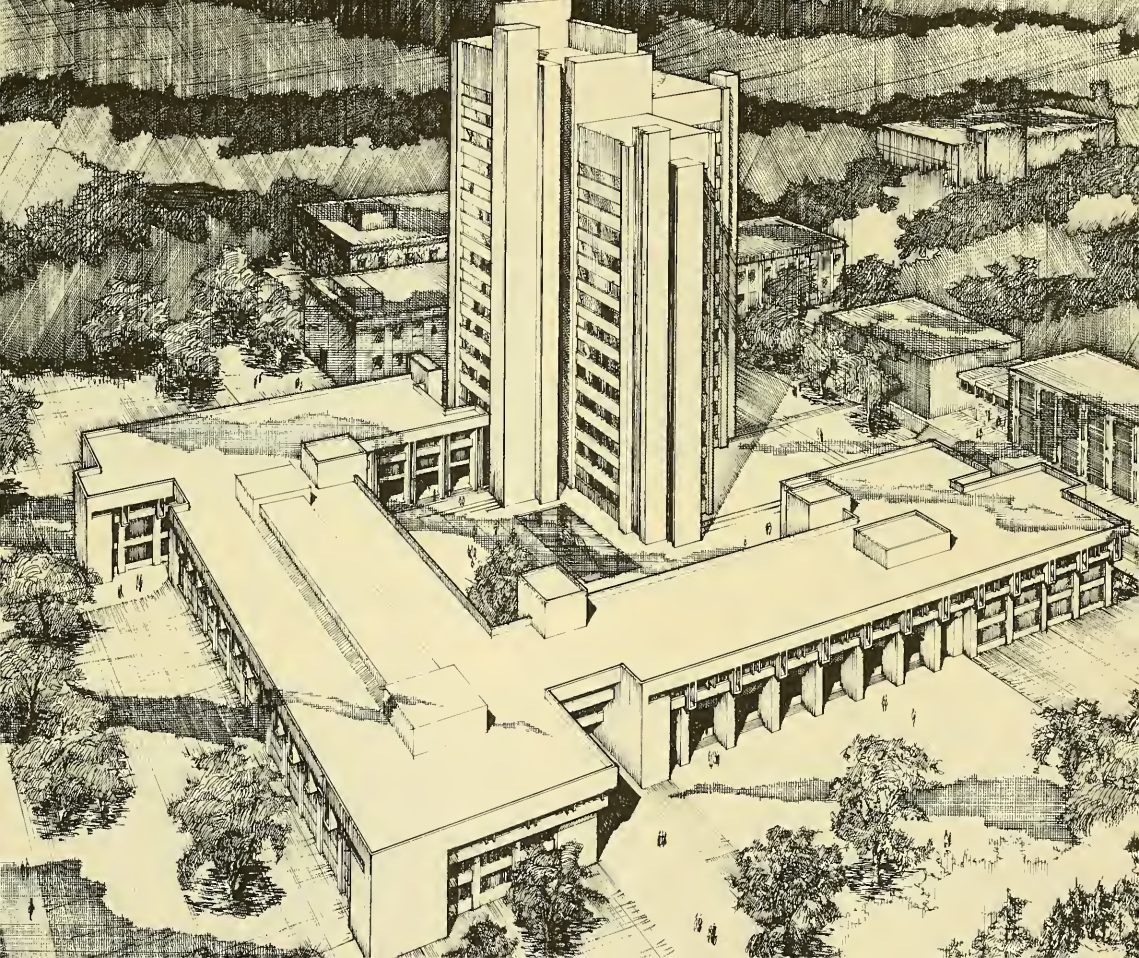
Approved during the year were Ph.D. programs in physics, mathematics, and agricultural engineering at the University, and a Four-College Ph.D. program in philosophy. New master's degree programs were added in labor studies and computer science, bringing to 75 the total of advanced degree programs available.

The University maintained its position of leadership in expanded use of electronic data processing in admissions and scheduling, installed a new higher speed digital computer, and gave computer science courses to 830 students, compared with 500 the prior year.

Almost doubling in the past two years, graduate school enrollment reached 1846. The number of advanced degrees awarded rose from 256 to 315, both record highs. The University ranked 28th in the nation in number of National Defense Education Act Fellowships received, with 43. Grants to the University for sponsored research rose to seven million dollars, compared with a half million just five years earlier.

Plans were drafted for a new Graduate Research Center in the physical sciences, and 2.8 million dollars in construction grants were received from the U.S. Office of Education toward the 20 million dollar facility. The first phase of the facility (shown in architect's conception at right) is scheduled for construction in 1967. Units such as a graduate research library and the computer center will surround the central chemistry towers.

Such expansion and progress, while gratifying, in no way guarantees us a position of leadership. This will be achieved only by continued support of those now striving to make a great graduate school sufficiently greater to come to grips with its future.



Irving Howards, director, and Robert Shanley, assistant director, Bureau of Government Research

Harvey Friedman, assistant director, Labor Relations and Research Center, at a labor conference on campus

Service to the Commonwealth...and Beyond

Architect's concept...new Continuing Education Center

Uganda reality...new University-assisted girls' school

Outside the undergraduate and graduate education programs, the University of Massachusetts during 1964-65 expanded its program of educational service to the Commonwealth, and achieved one of its overseas goals.

Initial plans were drawn during the year for a new Continuing Education Center on the Amherst campus. Its realization will correct a long-standing deficiency in our educational system.

The Center will serve adults who wish to renew their educational experience in general fields or acquire specialized knowledge which may not have been available when they received their formal education.

Massachusetts is far behind most states in public support of continuing adult education, and our obligations to the mature citizen must be acknowledged by the services we make available.

The new Center will be the headquarters for our state-wide programs in adult education. It will house short courses and conferences, and an important new service organization created during the year of this report: the Labor Relations and Research Center.

Opened last May, the Labor Relations and Research Center is directed by Ben B. Seligman. Its aims encompass academic course work, research, continuing education, and consultation services. It will serve under a credo articulated at the University by George Meany, president of the AFL-CIO—"the belief that higher education belongs to the working people as much as to the scholars."

Another new unit in our service organizations is the Water Resources Research Center, with Richard Damon as acting director. Established under Public Law 88-379, this Center will apply all available knowledge and new research toward solution of the water resources problems of the Commonwealth.

A Cooperative School Service Council has been established by the School of Education, under direction of Professor Clifford Jones, to provide liaison among the elementary and secondary schools of Massachusetts.

The Bureau of Government Research at the University continues to function successfully as a training, research, and service agency in the areas of state, county, and municipal government. Irving Howards has been appointed its new director.

Valuable work was continued during the year by our other service organizations, including the Massachusetts Population Research Institute, Polymer Research Institute, Research Computing Center, Speech and Hearing Center, and Agricultural and Industrial Microbiology Institute.

Overseas, years of planning resulted in the opening of the new 420-student Tororo Girls School in Uganda, Africa. This was a project which joined the efforts of our School of Education with those of the U.S. Agency for International Development. Dedication of the new school in June was attended by University administrators and U.S. and Uganda officials.

Another University-USAID program, aimed at establishment of a basic agricultural education program, continued to make progress in Malawi, Africa, under direction of our College of Agriculture. Malawi students will also pursue specialized study at the Amherst campus.

Again, let us not allow growth and new achievement to blind us. Although our aim is high and our improvement steady, we can never hope to be elevated by pulling on our own bootstraps. We will continue to do all that is humanly possible with the means at hand, but we cannot hope to serve the Commonwealth as it merits and requires unless increasingly greater financial support is provided and our hard-won position of partial fiscal autonomy is strengthened. The Commonwealth's rank as 50th among the 50 states in support of public higher education is indefensible. If we aspire to greatness, we must act according to our means as well as our highest convictions.

"Slavery is but half abolished while millions of free men with votes in their hands are left without education."
—Robert C. Winthrop

The University Building Authority's Year

Although we are constantly aware of the value to the University and the Commonwealth of the University of Massachusetts Building Authority, from the vantage point of a year's end we see most sharply the tremendous growth in the University's physical plant made possible by the Legislature through this relatively young but vitally important body.

During fiscal 1964-1965, approximately **$22 million** in new University facilities were under construction contracts with the Authority, without capital cost to the taxpayers.

Established under provision of Chapter 773 of the Acts of 1960 of the General Laws, as amended in 1962 and 1963, the nine-member Authority finances dormitory and student activity construction at the University through bond issues. Costs are self-liquidating through student fees, and no appropriations from tax revenue are made by the legislature for such construction.

Authority-backed contracts active during the fiscal year follow in chronological order:

—The Orchard Hill Residence, four seven-story dormitories for 1300 students at the northeast corner of the campus, opened in September, 1964—**$3.9 million**.
—Dining Commons South, 2500-student facility opened in October on Stockbridge Road, southeast of the center of the campus—**$1.4 million**.
—Alumni Stadium, an imposing 17,000-seat structure of reinforced concrete, erected during the year at the southwest corner of the campus—**$1.4 million**.
—Low-rise southwest complex, four four-story dormitories for 820 students, built during the year between the new stadium and main campus—**$2.8 million**.
—High-rise southwest complex, five 22-story dormitories for 2880 students at the same location, on which work was begun during the year—**$11.5 million**.
—Dining Commons 3, to seat approximately 1000 students, built during the year in the southwest complex to open in January, 1966—**$1.6 million**.

The Authority's record of achievement commands our respect, gratitude, and highest praise.

Commencement: Toward the Future

Commencement speaker in June, 1965, was Dr. William Manchester, University alumnus and author of the family-approved account of President Kennedy's assassination. He is shown receiving the degree of Doctor of Humane Letters.

The end of each academic year brings the Commencement of renewed aspiration and commitment, as we look to the future of public higher education in our Commonwealth. Never before have its promises and its demands been as great, nor its call for our devotion as compelling.

Devotion to public education parallels the belief in democracy as an ideal, which in turn demands equal opportunity for full human development. The harsh fact that we limit this opportunity today to one half of the qualified applicants does not alter our conviction that it must be extended to the other half as well. On the success of this philosophy, the welfare of the Commonwealth depends.

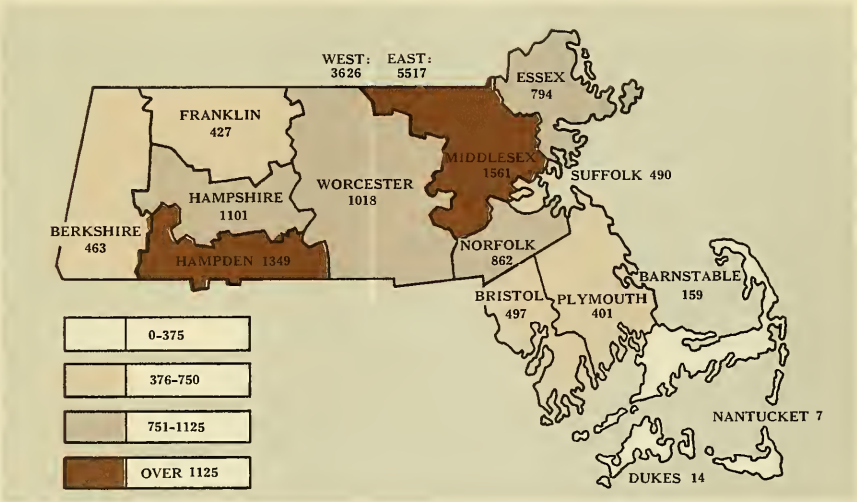
The clarity of our educational ideals, and the tenacity with which we pursue them, will measure our loyalty to the best in our heritage and our level of service to the future.

We do not believe, nor do we hope, that our task will be easy. We accept its rigors, and welcome its challenges. We realize that the easiest roads lead surely to oblivion. We seek the support of all Massachusetts citizens, the Governor and the General Court, as we move along the steep and narrow pathway toward greater service.

Massachusetts-Resident Students Enrolled at the University of Massachusetts

The map below shows distribution by county of all Massachusetts-resident students enrolled at the University of Massachusetts as of September, 1964—a total of 9143 students.

Distribution of in-state resident students on a East-West basis is also shown, with approximately three-fifths of the total from Eastern Massachusetts. Chart at right shows urban and non-urban distribution of Massachusetts resident students. Approximately 65 per cent of such students reside in the state's eight major city areas.



Urban and Non-Urban Distribution of Massachusetts-Resident Students

URBAN AREAS	UNDERGRAD	STOCKBRIDGE	GRADUATE	TOTAL
BOSTON	2679	132	170	2981
BROCKTON	191	12	12	215
FALL RIVER	102	7	8	117
LAWRENCE	137	10	9	156
LOWELL	113	8	9	130
NEW BEDFORD	172	11	9	192
SPRINGFIELD-HOLYOKE	1289	41	338	1668
WORCESTER	391	35	36	462
TOTAL URBAN AREAS	**5074**	**256**	**591**	**5921**
TOTAL NON-URBAN AREAS	**2440**	**170**	**612**	**3222**
GRAND TOTAL - MASS.	7514	426	1203	9143

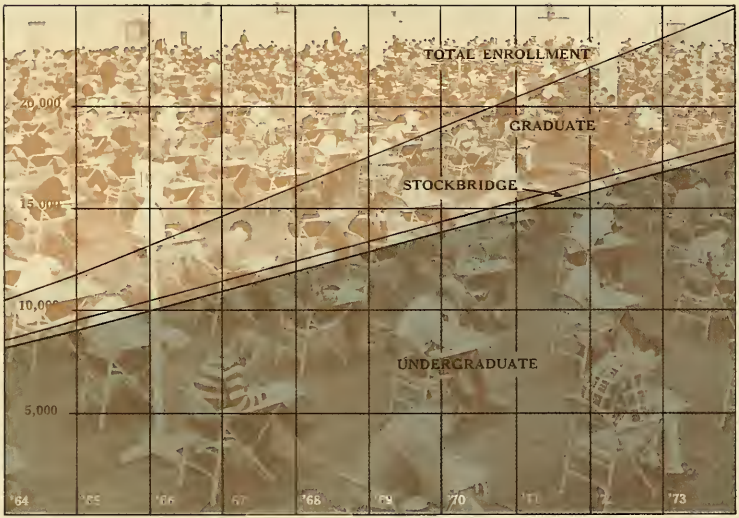
Long Range Enrollment Projection

Through September 1974

Expected growth of the total enrollment at the University of Massachusetts through the fall of 1974 is indicated on the graph below, with shaded sections representing undergraduate, graduate, and Stockbridge School enrollments. Numbers of students indicated for 1964 and 1965 are based on actual registration figures; the projected total for 1974 is 24,800.

The three bar graphs at right compare the actual enrollment for September, 1964, with that projected for a decade later, for each of the University's major subdivisions. Each is compared on its own scale.

These projections are for the Amherst campus only; they do not include figures for the University of Massachusetts/Boston or the University's Medical School.



REPORT OF THE TREASURER

Where The Operating Dollar Comes From . . .

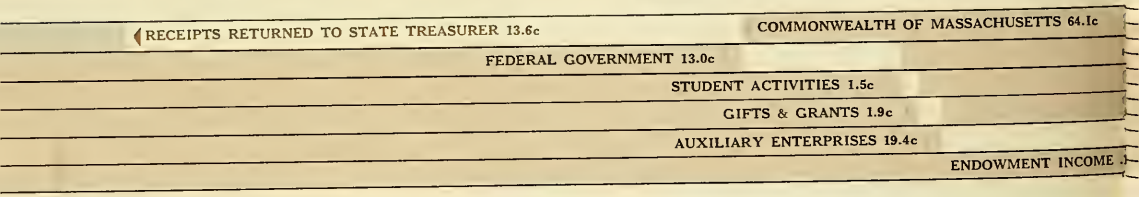
For the fiscal year 1965 the University received from all sources $27,852,888.48 for operating purposes. Of this, a total of $17,848,287.60 was appropriated by the Commonwealth, amounting to 64.1 cents out of each operating dollar. In the prior year, this figure was 65.2 cents of each operating dollar.

However, the University returned to the State Treasurer, as required by the State Constitution, all funds representing collections for student tuition, room, and sundry sales and services, amounting in fiscal 1965 to $3,780,225.60. Thus, the net cost to the taxpayers of the Commonwealth was only $14,068,062, or 50.5 cents out of each operating dollar. This compares favorably with the figure for fiscal 1964 of 50.7 cents out of each dollar.

The following sources provided the balance of the operating dollar for fiscal 1965:

Federal government, 13 cents; student activities, 1.5 cents; auxiliary enterprises (dining halls, etc.), 19.4 cents; gifts and grants, 1.9 cents, and endowment income, .1 cent.

1965 Income	Total Amount	Percer of Tot
Funds from University Receipts:		
Tuition	$ 2,228,881.91	8
Residence	1,276,126.39	4
Sales & Services	275,217.30	1
Total University Receipts	$ 3,780,225.60	1
Net Funds From Taxpayers of the Commonwealth	14,068,062.00	5
Sub-Total	$17,848,287.60	6
Federal Government	3,631,309.07	1
Student Activities	408,143.87	
Gifts & Grants	516,980.50	
Auxiliary Enterprises	5,431,175.89	1
Endowment Income	16,991.55	
Total Receipts	$27,852,888.48	10



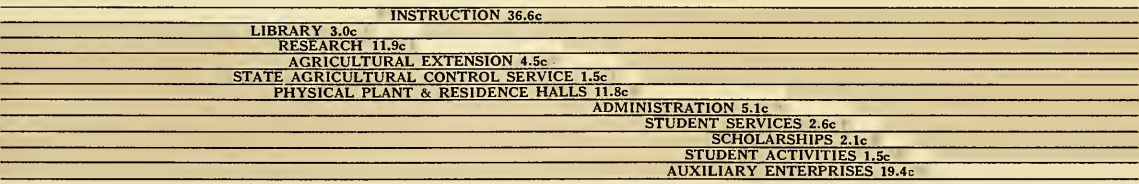
How It Is Spent . . .

Direct instructional costs represented the largest single operating expenditure, requiring $10,174,313.81 (or 36.6 cents of each dollar) out of total expenditures of $27,852,888.48. Research and library, closely related to instructional costs, required 11.9 and 3 cents respectively of each operating dollar. Agricultural Extension and state agricultural control services took 4.5 and 1.5 cents each.

Operation and maintenance of the physical plant and residence halls accounted for 11.8 cents of the dollar. A total of 19.4 cents on the dollar went toward auxiliary enterprises (dining hall operations, etc.) and 1.5 cents toward student activities. Other shares of the 1965 operating dollar were as follows: administration, 5.1 cents; student personnel services, 2.6 cents, and scholarships, 2.1 cents.

The chart at right shows that of the 36.6 cents of each dollar spent for instruction, 32.5 cents (88.8 per cent) came from state appropriations, and the rest—4.1 cents (11.2 per cent)—was provided by the Federal government and from gifts and grants.

1965 Expenditures	Total Amount	Percent of Total
Instruction: State Funds	$ 9,039,230.64	32.5
Federal Funds	1,059,180.18	3.8
Gifts & Grants	75,902.99	.3
Total Instruction	$10,174,313.81	36.6
Library	833,172.31	3.0
Research	3,309,060.96	11.9
Agricultural Extension	1,265,891.23	4.5
State Agricultural Control Svc.	419,131.27	1.5
Physical Plant & Res. Halls	3,290,566.08	11.8
Administration	1,414,507.99	5.1
Student Services	714,644.82	2.6
Scholarships	592,280.25	2.1
Student Activities	408,143.87	1.5
Auxiliary Enterprises	5,431,175.89	19.4
Total Disbursements	$27,852,888.48	100.0



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UNIVERSITY OF MASSACHUSETTS
1863

1964-1965 Report of the President