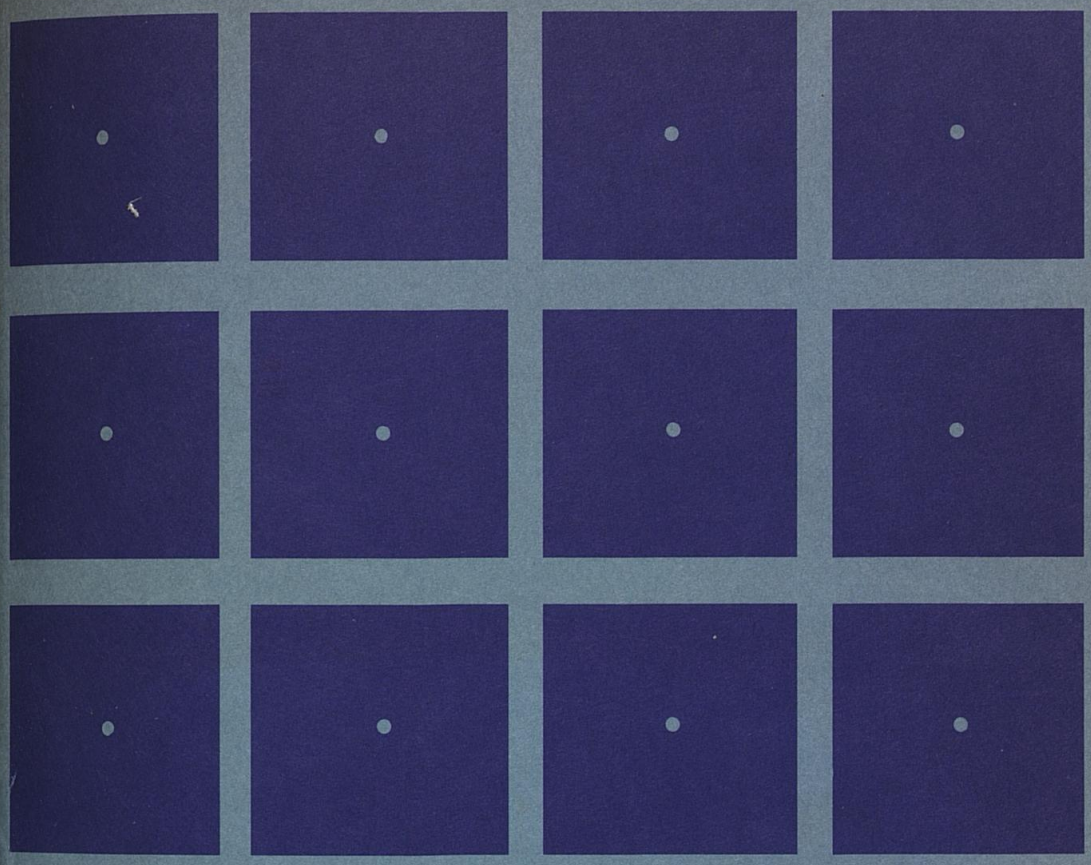
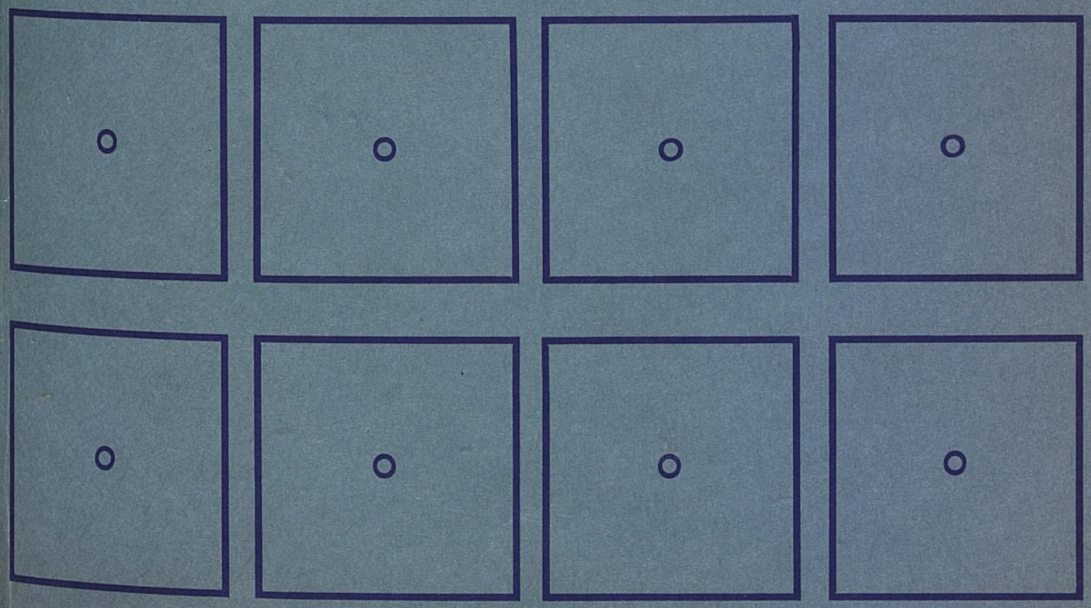
61:7



GRADUATE SCHOOL

University of Kentucky Bulletin • July 1969



BULLETIN OF THE
UNIVERSITY OF KENTUCKY

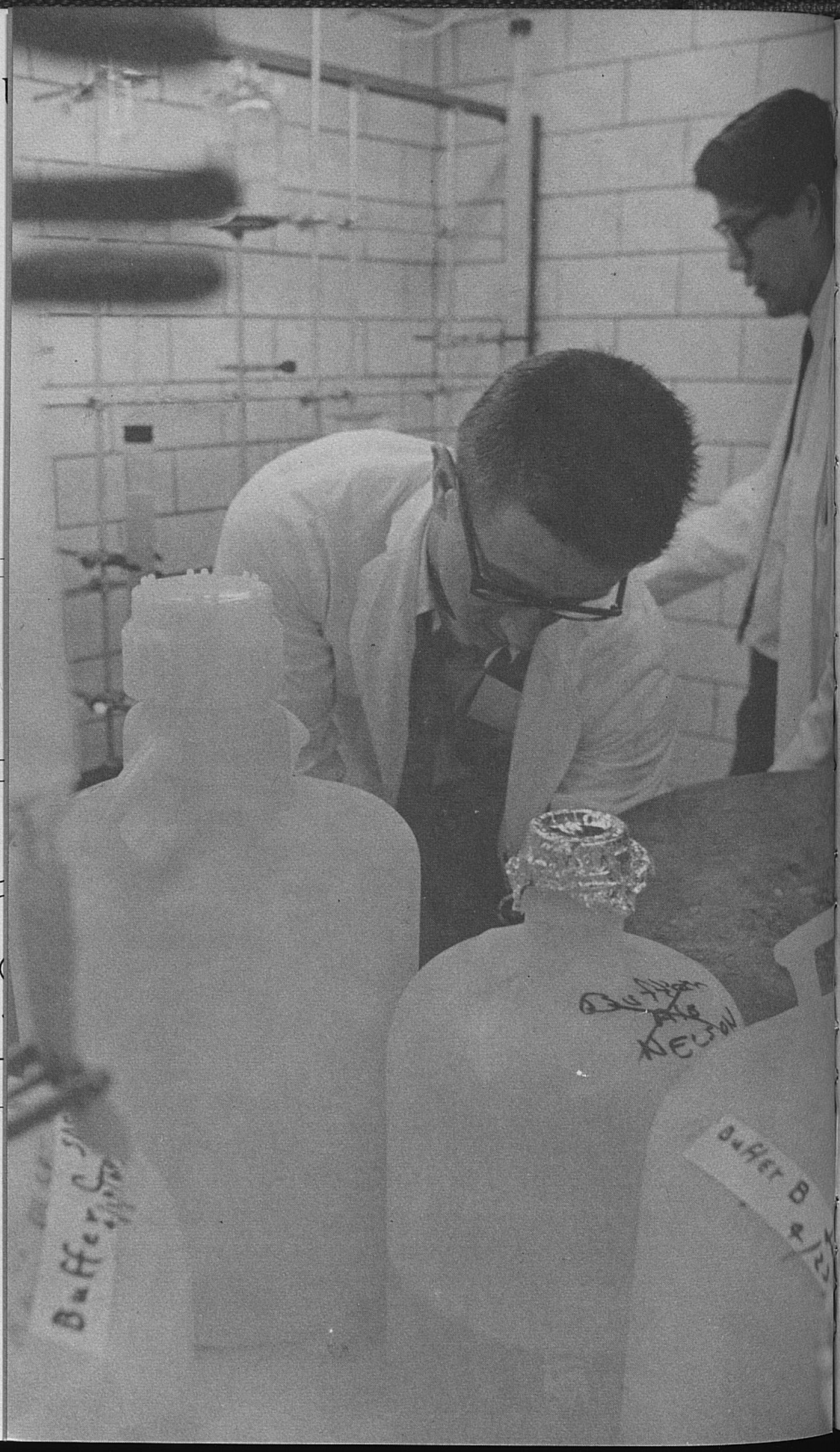
JULY, 1969

Graduate School

1969-70

One of a series of ten bulletins published January to October inclusive by the University of Kentucky, Lexington 40506. Second class postage paid at the Post Office, Lexington, Ky.

VOLUME 61 JULY, 1969 NUMBER 7



Uni

Gen

Sub

Grad

Fello

The

Contents

Page

University Calendar for 1969-70 4

General Information About the Graduate School 7

Subjects and Directors of Graduate Study 32

Graduate Courses of Study 37

I. Agriculture 37

II. Arts and Sciences 57

III. Business Administration and Economics 167

IV. Education 185

V. Engineering 217

VI. Law 243

VII. Medicine 245

VIII. Pharmacy 259

IX. Allied Health Professions 265

X. Home Economics 271

XI. Library Science 279

XII. Dentistry 285

Fellows and Scholars for 1969-70 287

The Graduate Council and Graduate Faculty 292

University Calendar—1969-70

1969	*Fall Semester*
July 28	Monday—Last day to submit all required documents to Registrar's Office for admission to the 1969 Fall Semester
Aug. 25, 26	Monday and Tuesday—Classification, registration and orientation for students not pre-registered
Aug. 27	Wednesday—Classwork begins
Sept. 1	Monday—Labor Day Holiday
Sept. 3	Wednesday—Last day to enter an organized class for the Fall Semester
Sept. 8	Monday—Last day to drop a course without a grade
Sept. 20, 27	Saturday—Graduate Record Examination
Sept. 26	Friday—Last day for filing application for a December degree in College Dean's Office. Graduation fees to be paid by October 27
Nov. 10	Monday—Last day to withdraw from a class before finals
Nov. 27-29	Thursday, Friday, and Saturday—Thanksgiving Holidays—academic holidays
Dec. 3	Wednesday—Thesis Deadline
Dec. 12	Friday—Last day to submit all required documents to Graduate School Admissions Office for admission to the 1970 Spring Semester
Dec. 13	Saturday—Classwork ends
Dec. 15-20	Monday thru Saturday—Final examinations
Dec. 20	Saturday—End of Fall Semester
Dec. 23	Tuesday—All grades due in Registrar's Office by 4:00 p.m.

1970	*Spring Semester*
Jan. 12, 13	Monday and Tuesday—Classification, registration and orientation for students not pre-registered
Jan. 14	Wednesday—Classes begin
Jan. 20	Tuesday—Last day to enter an organized class for the Spring Semester
Jan. 26	Monday—Last day to drop a course without a grade
Feb. 13	Friday—Last day for filing application for a May degree in College Dean's Office. Graduation fees to be paid by March 13
March 14-22	Saturday thru Sunday—Spring vacation

March 30	Monday—Last day to withdraw from a class before finals
April 17	Friday—Thesis Deadline
May 2	Saturday—End of classwork
May 4-9	Monday thru Saturday—Final examinations
May 9	Saturday—End of Spring Semester
May 12	Tuesday—Last day to submit all required documents to Graduate School Admissions Office for admission to the 1970 Summer Session
May 10	Sunday—Baccalaureate-Vesper
May 11	Monday—103rd Annual Commencement
May 12	Tuesday—All grades due in Registrar's Office by 4:00 p.m.

1970 *Summer Session*

June 9, 10	Tuesday and Wednesday—Registration
June 11	Thursday—Classwork begins
June 15	Monday—Last day to enter an organized class for the Summer Session
June 22	Monday—Last day to drop a course without a grade
June 26	Friday—Last day for filing application for an August degree in College Dean's Office. Graduation fees to be paid by July 10
July 4	Saturday—Independence Day Holiday—academic holiday
July 17	Friday—Thesis Deadline
July 23	Thursday—Last date to withdraw from a class before end of Summer Session
July 29	Wednesday—Last day to submit all required documents to Graduate School Admissions Office for admission to the 1970 Fall Semester
August 6	Thursday—End of 1970 Summer Session
August 10	Monday—All grades due in Registrar's Office by 4:00 p.m.



The Graduate School

LEWIS W. COCHRAN, M.S., Ph.D., Dean
JAMES C. HUMPHRIES, M.S., PH.D., Assistant Dean
CARL CABE, Ph.D., Assistant Dean
DOROTHY C. LINVILLE, A.B., Admissions Officer
LUCY ROBERTA HOGAN, A.B., Administrative Assistant
ROSA LENA BRUMFIELD, B.S. in Com., Administrative Secretary

Introductory Statement

THE UNIVERSITY OF KENTUCKY began offering graduate work in 1870, and awarding graduate degrees in 1876, although the Graduate School as a distinct unit was not organized until 1912.

The Graduate School is concerned with advanced study and research carried on by the faculty and students of all colleges and departments. Under it the total graduate resources of the University are merged in order to promote the achievement of knowledge in an atmosphere of free and lively inquiry.

Graduate work is offered in all colleges in the University. Directors of graduate study in the various subjects are listed in this bulletin just before the list of courses.

The following advanced degrees are conferred:

MASTER OF ARTS
MASTER OF ARTS IN EDUCATION
MASTER OF BUSINESS ADMINISTRATION
MASTER OF MUSIC
MASTER OF SCIENCE
MASTER OF SCIENCE IN ACCOUNTING
MASTER OF SCIENCE IN AGRICULTURE
MASTER OF SCIENCE IN AGRICULTURAL ENGINEERING
MASTER OF SCIENCE IN CHEMICAL ENGINEERING
MASTER OF SCIENCE IN CIVIL ENGINEERING
MASTER OF SCIENCE IN CLINICAL NUTRITION
MASTER OF SCIENCE IN DENTISTRY WITH SPECIALTY IN ORTHODONTICS
MASTER OF SCIENCE IN EDUCATION
MASTER OF SCIENCE IN ELECTRICAL ENGINEERING
MASTER OF SCIENCE IN ENGINEERING MECHANICS
MASTER OF SCIENCE IN HOME ECONOMICS
MASTER OF SCIENCE IN LIBRARY SCIENCE
MASTER OF SCIENCE IN MECHANICAL ENGINEERING
MASTER OF SCIENCE IN MEDICAL RADIATION
MASTER OF SCIENCE IN METALLURGICAL ENGINEERING
MASTER OF SCIENCE IN NUCLEAR ENGINEERING
MASTER OF SCIENCE IN PUBLIC HEALTH
MASTER OF SCIENCE IN RADIOLOGICAL HEALTH
MASTER OF SCIENCE IN STATISTICS
SPECIALIST IN EDUCATION
DOCTOR OF BUSINESS ADMINISTRATION (D.B.A.)
DOCTOR OF EDUCATION (Ed.D.)
DOCTOR OF MUSICAL ARTS IN MUSIC TEACHING (D.M.A.)
DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is offered with major work in the following fields: Agricultural Economics, Agricultural Engineering, Anatomy, Animal Sciences, Anthropology, Biology, Biochemistry, Chemical Physics, Chemistry, Civil Engineering, Diplomacy and International Commerce, Economics, Education, Electrical Engineering, Engineering Mechanics, English, Entomology, French, Genetics, Germanic Languages, History, Mathematics, Mechanical Engineering, Metallurgical Engineering, Microbiology, Musicology, Pharmaceutical Sciences, Pharmacology, Physics, Physiology and Biophysics, Plant Pathology, Plant Physiology, Political Science, Psychology, Sociology, Soil Science, Spanish, Statistics, Toxicology, and Veterinary Science. Minor work may be carried in any department offering graduate courses.

Organization of the Graduate School

THE GRADUATE FACULTY consists of the Dean of the Graduate School and all persons appointed thereto by the President of the University in the manner set forth below. As the chief University agency for the promotion of the ideals of graduate study, it determines the policies of the Graduate School and makes recommendations to the University Senate on such matters as require the approval of that body, and it may make recommendations on other matters to the President, or to other administrative officials. All rules affecting graduate work and the inauguration of new graduate majors must be approved by the Graduate Faculty.

Any proposed change in the rules of the Graduate School must be included in the agenda of the meeting and circulated to the Graduate Faculty at least ten days prior to the meeting at which it is to be considered.

New Graduate Faculty members may be proposed to the Dean of the Graduate School at any time by the college deans and department chairmen concerned, or in the case of persons not attached to a college faculty, by the Executive Vice-President of the University. Eligibility qualifications are as follows:

1. The doctor's degree or its equivalent in scholarly reputation.
2. The rank of assistant professor (or equivalent), or higher.
3. Scholarly maturity and professional productivity as demonstrated by publications, editorial services, research surveys, creative work, or patents; and research in progress at the time of proposal.
4. Definite interest in graduate work and the willingness to participate in the graduate program.

Appointment to the Graduate Faculty is made by the President of the University on nomination by the Dean of the Graduate School after

he and the Graduate Council have studied the credentials submitted in support of the proposed members.

Associate members are appointed by the Dean of the Graduate School upon nomination by the Director of Graduate Study. Associate membership is limited to non-tenured Assistant Professors who hold the doctorate, have been full-time members of the faculty for at least one year, and have initiated a significant research effort. This membership may continue no more than five years. Associate members are authorized to teach graduate courses, direct masters' theses, serve on and co-chair doctoral committees, and attend and participate in Graduate Faculty meetings. They do not have voting privileges in the Graduate Faculty.

Administrative officers assigning teaching and other duties to members of the Graduate Faculty who are taking an active part in the graduate program (i.e., are heavily engaged in directing theses, carrying on productive research, etc.) should make appropriate reduction in the duties required of such teachers.

THE DEAN AND HIS OFFICE. The Dean of the Graduate School is charged with the administration of the policies adopted by the Graduate Faculty and the University Senate relating to graduate studies. He presides over all meetings of the Graduate Faculty and calls meetings of this faculty whenever he thinks it advisable or whenever requested to do so by one fourth of the membership. He makes recommendations to the Graduate Faculty respecting the requirements for advanced degrees, the regulations necessary to insure a high standard of graduate work, the departments of colleges authorized to offer courses leading to graduate degrees, and all other aspects of the graduate program. He appoints a committee for each graduate student, arranges for final examinations, advises students with regard to their studies and the requirements of the Graduate School, and in all other ways administers the graduate program in the interests of efficient instruction and the highest attainment possible on the part of each graduate student. He is responsible for determining and certifying to the Registrar candidates who have fulfilled requirements for advanced degrees, and he reports annually to the President of the University on the work of the Graduate School and its needs.

The President and the Dean of the Graduate School are members ex-officio of all committees of the Graduate Faculty.

THE GRADUATE COUNCIL is composed of eleven members and the Dean of the Graduate School, who is chairman. There are eight elected representatives and three members appointed by the Dean of the Graduate School. One of the elected members is from the College of Agriculture, two from the College of Arts and Sciences, one from the College of Business and Economics, two from the College of Education,

one from the College of Engineering, and one from the College of Medicine. The member or members from each of these colleges are elected by the Graduate Faculty members in that college. The term of office of the elected and appointed members is three years, and no member may succeed himself until three years have elapsed since the completion of his last term.

The Graduate Council approves or disapproves proposals concerning courses offered for graduate credit, and advises and lends assistance to the Dean in his execution of policies and regulations determined by the Graduate Faculty. Specifically, the Council . . .

1. Studies requests of departments relating to proposed graduate programs.
2. Reviews existing programs and courses.
3. In cooperation with the Dean, initiates recommendations to the Graduate Faculty. (This procedure is not intended to prevent a faculty member from bringing any recommendation or request directly before the Graduate Faculty.)

The Graduate Council has only such authority as is herein granted, or such as the Dean or the Graduate Faculty may delegate to it. A majority of the Graduate Council constitutes a quorum for the transaction of business.

Directors of Graduate Study. A director of graduate study serves as adviser to each student majoring in his area until the student has a thesis director. The director of graduate study then recommends that this thesis director be appointed the student's adviser or committee chairman. In areas where theses are not required, the director of graduate study is the adviser for all students not writing theses. All student classification schedules must be endorsed by the student's adviser.

If it is desirable, a director of graduate study may recommend that additional advisers in the area be appointed. A director of graduate study who is to be absent from the University for as long as a semester must call this fact to the attention of the Dean so that a substitute may be appointed.

Directors of graduate study make annual reports to the Dean of the Graduate School on the progress and needs of graduate work in their areas in time to permit the Dean to use this information in his annual report to the President of the University.

The Dean of the Graduate School, with the advice of the college dean(s) and the approval of the President, may recommend to the Graduate Faculty the areas of graduate study and research into which the University may be divided. (The logical unit for an area is a

department. By common consent, however, certain departments may be grouped into an area; and in exceptional cases a department may be divided into two or more areas.) The Directors of Graduate Study for the various areas are recommended to the President of the University by the Dean of the Graduate School after he has conferred with the respective graduate staffs and college deans of the areas concerned.

Establishment and Modification of Graduate Programs. An area which wishes to establish a new graduate program or modify an existing one must submit its program to the Graduate Council, which will make recommendations concerning it to the Graduate Faculty.

Honorary Degrees. The selection of candidates for honorary degrees originates in the Graduate Faculty, and the Graduate Faculty makes its recommendations to the University Senate.

Honorary degrees are normally conferred at the May Commencement, but may be conferred at other times with the approval of the Graduate Faculty. Recipients must be present in order to receive honorary degrees.

Admission

A student who is a graduate of a fully accredited institution of higher learning and has an undergraduate grade-point standing of 2.5 on a basis of 4.0 may apply for admission to the Graduate School by submitting to the Graduate Admissions Office two official transcripts of all college courses and a written application at least a month before anticipated entrance. Application blanks may be obtained from the Admissions Office of the Graduate School. A student with a grade-point average of less than 2.5, or a graduate of a non-accredited institution, may be admitted only after the Graduate Record Examination or other evidence acceptable to the Dean of the Graduate School, and to the Department, indicate that he is capable of doing satisfactory graduate work. Individual departments may establish higher requirements.

It should be clearly understood that a graduate student may not be able to begin immediately a full graduate program leading to the degree he desires. It may be necessary for him to demonstrate his ability to write accurate and effective English or he may have to satisfy certain prerequisites which he omitted in his undergraduate curriculum. Deficiencies are determined by the department in which the major work is to be done. Ordinarily, a graduate student may begin a full program in any field in which he has a balanced undergraduate major or its equivalent.

Admission to the Graduate School entitles a student to take such courses as he desires, provided he has the necessary prerequisites. *How-*

ever, admission does not automatically make a student a candidate for a graduate degree.

Attendance in the Graduate School at the University of Kentucky is not a right. It is a privilege which may be withdrawn by the University or any area of graduate study if it is deemed necessary by the Dean of the Graduate School in order to safeguard the University's standards of scholarship and character.

STUDENT RESPONSIBILITY

It is the responsibility of the student to inform himself concerning, and to observe all regulations and procedures required by the course he is pursuing. *In no case will a regulation be waived or an exception granted because a student pleads ignorance* of the regulation or asserts that he was not informed of it by his adviser or other authority. Therefore, the student should become familiar with the *Graduate School Bulletin*, including (1) the section presenting the requirements for the degree which he plans to take, and (2) the offerings and requirements of his major department.

The student should consult the Director of Graduate Studies of the department in which he will do his work concerning course requirements, any deficiencies, the planning of a program, special regulations, etc. Departments may have degree requirements that are not listed in the *Bulletin*.

It is to be noted that the Graduate Dean interprets the *Graduate Bulletin;* any other interpretations are unofficial. Only the Graduate Council may waive requirements stated in this Bulletin.

ADVANCED DEGREES FOR FACULTY MEMBERS

Members of the faculty of the University of Kentucky having a rank higher than that of instructor may not be considered as candidates for advanced degrees from this institution. They may take graduate courses, but these may not apply toward a degree from the University.

THE GRADUATE RECORD EXAMINATION

All students working for graduate degrees must take the Graduate Record Examination (the Aptitude Test, and the Advanced Test in the major subject). This must be done no later than the first term of graduate work. (See the calendar at the front of this bulletin.)

The College of Business and Economics may substitute the Admission Test for Graduate Study in Business (ATGSB) for the Graduate Record Examination, Aptitude and Advanced Tests, for MBA, DBA and Accounting students.

APPLICATION FOR FULL GRADUATE STANDING

A graduate student desiring to earn a graduate degree must be approved for full graduate standing by the department in which he intends to major and by the Graduate School. Application should be made as soon as scores on the Graduate Record Examination are available, and in any case prior to the beginning of the semester or term in which the degree is sought.

To be admitted to full graduate standing, a student (in addition to meeting the admission requirements) must have scores on the Graduate Record Examination satisfactory to the department concerned and to the Dean of the Graduate School, and a *B* average or higher on all graduate work completed at the University of Kentucky.

Graduate work taken before a student is admitted to full graduate standing will be evaluated by the Director of Graduate Study in the major area and by the Dean of the Graduate School at the time the application for full graduate standing is considered.

GRADUATING SENIORS AS PART-TIME GRADUATE STUDENTS

A senior in the University of Kentucky lacking no more than six credit hours for graduation and having an undergraduate average of at least 2.5 may register in the Graduate School with the consent of his college dean and the Dean of the Graduate School. Approval of the appropriate director of graduate study is required if the student is to be an applicant for a degree. The total load of such a student may not exceed twelve credit hours. Graduate credit will be allowed for each credit hour of graduate work beyond the six or fewer credit hours needed to complete undergraduate requirements. The incidental fee is that of a full-time student in the school in which more than half of the work is taken. In cases where the load is evenly divided between the schools, the larger fee is assessed. Requirements for the undergraduate degree must be completed during the semester in which the student is allowed to register for part-time graduate work. Students desiring to enroll in the Graduate School under these conditions must fill out in duplicate a petition listing the course or courses to be taken in order to complete their undergraduate requirements. The petition must be approved by both deans concerned.

General Requirements for All Advanced Degrees

COURSES AND GRADES

All courses numbered 500 through 799 may be counted for credit toward a graduate degree provided they are approved as an appropriate

part of the student's graduate program by his graduate adviser or committee. Courses numbered 400 to 499 carry graduate credit for nonmajors only. An over-all average of *B* on all work taken as a graduate student, as well as a *B* average on all work carrying graduate credit, must be attained before an advanced degree may be awarded. All work is to be counted and none of it may be omitted in computing the average except those grades in courses which do not give graduate credit may be omitted from a student's average by the Dean of the Graduate School on recommendation of the student's adviser. *D* grades are not given to graduate students. An "incomplete" (*I*), unless the Dean of the Graduate School grants an extension of time, must be removed within one calendar year after the close of the term in which the *I* is assigned if the student is to receive credit.

DROPPING OF COURSES

During the first ten class days of the term a graduate student may drop a regular course without a grade, provided he has the approval of his instructor, his director of graduate study, and the Dean. Regular courses may not be dropped later in the term without the assignment of a grade: *W* if a student withdraws passing, *E* if he is failing. However, only under very special circumstances may he be allowed to withdraw from a class within five weeks of the final examination period.

GRADES

The official grades of graduate students are recorded in the office of the Registrar. The Registrar provides official transcripts on the same basis as for undergraduate students. Also, he provides the Dean with the grades of all students in order that the Dean may be able to advise students concerning their programs.

The grading of graduate students is done according to the following scale:

A—high achievement	4 grade points per credit
B—satisfactory achievement	3 grade points per credit
C—minimum passing grade	2 grade points per credit
E—failure	0 grade points per credit
I—incomplete	see explanation below
S—satisfactory	see explanation below

A grade of *I* (incomplete) may be assigned to a graduate student if a part of the work of a course remains undone and there is a reasonable possibility that a passing grade will result from completion of the work. No student may graduate with an *I* on his record without the permission of his adviser and the approval of the Dean of the Graduate School.

A grade of *S* (satisfactory work in progress) may be recorded for students in graduate courses which carry no credit; and in graduate seminars, independent work courses, and research courses which extend beyond the normal limits of a semester or summer term. The grade may not be given to a student in a course carrying credit if the student has done unsatisfactory work or if he has failed to do a reasonable amount of work. The project must be substantially continuous in its progress. When the work has been completed, a final grade will be substituted for the *S*.

Once a grade (other than an *I* or *S*) has been reported to the Registrar's Office, it may not be changed unless an error was made at the time the grade was given and recorded, and then only upon the written unanimous approval of the instructor, the Registrar, and the Dean of the Graduate School.

REGISTRATION AND CLASSIFICATION

All students expecting graduate credit must be enrolled in the Graduate School. Graduate Students will conform to the general registration schedule of the University and may not enter later than the last allowable date set by the Registrar.

Before registering, a graduate student must obtain his adviser's approval of his proposed program.

CREDIT EQUIVALENCE

Certain research courses carry no credit hours or grades but do contribute to the residence requirements of graduate degrees. For these courses the credit equivalent is stated in the course descriptions.

ACADEMIC LOAD

The total term load of a student is the sum of all credits and credit equivalents being carried. The normal load of a graduate student during any semester is twelve credit hours or equivalent and under no circumstances may it exceed fifteen credit hours or equivalent. In the summer session the normal load is six credit hours and the maximum nine. Students satisfactorily completing in residence 9 course credits, or equivalent, of graduate level work during a semester, or 6 course credits, or equivalent, during a summer term are classified as full-time or full-residence students. Those completing less than these amounts are classified as part-time or part-residence students.

A full-residence student who falls below the minimum full-residence equivalent as the result of failing or dropping one or more courses is reclassified as a part-time or part-residence student for that term.

A master's candidate working on his thesis may register for up to the equivalent of 6 course credits by signing for course 768 in the appropriate department and indicating the desired credit equivalent in parentheses on the registration card.

A doctoral candidate working on his dissertation may register for up to the equivalent of 12 credits by signing for course 769 in the appropriate department and indicating the desired credit equivalent in parentheses on the registration card.

Graduate students serving in the University as assistants or part-time instructors should register for less than the normal load, as determined by their advisers. Persons holding full-time working or professional assignments, whether employed by the University or not, may not take for graduate credit toward a degree in any single semester or term more than 5 credit hours. A student may petition for a waiver of this rule if he meets the following conditions: (1) has satisfactorily completed six credit hours of graduate work; (2) has attained higher than national average scores on the aptitude and advanced tests of the Graduate Record Examination; (3) and has appropriate employment facilities and conditions.

SHORT COURSES: WEEKLY COURSES

Short courses are defined as courses of less than a term in length; weekly courses are courses of more than one credit that meet only once a week. A short course may not carry credits greater than the number of weeks during which it is offered. Two short courses of 4 weeks or less or two full-term courses and a short course may not be taken simultaneously. A total graduate program may not be made up of short courses. Not more than 12 hours of the course work requirements for a degree may consist of courses (resident and extension) that meet only once a week.

TIME LIMIT FOR DEGREES

No course or equivalent credit may be given for graduate study completed more than eight years prior to the end of the semester at which the student expects to receive his degree unless such credit or equivalent is specifically validated by the Graduate Council on written recommendation of the appropriate director of graduate study. No course or equivalent credit may be validated in this manner if completed more than twelve years prior to the end of the semester in which the student expects to receive his degree.

GRADUATION

Advanced degrees may be conferred at the close of any semester or summer session, but commencement exercises are held only at the close of the academic year. A student who is scheduled to receive his degree at the close of the academic year is expected to attend the commencement exercises unless he is excused in writing by the Dean of the Graduate School. Students who are eligible to receive degrees at the end of a first semester or a summer session may elect to defer their graduation and participate in the next commencement exercises. Appropriate academic costume must be worn. The graduation fee covers the cost of the diploma, the hood, and, in the case of the master's degree (with thesis), the binding of the thesis.

To be eligible for a degree, the student must file an application at the Graduate Office within 30 days after the beginning of the semester or 15 days in the Summer Session in which he expects to complete his work. The degree applicant must pay his graduation fees within 60 days after the beginning of the semester or 30 days in the Summer Session in which he expects to complete his work.

FEES

Registration fees per semester are $140 for residents of Kentucky, $490.00 for non-residents. Part-time graduate students who are legal residents of the state pay $17.00 per semester credit; non-residents pay $55.00 per semester credit. Resident students carrying full loads in the summer will pay $80.00, non-resident students $260.00 Those taking less than full loads pay the regular semester credit fee. The Registrar determines the status of one's residence for purposes of assessing fees.

Graduate fellows, graduate assistants, and instructors pay the fees assigned to Kentucky residents.

General Requirements for All Masters' Degrees

(See also pages 11-17)

ON-CAMPUS RESIDENCE

At least 18 semester hours of the minimum degree requirements must be earned while in residence on the Lexington campus of the University of Kentucky. Normally, candidates for masters' degrees must spend at least two full summer terms or one semester in full residence

at the University. For individual superior students the full residence requirement may be waived if recommended by the director of graduate study in the student's major area and approved by the Graduate Dean. Minimum eligibility for being so recommended includes: (1) the satisfactory completion of 12 credit hours of graduate work, (2) the attainment of national average scores on the Graduate Record Examination, and (3) the availability of employment facilities and conditions which make feasible satisfactory completion of degree requirements while the student is fully employed.

TRANSFER OF CREDITS

With the approval of his graduate adviser and the dean, a student may transfer up to six credit hours toward the satisfaction of the minimum requirements for masters' degrees, provided the work in question was taken while he was enrolled in residence in an approved graduate school.

EXTENSION AND CORRESPONDENCE WORK

Under certain conditions, up to six of the credit hours required for any master's degree may be earned in extension courses given in person by University of Kentucky instructors. No graduate credit is given for courses taken by correspondence.

M.A. OR M.S. DEGREE

Whether a candidate selects a Master of Arts or a Master of Science degree is left to the option of the candidate and his major department. In general it may be said that a candidate with major work in the natural sciences should take the M.S. degree; others the M.A.

COURSES AND CURRICULA

Graduate students are eligible to take regular courses which meet as organized classes and independent-study or research courses in which each student carries on investigations independent of class meetings. Independent study or research courses may not duplicate thesis work; thesis work must be done in addition to the minimum course requirements. At least two-thirds of the minimum requirements for the master's degree must be in regular courses, and at least half of the minimum requirements must be in courses numbered on the 600 or 700 level. Exceptions to this rule may be made only with the approval of the Graduate Council. Courses numbered at the 600 or 700 level shall be taught only by members of the Graduate Faculty or by such other instructors as are approved by the Graduate Dean.

A student may work toward only one master's degree at a time. He must establish at least one year of residence while earning a second master's degree.

EXAMINATIONS

A final examination (oral and/or written) is given all candidates for masters' degrees not later than eight days before the close of the semester in which the degree is to be awarded. The examination is scheduled by the Graduate Dean and the report is returned to him upon completion of the examination, which in no case may be later than two weeks after the start of the examination. The examining committee consists of at least three qualified members recommended by the director of graduate study and appointed by the Dean of the Graduate School.

If the candidate fails his final examination, the committee may recommend to the Graduate Council the conditions under which a second examination may be administered. Insofar as it is practicable the same examining committee gives this examination. In all decisions the majority opinion of the committee prevails. If the committee is evenly divided, the candidate fails. A third examination may not be allowed.

FEES

Before any master's degree may be conferred the student must pay a commencement fee of $25.00 at the Billings and Collections Office.

Requirements for the Degrees of Master of Arts and Master of Science

The Graduate School authorizes all departments which are approved for graduate work and which wish to do so to permit students to satisfy the requirements for the M.A. and the M.S. degrees by either of two plans.

Plan A

In addition to meeting all general requirements for masters' degrees (see pp. 11-16) the candidate must complete at least 24 semester credit hours of graduate course work with a standing of 3.0 (*B*) or higher, satisfy the language requirements, and write a thesis. A candidate must have a major area (defined usually as an academic department) and must (with the exceptions noted below) take at least two thirds of his courses in this area; the other one third may be taken in this area or in areas which have a graduate relationship to it. In Education, Agriculture, and Communications only one half of the work must be in the major area. When the setting up of major topics seems to require it, the Dean or (in

unusual cases) the Graduate Council may, on recommendation of the appropriate director of graduate study, authorize courses taught outside the major to count on the major.

Thesis

Two typewritten, unbound copies of the thesis must be presented to the Graduate School Office not later than two weeks before the last day on which grades may be reported to the Registrar's office. These copies must be approved by the thesis director and the appropriate director of graduate study, must be on 100 per cent rag or cotton fiber paper, and must be in a form acceptable to the Graduate School. Instructions for the preparation of theses should be obtained from the Graduate Office before the thesis is typed. The candidate must also submit an abstract of his thesis which does not exceed two hundred words and is suitable for publication. The final examination may not be taken before the thesis has been accepted by the Graduate School Office.

Theses must be developed under the direction of a member of the Graduate Faculty, except that in special cases the Graduate Dean may authorize a staff member not on the Graduate Faculty to serve as co-director. Collaborative group effort by two or more graduate students is not forbidden, but there must be enough independent effort to enable each student to make a separate contribution and to prepare an individual thesis.

Each thesis must be acceptable to the examining committee at the time of the final examination.

Theses submitted by candidates become the physical property of the University of Kentucky and authors agree that the University may decide the conditions under which they may be used or published. The University protects the authors' rights by placing certain restrictions upon borrowers' use of theses as long as they are unpublished. A copy of the following regulations (to be prepared by the student) is placed before the title-page of every thesis.

> Unpublished theses submitted for the masters' and doctors' degrees and deposited in the University of Kentucky Library are as a rule open for inspection, but are to be used only with due regard to the rights of the authors. Bibliographical references may be noted, but quotations or summaries of parts may be published only with the permission of the author, and with the usual scholarly acknowledgments.
>
> Extensive copying or publication of the thesis in whole or in part requires also the consent of the Dean of the Graduate School of the University of Kentucky.
>
> A library which borrows this thesis for use by its patrons is expected to secure the signature of each user.

Name and Address Date

.....

.....

.....

.....

.....

FOREIGN LANGUAGE REQUIREMENT:

A reading knowledge of a modern foreign language is required. Ordinarily this language will be French, German, or Russian, but another language may be substituted if it can be shown to be pertinent to the student's program and is approved by the adviser and the Dean of the Graduate School. The language requirement must be satisfied by an examination given by the appropriate language department of the University or by such persons as the Graduate Dean may specify. A candidate for a degree in the language which is his native tongue must do a full minor (one third of his work) in areas in which English is the language employed.

Plan B

Plan B (which is not necessarily available in all departments that have Plan A) has the same minimum requirements as Plan A except that six or more credit hours of course work may be submitted for a thesis. A student may follow this plan only with approval of the department concerned.

A student should consult his adviser for any additional requirements that may have been set up for Plan B by his area of study.

Specialized Masters' Degrees

Special requirements concerning the Master of Science in Accounting, the Master of Science in Agriculture, the Master of Science in Clinical Nutrition, the Master of Science in Dentistry, the Master of Science in Home Economics, the Master of Science in Library Science, the Master of Arts in Education, the Master of Science in Education, the Master of Science in Public Health, the Master of Music, the Master of Science in Statistics, the Master of Business Administration, the Master of Science in Radiological Health, the Master of Science in Radiation Dosimetry, and the Master's Degrees in Engineering are explained in the section of this Bulletin which outlines departmental offerings.

Requirements for the Degree of Doctor of Philosophy

The degree of Doctor of Philosophy is conferred upon a candidate who, after completing not fewer than three years of graduate work devoted to study of a special field of knowledge, presents a satisfactory thesis, passes a comprehensive examination on his thesis subject and chosen field, and shows sufficient promise of scholarly attainment.

The doctor's degree is intended to represent, not a specified amount of work covering a specified time, but the attainment, through long study, of independent and comprehensive scholarship in a special field. Such scholarship should be evidenced both by the student's grasp of subject matter and by his capacity to do research.

Information concerning admission may be found on page 11.

THE STUDENT'S ADVISER AND SPECIAL COMMITTEE

The director of graduate study in the student's major area serves initially as the student's adviser and signs his schedule before it is presented to the Dean. When the thesis director has been chosen, the student's special committee is set up by the Dean after he has conferred with the student, the director of graduate study, and the thesis director.

The special committee consists of the thesis director as chairman, two or three other members from the major area, and at least one representative from each minor area—in all, no fewer than five members. This committee advises the applicant and sets the requirements which the student must meet before he may be admitted to the qualifying examination. The special committee keeps minutes of all meetings and sends abbreviated copies to the Dean to be made a part of the student's record. Ordinarily this committee determines when the qualifying examination is to be administered, and the chairman schedules the examination in writing, sending a copy of the announcement to the Dean. The committee is the final judge on a majority basis of the questions to be asked on the qualifying examination and of whether the student passes.

A department which elects to do so may give a uniform departmental qualifying examination to its candidates instead of delegating full responsibility to the special committee.

MAJOR AND MINOR SUBJECTS

Every applicant for the Ph.D. degree must select a major area of study and some programs require one or two minor areas. The major area is one in which the student intends to concentrate his efforts.

If a minor area is required, this area must be approved by the Graduate Dean and the subjects to be included in the minor(s) must be approved by the representatives of the minor(s) on the special committee. Normally, when an outside minor is required, at least one-sixth of the student's program should be devoted to study in this area.

RESIDENCE REQUIREMENTS

A minimum of three collegiate years of full-residence graduate work or its equivalent in a combination of full- and part-time residence, is required for the doctorate. At least two semesters (exclusive of summer sessions) of the required residence above the master's degree (or its residence equivalent) must be earned at the University of Kentucky in full-residence status, or in a combination of graduate study, research, and not more than half-time assignment as a research or teaching assistant. "Residence equivalent" to the master's degree is interpreted as one academic year of full-residence graduate work or its equivalent in a combination of full and part-time residence.

A year of residence is required after the qualifying examination before the degree is conferred. If the examination is completed within the first six weeks of a semester, that semester will count as half the year. If a student has passed his qualifying examination but has earned less than one year of residence after the qualifying examination, he may petition the Graduate Dean for a waiver of this requirement.

The amount of residence to be transferred on account of prior graduate work at some other institution is determined jointly by the director of graduate study in the area and the Dean of the Graduate School. Ordinarily, however, graduate students may be allowed only one year of residence toward the doctorate for earlier study which has been used to satisfy the requirements for a master's degree or masters' degrees.

Candidates working on the dissertation project who need residence credit should register for course 769 in proportion to the amount of time to be devoted to the project. Students working full-time on the dissertation should register for the equivalent of 12 credits; i.e. 769 (12). Those devoting less than fulltime should register for proportionately less 769 residence.

Should conditions merit or require that all or part of the dissertation project be carried out away from the campus of the University of Kentucky and the arrangement has the approval of the candidate's dissertation director and the Dean of the Graduate School, needed minimum residence credit can be gained by registering for course 769 as described above for on-campus candidates.

Students with full-time positions and who are taking no credit course

work may register for no more than the 769 equivalent of 5 credits per semester or 3 credits per summer term.

While it is expected that a well-prepared student of good ability may secure the degree upon completion of three years of full-time study, it should be understood that this requirement is a minimum and is wholly secondary to scholarly accomplishment.

Students who have fulfilled the minimum residence requirements for a graduate degree and who are not registering for course credits but who are carrying out on-campus dissertation work, hence are utilizing University faculty and/or facilities either full-time or part-time must register during each term of such on-campus activity.

LANGUAGE REQUIREMENTS

As stated in the specific program description, an applicant must have a reading knowledge of one or two modern foreign languages. The language or lauguages will normally be chosen from French, German, or Russian. However, with the approval of the student's special committee, the director of graduate study in the area, and the Graduate Dean, certain substitutions may be made:

1. Some other language may be substituted for one of those normally required if it can be demonstrated that the student's scholarly needs will be better served thereby.
2. In special cases fluency in one foreign language may be substituted for a reading knowledge of two languages.

If after four semesters of full-time graduate work (i.e., above the A.B.) the student has not satisfied the foreign language requirement, he must register for a language course or courses as a part of his course load. The language requirement must be satisfied before the applicant may be admitted to the qualifying examinations. Proficiency in foreign languages is determined by examinations conducted by the appropriate language department or by such persons as the Graduate Dean may specify.

THE QUALIFYING EXAMINATION

A qualifying examination is required of all applicants for the doctorate in order to determine whether the applicant should be admitted to candidacy. Normally this examination is prepared by the student's special committee (see page 22) and should be taken during or after the student's fourth semester of full-time graduate study, or the equivalent. The qualifying examination shall be both written and oral. The special committee reports to the Dean the result of the examination. If the result is failure, the committee recommends the conditions to be

met before another examination may be administered. The minimum time before another examination may be given is four months. The same committee, or as many of the members as are available, plus those added by the Dean to fill vacancies, gives the second examination. This examination must be completed and the result reported to the Graduate Dean within sixty days of the beginning of the examination. A third examination may not be allowed.

THE THESIS

Each candidate must present a thesis which is the result of original research and adds to or otherwise modifies what was previously known on the subject. Unless the director of the thesis specifically recommends departures, the thesis must be in conformity with the instructions prepared by the Graduate School, must be on 100 per cent rag or cotton fiber paper, and must be satisfactory in style and composition.

Before the thesis is formally submitted, the student must bring it to the Graduate Office to have it checked for form. Two typewritten copies of the thesis (unbound) and two typewritten copies of an abstract, usually of not less than 400 words nor more than 600 words, must be presented to the Dean of the Graduate School at least two weeks before the final date on which the Registrar's Office will receive grades of candidates for degrees at the next commencement. An approval sheet signed by a majority of the special committee (including the director of the thesis) must accompany the thesis. When theses are submitted, a standard form containing RULES FOR THE USE OF THESES must be prepared and must be included with the manuscript, before the title page. (See page 20 for these RULES.)

Each graduating doctoral student will pay a fee of $75.00 to cover microfilming and copyright of the dissertation, binding of the dissertation, and the cost of the hood. Payment will be made at the Billings and Collection Office.

THE FINAL EXAMINATION

After the acceptance of the thesis by the special committee and the Dean of the Graduate School, the candidate is given a final oral, or, if the examining committee elects, an oral and a written examination. The examining committee consists of a minimum of five persons, appointed by the Dean of the Graduate School, after he has conferred with the director of graduate study for the area. The director of graduate study (or his delegate) serves as chairman of the committee. Other members include the thesis director, a third representative of the department, a representative of the minor area, and one member of the Graduate Faculty associated with neither the major nor minor areas. (The Presi-

dent of the University and the Dean of the Graduate School are ex-officio members of all examining committees.) The final examination includes a defense of the thesis and may be as comprehensive in the major and minor areas as the committee desires to make it. In all decisions the majority opinion of the committee prevails. If the committee is evenly divided, the candidate fails.

If the candidate fails, the committee may recommend to the Graduate Dean the conditions under which the candidate may have another examination. This examination will be administered by as many of the original committee members as are available, plus new members appointed by the Dean to fill vacancies.

If the student passes this examination, he will be recommended for the degree at the next commencement, provided one academic year has elapsed since the qualifying examination.

Requirements for the Degree of Doctor of Education

The requirements for the degree of Doctor of Education are the same as for the degree of Doctor of Philosophy with the following exceptions:

1. No foreign languages are required for the Ed.D. degree.
2. A minimum of 72 credit hours is required, at least one third and not more than one half of which must be in departments outside the College of Education.

Applicants for the Ed.D. degree, who are required to do at least one third of the minimum requirements outside of areas of the College of Education, must declare at least one area other than Education when their special committees are appointed. Two members must be chosen from areas outside the College of Education.

The Graduate Committee of the College of Education and the Graduate Dean will evaluate credits and residence to be allowed transfer students. It is understood, however, that the special committee may accept only such courses as fit into the graduate program of the student.

JOINT-DOCTORAL PROGRAM WITH THE STATE UNIVERSITIES

Doctoral programs in Education are offered jointly between the University of Kentucky and the other state universities: Eastern, Morehead, Murray, and Western. These programs permit qualified candidates to complete approximately one year of graduate work above the master's

degree at the cooperating university. A minimum of eighteen credit hours of course work, the qualifying examination and the dissertation must be completed at the University of Kentucky, and a minimum of one academic year must be spent in full-time residence on the Lexington campus. The work of each candidate is directed by a joint faculty committee from both institutions.

Persons interested in this program should confer with the Dean of the Graduate School at the cooperating university, or the Coordinator of Graduate Studies in Education at the University of Kentucky. Applications may be filed for review by a joint screening committee. Admission will depend upon academic standing, scores on standardized examinations, and personal references.

Requirements for the Degree of Doctor of Musical Arts

The requirements for the degree of Doctor of Musical Arts are the same as for the Doctor of Philosophy, with the following exceptions:

1. Only one foreign language, normally French or German, is required for the D.M.A. degree. The candidate must also demonstrate a working knowledge of musical terms in French, German, and Italian prior to the qualifying examination.
2. The applicant for this degree must have at least two years of successful teaching experience.

Further information concerning prerequisites and courses of study can be found on page 120 of the Graduate Catalogue. At present the Doctor of Musical Arts is offered only in the field of Music Teaching.

The Director of Graduate Studies of the Department of Music and the Graduate Dean will evaluate credits and residence to be allowed transfer students. It is understood, however, that the special committee may accept only such courses as fit into the graduate program of the student.

Requirements for the Degree of Doctor of Business Administration

The Doctor of Business Administration is designed primarily for students interested in teaching and research. It focuses on administrative science and requires additional work in research methodology, economic theory, and quantitative analysis.

Major and minor fields may be selected from accounting, behavioral analysis, managerial economics, finance, human resource development, international business, and marketing. Further information concerning prerequisites and courses of study can be found on page 168 of the Graduate Bulletin.

Requirements for the Degree of Specialist in Education

The degree of Specialist in Education is conferred upon a candidate who satisfactorily completes a sixth-year planned program in Education under the general requirements of the Graduate School (page 13) and the following special requirements.

Admission

The student, prior to admission to the program, must (1) have a master's degree, (2) ordinarily have a standing of 3.4 or higher on his graduate work, (3) meet the requirements for a teaching certificate or have credentials appropriate to his field of specialization, and (4) have at least 30 credit hours in courses in education (undergraduate and graduate).

A student must file an application with the Dean of the College of Education. The application will be considered by an admissions committee of the College of Education and each student must be recommended to the Graduate School by the division or department in which he plans to major.

Program

The student must earn a minimum of 30 credit hours of graduate work beyond the master's degree (of which at least 15 must be in courses numbered 600 or above).

The division or department in which the student majors is responsible for helping the student plan a program to meet his needs. The program should contribute to specialization in a field but should not neglect the broader development of the individual.

The student must complete an independent research problem (equal to 3 but not to exceed 6 credit hours) and submit a written report, a copy of which is to be filed with the division or department directing the research.

With the approval of the Graduate Dean and of the division or department in which he is to major, the student may transfer a maximum of 6 hours of residence credit earned beyond the master's degree from an institution which is approved to offer work above the master's level.

Final Examination

The final examination required of all candidates is administered by an examining committee consisting of at least three qualified members recommended by the adviser and the director of graduate study and appointed by the Dean of the Graduate School.

Graduate Students Not Applicants for Degrees

Graduate students who are not working toward advanced degrees are not required to designate major or minor subjects, but may elect their work with a view to the special purposes for which they are in attendance at the University.

Any course of study announced for advanced undergraduates and graduates is open for election by such students under the same conditions as apply to candidates for degrees.

Should a graduate student who has not taken his work with a view to obtaining a degree subsequently desire to become an applicant for a degree, the number of credit hours he is to receive for work already done will be determined at the time he applies for admission as applicant for the degree.

Research Program at Oak Ridge Associated Universities

The University is one of the Sponsoring Universities of the Oak Ridge Associated Universities located at Oak Ridge, Tennessee. Through this association, the University of Kentucky Graduate Research Program has at its disposal all of the facilities of the National Laboratories in Oak Ridge and of the research staffs of these laboratories. When masters' and doctoral candidates have completed their course work, it is possible by special arrangement for them to go to Oak Ridge to work on their research problems and prepare their theses. In addition, it is possible for staff members of the University to go to Oak Ridge for varying periods, usually for not less than three months, for advanced study in their particular fields.

Students on Oak Ridge Graduate Fellowships receive stipends which vary according to the number of their dependents and the level of work they are doing. Staff members may work in Oak Ridge on stipends commensurate with their present salary and rank.

Information concerning stipends and other matters may be obtained from the office of the Graduate School or from the Chairman of the

University Relations Division of the Oak Ridge Associated Universities, Box 117, Oak Ridge, Tennessee 37831.

Southern Regional Training Program in Public Administration

Since 1945 the University of Kentucky, the University of Alabama, and the University of Tennessee have conducted a joint program in public administration leading to a master's degree. Part of the course work is completed at each institution, and three months of successful internship are required. Detailed information concerning the program may be obtained from the Department of Political Science of the University of Kentucky.

Center For Developmental Change

The Center for Developmental Change (CDC) is a special unit which reflects the efforts of the University of Kentucky to define and attack the contemporary problems of social and economic development.

Developmental change is defined as planned and innovated change, directed toward the attainment of chosen goals. The Center undertakes, promotes and stimulates the study of developmental change. It seeks greater understanding of change processes and more widespread dissemination of the knowledge and skills of application. It is concerned with how better to train people to work on development problems.

CDC correlates certain domestic and international research, action, and training programs. Domestic projects are focused on Kentucky and Appalachia, with regional studies of urban and rural problems. The international projects include technical assistance and education support programs, such as training Peace Corps Volunteers for India and establishing an agricultural center in Northeast Thailand.

The Center seeks to introduce ways of learning systematically about the processes of developmental change into the projects and programs of the appropriate units of the University. To encourage the study of developmental change, the Center provides graduate assistantships and coordinates a Ph.D. minor concentration in developmental change.

Advanced Study and Research by Guests of the University

When appropriate resources are available at the time desired, the President of the University, upon the recommendation of the Dean of the Graduate School and the department affected, will welcome advanced

scholars as guests of the University, with the privilege of auditing seminars and research courses and of carrying on research in laboratories and libraries. Normally there will be no charge except for laboratory expenses. Negotiations for such arrangements should be conducted in advance through the Graduate Office.

Graduate School Fellowships

University of Kentucky Research Foundation Fellowships: The University of Kentucky Research Foundation supports several graduate fellowships of $2,400, each carrying with it waiver of out-of-state fees.

Haggin Fellowships: The Haggin fellowships, endowed by Margaret Voorhies Haggin in memory of her father, George Voorhies, carry a stipend of $2,400, plus remission of out-of-state fees.

Both Haggin fellowships and Kentucky Research Foundation fellowships are open to all students who hold a bachelor's degree or higher from any college or university of recognized standing. All fellows are expected to devote their entire time to graduate work, and no teaching or other departmental work may be required of them; nor are they permitted to perform any duties for extra pay.

Patterson Fellowships: A number of non-service Patterson Fellowships are available from income from the bequest of President William Andrew Patterson, the first president of the University, for students with a major interest in diplomacy and international relations. The regular University fellowship form should be used when applying for a Patterson Fellowship. Applicants who state their major subject to be Diplomacy and International Commerce automatically will be considered for Patterson as well as any other fellowship support for which they are eligible.

The Dr. Paul I. Murrill Memorial Scholarship: This scholarship was set up by Mrs. Paul I. Murrill in honor of her husband, who was a graduate of the University of Kentucky. It pays a variable stipend of approximately $2,500 a year to a student who possesses outstanding qualities of character and aptitude for fruitful graduate work. Preference shall be given to scholars in the field of Chemistry.

The Robert N. Jeffrey Fellowships: These three fellowships are supported by the Jeffrey Memorial Endowment Fund set up by Mrs. Helen Lasby Jeffrey in honor of her husband, Robert N. Jeffrey, who was formerly Plant Physiologist at the Agricultural Experiment Station. These fellowships pay a stipend of $2400 to $2800 (with waiver of out-of-state tuition) and are subject to renewal if the progress of the student is satisfactory. They are open to Ph.D. applicants in all areas of the University concerned with tobacco research. The fellows' dissertation research must apply directly to tobacco.

Forms for making application may be secured from the office of the Dean of the Graduate School and must be submitted not later than February 1 of each year.

Other Fellowships

The George W. Pirtle Fellowship in Geology: A grant of $500 a year is given by George W. Pirtle to a graduate student in geology upon the recommendation of the faculty of the Department of Geology. The award is made upon the basis of need and promise of future achievement in the geological field. Mr. Pirtle has set up this grant in appreciation of the training he received in the Geology Department. He was the first student to obtain the master's degree from the University with a major in Geology. The grant is given in honor of Dr. A. C. McFarlan.

J. Stephen Watkins Foundation Fellowship for Civil Engineering: The Watkins Fellowship, contributed by the J. Stephen Watkins Foundation, carries a stipend of $2,400, plus remission of out-of-state fees, and has been offered every other year beginning in 1965.

Automotive Safety Foundation Fellowships for Civil Engineering, with stipend of $3,000, plus remission of out-of-state fees.

United States Steel Foundation Fellowship for a graduate student in History. Stipend of $2,400 annually for two years.

Office of Civil Defense Fellowships in Nuclear Science and Engineering with stipend of $2200, plus remission of out-of-state tuition.

Information concerning other fellowships (National Science Fellowships, National Science Traineeships, NASA Traineeships, National Defense Fellowships, etc.) may be obtained from the Graduate Office.

Research and Teaching Assistantships

Most departments employ part-time teaching and research assistants at stipends ranging up to $3,000, plus waiver of out-of-state fees. Information concerning assistantships may be obtained from the various departments.

Subjects and Directors of Graduate Study

The courses offered for graduate work are listed under the following groups:

Subjects	*Directors of Graduate Study*
I. AGRICULTURE	
Agricultural Education	Harold R. Binkley
Agricultural Economics	Robert W. Rudd

Agricultural Engineering ..... Blaine F. Parker
Agricultural Extension Education ..... Frank Santopolo
Agronomy ..... J. L. Ragland
Animal Sciences ..... W. P. Garrigus, George E. Mitchell, Jr.
Entomology ..... B. C. Pass
Forestry
Home Economics Education (See Education)
Horticulture ..... Hubert C. Mohr
Plant Pathology ..... R. E. Hampton
Plant Physiology ..... A. J. Hiatt
Soil Sciences ..... R. E. Phillips
Veterinary Science ..... J. H. Drudge

II. Arts and Sciences

Anthropology ..... Henry F. Dobyns
Art ..... George W. Gunther
Biology ..... Samuel F. Conti
Botany ..... Samuel F. Conti
Chemical Physics ..... G. S. Hurst
Chemistry ..... Robert W. Kiser
Communications ..... Robert D. Murphy
Classics (See Germanic and Classical Languages)
Computer Science (At present no graduate majors are offered in this subject)
Diplomacy and International Commerce ..... Lloyd Jensen
Dramatic Arts (See English)
Economics (See Business and Economics)
English ..... Robert D. Jacobs
W. S. Ward, Donald A. Ringe
French Languages ..... Walter G. Langlois
Genetics ..... Samuel F. Conti
Geography ..... P. P. Karan
Geology ..... William H. Dennen
Germanic and Classical Languages ..... Wayne Wonderley
Greek (See Germanic and Classical Languages)
History ..... Carl B. Cone
Journalism (See Communications)
Latin (See Germanic and Classical Languages)
Mathematics ..... James H. Wells
Microbiology ..... Earle Swim
Music ..... George J. Buelow
Musicology ..... George J. Buelow
Philosophy ..... Jesse DeBoer
Physics and Astronomy ..... Bernard D. Kern
Political Science ..... S. Sidney Ulmer
Psychology ..... Robert A. Baker
Social Work (At present no graduate majors are offered in this subject)
Sociology ..... William F. Kenkel
Spanish ..... William C. McCrary

Speech (See Communications)
Statistics ..... Richard L. Anderson
Telecommuncations (See Communications)
Theatre Arts ..... Wallace Briggs
Zoology ..... Samuel F. Conti

III. Business and Economics

Business Administration ..... Joe Logan Massie
Economics ..... Joe Logan Massie

IV. Education

Administrative and Supervision ..... J. R. Ogletree, James Kincheloe
Agriculture Education ..... Harold Binkley
Business Education ..... V. A. Musselman
Counseling ..... (Acting) Dwight Auvenshine
Educational Psychology and Counseling ..... Louis Karmel
Elementary Education ..... James Moore
Higher and Adult Education ..... Collins Burnett
Home Economics Education
Health, Physical Education, and Recreation .... Joseph Gruber
Secondary Education ..... Harry Barnard
Social and Philosophical Studies in Education ..... John Rich
Special Education ..... William Tisdall

V. Engineering

Agricultural Engineering ..... Blaine F. Parker
Chemical Engineering ..... Robert B. Grieves
Civil Engineering ..... Don J. Wood
Electrical Engineering ..... Robert L. Cosgriff
Engineering Mechanics ..... O. W. Dillon
Mechanical Engineering ..... Roger Eichhorn
Metallurgical and Mining Engineering ..... Hans Conrad

VI. Law (At present no graduate majors are offered in this subject)

VII. Medicine

Anatomy ..... Harold F. Parks
Biochemistry ..... David C. White and Alfred D. Winer
Pharmacology ..... Tihamer Z. Csaky
Physiology and Biophysics ..... Fred W. Zechman, Jr.
Toxicology ..... Tihamer Z. Csaky

VIII. Pharmacy

Pharmaceutical Sciences ..... H. B. Kostenbauder

IX. Allied Health Professions

Clinical Nutrition ..... Paul Thornton
Public Health ..... Ralph W. Eichenberger
Radiological Health ..... Joseph A. Sayeg
Medical Radiation Dosimetry ..... Robert H. Greenlaw

X. Home Economics
Home Economics ..... Leonard Packett
Nutrition and Food Science ..... Leonard Packett

XI. Library Science ..... Lawrence Allen

XII. Dentistry ..... William R. Proffit



Graduate Courses of Study

Note: Arabic numbers in parentheses indicate the number of semester hours given for each course and the Roman numerals refer to the semester in which the course is offered; S stands for the summer session.

I. AGRICULTURE

Requirements for the Degree of Master of Science in Agriculture and Master of Science in Agricultural Engineering

(See also pages 17-21.)

Students who are graduates of fully accredited institutions of higher learning may obtain the degree of Master of Science in Agriculture or Master of Science in Agricultural Engineering by satisfying the following requirements:

1. The completion of 24 semester hours of graduate work with an average standing of 3.0 or better, and a thesis, or at the option of the major professor (except in Agricultural Engineering), the completion of 36 semester hours of graduate work with a standing of 3.0 or better, and no thesis requirement. At least one-half of the hours must be on the 600 level or above.
2. Under either plan no grade below C may be counted.
3. One-half of the work must be in one department, the remainder in any other department or departments approved by the major professor.
4. There is no language requirement for either of these professional degrees.

In either case a final oral examination is given the candidate not later than 8 days before the close of the semester in which the degree is to be secured. The candidate is expected to show a comprehensive knowledge of the subject matter related to the field of his major work and in case a thesis has been prepared to defend it.

AGRICULTURAL ECONOMICS

The degrees of Master of Science, Master of Science in Agriculture (Plan B available), and Doctor of Philosophy may be earned with a major in Agricultural Economics. The student will be expected to concentrate, in addition to Agricultural Economics, in Economics and Research Methodology. Those without sufficient background or training will be expected to make up deficiencies indicated by the department.

The Ph.D. program emphasizes training in research. In addition to Agricultural Economics and Economics courses the student can select courses from a broad array of agricultural and social science disciplines. The student will be expected to demonstrate ability to interrelate knowledge gained within and among the areas of concentration, and to demonstrate his ability to do independent thinking in preparation for his dissertation.

Prior to being admitted to the qualifying examinations, the applicant must demonstrate a reading knowledge of one modern foreign language.

AGRICULTURAL MARKETING

401 *Marketing Tobacco.* (2) II
Special emphasis on the marketing of and the market system for tobacco. Application of marketing principles and methods to tobacco. Prereq: AEC 300. *Clark.*

402 *Tobacco Market Grades and Grading.* (1) II
Procedures and problems in establishing market standards for tobacco, including practice in grading. Prereq. or concur: AEC 300 or approval of instructor. *Clark.*

403 *Marketing Livestock and Livestock Products.* (2) II
Analysis of livestock and dairy markets; market organization, agencies, institutions, and services; and public regulations. Prereq: AEC 300. *Gooch.*

501 *Economics of Agricultural Marketing.* (3) II
Analysis of agricultural markets with major emphasis on use of the theoretical tools–pricing practices, product choice, advertising firm and industry growth, location and economic development. Three class hours per week. Prereq: AEC 300. *Mather.*

505 *Structure and Organization of Agricultural Businesses.* (3) II, S
Understanding of the structure and organization of agriculturally-related businesses and industries, including cooperatives, and the influence of these on key management decisions by owners and managers of farms, as well as policy and decision-makers in such businesses.

606 *Advanced Agricultural Marketing.* (3) II
A critical examination of methods, objectives, and results of various types of research in market organization, marketing functions, market management, and price analysis. Prereq: approval of instructor. *Rudd and Mather.*

FARM MANAGEMENT

409 *Decision-making in Agricultural Business Firms.* (3) II
Analysis of the major types of management problems commonly faced by agricultural business firms, formulation of alternative courses of action with emphasis on sound approaches to solutions and determination of business policy decisions. Three class hours per week. Prereq: Permission of instructors. *Binkley.*

415 *Farm Accounting and Record Analysis.* (3) II
Development and analysis of records to farming situations. Interpretation of essential records from a farm manager's viewpoint as a means of improving decision-making. Lecture, three hours per week. Prereq: AEC 310. *Criswell.*

511 *Advanced Farm Management.* (3) II, S
An advanced analysis of management and managing farms. Prereq: AEC 310. *Justus.*

516 *Land Value and Appraisal.* (odd years) (3) I
The capitalization process, and other methods of valuing farm land; appraisal procedures of the Federal Land Banks and other credit institutions. Prereq: AEC 310, or approval of instructor. *Bondurant, Justus.*

518 *Farm Labor Utilization.* (3) I

Efficient work method fundamentals as applied to agricultural production, work simplification analysis of specific farm jobs and incentive pavment plans for encouraging economic use of farm labor, are studied. Prereq. or concur: AEC 310. *Byers.*

PRODUCTION ECONOMICS

520 *Production Economics.* (3) I

Economic analysis of agricultural production. A theoretical treatment of land and capital returns, costs and related functions of agricultural production at an elementary level. Prereq: AEC 310. *Redman.*

620 *Economics of Agricultural Production: Static Application.* (3) II

Application of economic principles to agricultural production problems of resource combination, enterprise selection, scale of operations, household-firm relationships, interregional competition, and national agricultural policies and programs. Prereq: Approval of instructor. *Redman.*

621 *Economics of Agricultural Production: Dynamic Application.* (3) I

A continuation of AEC 620 with application to dynamic situations. Prereq: AEC 620 and approval of instructor. *Redman.*

MATHEMATICAL ECONOMICS

590 *Introduction to Mathematical Economics.* (3) II

A review of mathematical approaches to economic theory. Models applicable to production, marketing and pricing problems. Prereq: ECO 462 or equivalent, MA 211 (same as ECO 590).

690 *Mathematical Economics—Macro Theory.* (3) I

Selected aggregative models treated mathematically. Emphasis on maximization problems for linear systems. Leontief input-output models. Prereq: ECO 360, MA 113, or equiv. (Same as ECO 788).

691 *Econometrics II.* (3) II

The application of statistical methods to problems of economic analysis. Building and measuring relationships among economic variables. Econometric models of the economy as a whole and of individual sectors. Prereq: ECO 692 or equivalent. (Same as ECO 792.)

AGRICULTURAL POLICY AND LAND ECONOMICS

540 *Agricultural Policy.* (3) I

Historical development of principles underlying agricultural policy; objectives of agricultural policy; appraisal of current and proposed agricultural programs. Prereq: AEC 300. *Anschel.*

545 *Land Economics.* (3) I

Institutional, technological and physical forces affecting the use of land resources in agriculture. Analysis of problems connected with land tenure, land conservation and transfer of farm real estate. Prereq: AEC 310, or approval of instructor. *Bondurant and Redman.*

640 *Advanced Agricultural Policy.* (3) II

Impacts of policies upon economic progress, efficiency in resource use, distribution of income, and welfare in agriculture. Prereq: approval of instructor. *Rudd.*

AGRICULTURAL ECONOMIC DEVELOPMENT

470 *International Agriculture, World Food Needs and U. S. Trade in Agricultural Products.* (3) II

Present and potential food needs by geographic areas, comparative advantages in food production in relation to world trade in agricultural products, impediments to food distribution on a world basis, and economic repercussions to American agriculture. Three class hours per week. Prereq: ECO 261 and AEC 300. *Brannon and Anschel.*

626 *Agriculture and Economic Development.* (3) II

Analytical consideration of role of agriculture in economic development in relation to overall development strategy at various stages of growth. Theoretical and policy issues of particular relevance to the agricultural development in underdeveloped agrarian economies with various resource, social, political and economic systems. Prereq: ECO 475 or consent of instructor (same as ECO 674). ***Anschel and Brannon.***

AGRICULTURAL PRICES AND FINANCE

455 *Agricultural and Farm Finance.* (3) I, S

Credit needs of agriculture; problems connected with farm and market agency financing; organization and operation of agricultural credit agencies. Prereq: AEC 310; ECO 260. *Clark, Criswell.*

550 *Agricultural Prices.* (3) II

Price behavior of agricultural products including supply-price relationships and general price-level relationships. Prereq: ECO 260. ***Bobst.***

650 *Advanced Agricultural Prices.* (3) I

Advanced study of agricultural price behavior by the application of economic theory and statistical analysis. Prereq: approval of instructor. ***Rudd and Bobst.***

SPECIAL PROBLEMS

580 *Special Problems in Agricultural Economics.* (1-3) I, II

Directed independent study of a selected problem. Prereq: approval of instructor and chairman of department. ***Rudd, Staff.***

780 *Special Problems in Agricultural Economics.* (3) I, II, S

Open to graduate students who have the necessary training and ability to do research on some selected problem. Prereq: approval of chairman of department. ***Rudd, Staff.***
May be repeated to a maximum of nine credits.

RESEARCH METHODS

560 *Introduction to Research Methods in Agricultural Economics.* (3) I

Survey of agricultural economics research areas, methods of initiating, preparing and conducting research projects, financing agricultural research. Applicable to problems of agricultural production and marketing. Prereq: Senior standing and consent of instructor. *Smith.*

660 *Research Methods in Agricultural Economics.* (3) II

An analytical examination of research methods and techniques used in agricultural economics. Prereq: approval of instructor. *Redman.*

661 *Programming Models in Agricultural Economics* (3) I

A study of some programming models useful in agricultural economics; includes an examination of the structure of the models themselves, economic interpretation of their components and their use in research in agricultural economics. Prereq: Consent of instructor. *Bradford.*

SEMINAR

770 *Agricultural Economics Seminar.* (0) I, II

Analysis of economic problems which affect agriculture. *Staff.*
May be repeated three times.

768 *Residence Credit for the Master's Degree* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

AGRICULTURAL EDUCATION *(See Education)*

AGRICULTURAL ENGINEERING *(See Engineering)*

AGRONOMY

The Department of Agronomy offers graduate work leading to the master's degree with majors in crop science or soil science and to the Ph.D. degree with a major in soil science. Work leading to advanced degrees must conform to the general rules and regulations of the Graduate School, except that a reading knowledge of one modern foreign language is required for the Ph.D. degree in Soil Science. The department permits use of Plan A or Plan B to satisfy the requirements for the M.S. degree.

The Department of Agronomy also participates in an interdepartmental graduate program leading to the Ph.D. degree with a major in plant physiology.

GENERAL COURSES

599 *Special Problems in Agronomy.* (1-4) I, II, S
Prereq: Consent of instructor.
May be repeated for a maximum of nine credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Agronomy Seminar.* (1) I, II
Reports and discussion of problems and investigations of problems in soils, crops and plant physiology. May be repeated three times for maximum of four credits.

799 *Research in Agronomy.* (1-4) I, II, S
Prereq: Consent of instructor.
May be repeated for a maximum of twelve credits. *Staff.*

CROP SCIENCES COURSES

502 *Ecology of Economic Plants.* (3) I
Critical study of the response of economic plants to natural and man-modified environments. Lecture and discussion, 2 hours; lab, 2 hours. Prereq: BOT 101 and AGR 206 or consent of instructor. *Duncan.*

503 *Weed Identification and Control.* (3) I
The important characteristics, identification, and control of weeds, with emphasis on identification and control of Kentucky weeds. Lecture and discussion, 2 hours; lab, 2 hours. Prereq: AGR 206. *Herron.*

506 *Introduction to Plant Breeding.* (3) II
A study of the principles involved and the techniques used in breeding crop plants. Lecture and recitation, 2 hours, lab, 2 hours. Prereq: AGR 206, and BOT 530 or ASC 260. *Poneleit.*

508 *Advanced Crops: Tobacco.* (3) I
Origin of the nicotiana species, botany, pathology, entomology, physiology, breeding, and culture of tobacco, with special emphasis on burley. Lecture and discussion, 2 hours; lab, 2 hours. Prereq: BOT 101; AGR 206 or consent of instructor. *Staff.*

510 *Ecology and Utilization of Grasslands.* (4) II
Critical study of grassland plants and the biological and physical factors operative in utilization of natural and cultivated grasslands by domestic animals. Lecture and recitation, 3 hours; lab 2 hours. Prereq: BIO 201 and 203 or consent of instructor. *T. Taylor.*

512 *Advanced Crops: Cereals.* (3) I
A study of the grain crops of the world in respect to adaptation, culture and uses. Lecture and recitation, 2 hours, lab, 2 hours. Prereq: BOT 101; AGR 206, or consent of instructor. *Finkner.*

730 *Grassland Research.* (3) II
The conduct and interpretation of grassland experiments with emphasis on pasture research and the plant-animal complex. Lecture and discussion, 3 hours. Prereq: Consent of instructor. *Templeton.*

732 *Mineral Nutrition of Plants.* (3) I
Discussion of accumulation, translocation and utilization of mineral elements by higher plants. Emphasis will be placed on the relationships between these processes and plant metabolism. Lecture and discussion, two hours; lab, three hours. Prereq: Botany 701 or BCH 515, or consent of instructor. (Same as BOT 732). *Hiatt.*

734 *Physiology of Growth and Development.* (3) II
A critical evaluation of research in selected aspects of plant growth and development. Emphasis will be on effects of growth environment. Lecture-discussion, three hours. Prereq: Botany 701 or consent of instructor. (Same as BOT 734). *Kasperbauer.*

COURSES IN BOTANY

(May be used for agronomy credit, subject to the approval of adviser.)

501 *Plant Physiology.* (3-5)
See course description under Botany.

634 *Cytogenetics.* (4)
See course description under Botany.

701 *Plant Metabolism.* (3)
See course description under Botany.

COURSES IN SOIL SCIENCE

566 *Soil Biology.* (3) I
The nature and biochemical activities of the soil microflora; their significance in soil genesis and structure and their rôle in soil fertility. Lecture, two hours; lab, two hours. Prereq: AGR 366, MB 200. *Bloomfield.*

568 *Soil Conservation and Management.* (3) II S

A study of the principles of wise land use and effective soil management with experience in their application. Lecture and discussion, two hours, lab., two hours. Prereq: AGR 366. *Survant.*

570 *Soil Fertility and Fertilizers.* (3) I

Sources and manufacture of fertilizer materials; soil reaction of elements essential for plant growth; effective use of fertilizers for various soil situations. Lecture and discussion, three hours. Prereq: AGR 366 or equiv. *Sims.*

573 *Soil Morphology and Mapping.* (3) I

Study of concepts of soil horizons and soil profiles, and the chemical, physical and mineralogical parameters useful in characterizing them. Use of soil survey equipment, preparation of soil maps and development of a land use plan for an assigned area. Lecture and recitation, two hours; lab, three hours. Prereq: AGR 366; GLY 100 or consent of instructor. *Bailey.*

575 *Soil Physics.* (4) II

Physical properties of soils, with emphasis on soil-water relations, and structure. Lecture and discussion, two hours; lab., four hours. Prereq: AGR 366 and approval of instructor. *Phillips.*

581 *Chemical Analysis of Soils and Plants.* (3) I

Laboratory emphasis on instrumental methods and techniques used in quantitative and qualitative chemical analysis of soil and plant materials and relation of these analyses to physical, chemical and biological systems. Lecture, one hour; lab., six hours. Prereq: CHE 226 and AGR 366 or equiv., or approval of instructor.

652 *Soil Classification and Geography.* (even years) (3) II

A critical evaluation of the concepts of soil classification, with particular reference to the current U.S. scheme. Study of geographic locations and nature of their soil associations as related to gross consideration of soil genesis. Lecture and recitation, two hours; lab., two hours. Prereq: AGR 573, AGR 581 or consent of instructor. *Bailey.*

660 *Advanced Soil Biology.* (even years) (2) II

A critical evaluation of the current research status in selected aspects of soil biology. Lecture and discussion, two hours. Prereq: AGR 566 or consent of instructor. *Bloomfield.*

671 *Soil Chemistry.* (3) II

A study of the chemical characteristics of the soil and of the more important chemical processes in the soil. Lecture and discussion, two hours; lab., three hours. Prereq: AGR 570, AGR 581, CHE 442 or consent of instructor. *Thomas.*

681 *Mineralogical and Chemical Analysis of Soils.* (odd years) (3) II

Laboratory emphasis on instrumental methods and techniques used in quantitative and qualitative mineralogical and chemical analysis of soils and relation of these analyses to physical, chemical and biological systems. Lecture, one hour, lab., six hours. Prereq: CHE 226, AGR 366, 581 or equiv. or approval of instructor. *Barnhisel.*

712 *Advanced Soil Fertility.* (even years) (3) I

An integration of the effects of soil, climatic and physiological factors on the nutrition and dry matter accumulation of plants. Lecture and discussion, two hours; lab., two hours. Prereq: AGR 570 or consent of instructor. *Peaslee.*

721 *Soil Genesis.* (odd years) (3) II

Critical study of theories and concepts in soil genesis and their relationships to soil morphology and classification. Analysis of soil properties and soil forming processes responsible for the development of unique soil pedons. Lecture and recitation, two hours; lab, three hours. Prereq: Consent of instructor. *Bailey.*

741 *Clay Mineralogy.* (even years) (3) II

A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, two hours; lab., two hours. Prereq: GLY 212, 213; AGR 581, 681, or equiv. or consent of instructor. *Barnhisel.*

ANIMAL SCIENCES

The degrees of Master of Science, Master of Science in Agriculture and Doctor of Philosophy are available with majors in Animal Sciences. Masters degrees are awarded under either Plan A or Plan B. Programs in the department are divided into the disciplinary areas of Animal Foods, Animal Nutrition, and Genetics and Physiology. Special interests in beef cattle, dairy cattle, horses, poultry, sheep, swine, meats, dairy technology and dairy microbiology may be pursued within these areas.

A reading knowledge of one modern foreign language is required of candidates for the Ph.D. degree.

500 *Animal Breeding.* (4) I

The application of genetic principles to the improvement of farm animals. Phenotypic and genetic relationships among economic traits as well as modes of inheritance and methods of measuring the traits. The role of inbreeding, outbreeding and selection methods in producing genetically superior population for dairy cattle, poultry, meat animals and horses. Lecture, four hours (Equivalent of ASC 260 may be substituted.) Prereq: ASC 260. *Thrift, et al.*

504 *Sheep Science.* (3) II

History and importance of the sheep industry; selection, breeding, feeding, and management of sheep; production and handling of wool. Lecture, 2 hours. Lab. 2 hours. Prereq: ASC 280, GEN 106. *Ely.*

506 *Beef Cattle Science.* (3) II

Scope and importance of the beef cattle industry; selection, breeding, feeding, and management of beef cattle. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280, GEN 106. *Bradley.*

508 *Swine Science.* (3) I, II

History and importance of the swine industry; selection, breeding, feeding and management of swine. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280, GEN 106. *Cromwell.*

520 *Dairy Cattle Science.* (2-3) I

Feeding and management of dairy cattle contributing to profitable production of quality milk. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280 and GEN 106, or consent of instructor. *Jacobson, Graden.*

526 *Reproduction in Dairy Cattle.* (2) II

A study of male and female reproductive processes in dairy cattle and the application of artificial breeding to the improvement of dairy herds. Lecture, 1 hour. Lab., 2 hours. Prereq: GEN 106, ASC 260, ZOO 100 or consent of instructor. *Olds.*

530 *Dairy Microbiology* (4) I

Application of bacteriological principles to production and processing of dairy products, entrance of microorganisms into dairy products, effects of their growth and methods for control. Lecture, 2 hours. Lab. 4 hours. Prereq: MB 200 or 400. *Langlois.*

533 *Advanced Animal Food Microbiology.* (3) II

Bacteriological principles and problems relating to specific dairy products and processes. Prereq: ASC 530 and 531.

534 *Principles of Dairy Technology.* (4) II

Chemical and physical characteristics of dairy products; chemical, physical and physico-chemical principles involved in dairy processing; special methods of analysis. Lecture, 1 hour. Lab., 6 hours. Prereq: CHE 236, ASC 335. *Freeman.*

536 *Dairy Processing and Plant Management.* (6) II

Methods used for processing milk, butter, ice cream, cheese, and concentrated milk; fundamentals of dairy plant management. Lecture, 2 hours. Lab., 8 hours. Prereq: ASC 335. *Rudnick, Freeman.*

542 *Poultry Science.* (3) I

Studies of control measures in poultry diseases, nutrition, marketing; flock management and replacement. Lecture, 2 hours. Lab., 2 hours. Prereq: GEN 106. *Johnson.*

548 *Poultry Nutrition.* (3) II

A study of nutrient utilization and requirements for growth and reproduction in Avian species. Lecture, 2 hours. Lab., 2 hours. Prereq: CHE 236. or equivalent, ASC 580. *Begin.*

562 *Advanced Genetics.* (3) II

Concerned chiefly with the physical basis of heredity, mutations, chomosomal aberrations, linkage, genetics and development, and reports on current literature. Lecture, 3 hours. Prereq: ASC 260.

564 *Milk Secretion.* (3) II

Anatomy of the mammary gland, physiology and biochemistry of milk secretion and management factors affecting yield and composition of milk. Lecture, 3 hours. Prereq: ASC 280, VS 350. *Van Horn.*

580 *Principles of Animal Nutrition.* (3) I

The chemistry and physiology of animal nutrition and the nutritive requirements for growth, fattening, reproduction, lactation and other body functions. Lecture, 3 hours. Prereq: CHE 236 or equivalent. *Mitchell.*

622 *Current Developments in Dairy Science.* (3) II or S

A course designed to acquaint the advanced student with the more significant problems and scientific developments of current interest in the dairy field. Prereq: Graduate standing and consent of major adviser. *Dairy Science Staff.*

630 *Advanced Meat Science.* (3) I

Advanced meat science with special reference to the histological, chemical, physical and microbiological properties as they relate to meat quality, organoleptic acceptability and processing procedures. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 304, 306 or equivalent; one course in Histology or Biochemistry or consent of instructor. *Kemp, Moody, Fox.*

660 *Physiology of Reproduction.* (3) II

Physiological processes of reproduction in farm animals; gonadal functions; endocrine relationships; fertility; and factors affecting reproductive efficiency. Lecture, 3 hours. Prereq: ASC 500, VS 501. *Dutt.*

662 *Population Genetics.* (odd years) (3) I

Introduction to principles of static and dynamic populations; statistical concepts and tools applied to quantitative inheritance. Prereq: One course each in statistics and genetics and consent of instructor. *Thrift.*

664 *Advanced Animal Breeding.* (even years) (3) I

Specialized phases of genetics, selection, mating systems and population parameters applicable to synthesis of breeding programs for animal improvement. Prereq: ASC 260, ASC 500 and STA 470 or equivalents. *Thrift.*

680 *Laboratory Methods in Animal Nutrition and Meats.* (4) I

The use of laboratory techniques and equipment in the solution of fundamental problems of nutrition and meats. Lecture and recitation, 1 hour. Lab., 6 hours. Prereq. or concur: ASC 580. *Little.*

682 *Nutritient Metabolism.* (5) S

Introduction to history, principles and present concepts of ruminant and non-ruminant mineral nutrition. Prereq: One course in introductory nutrition, physiology or biochemistry and consent of instructor. *Mitchell, Little.*

684 *Advanced Ruminant Nutrition.* (3) II

Introduction to principles of ruminant metabolism in the utilization of feedstuffs for meat, milk and wool production. Prereq: one course in nutrition, physiology or biochemistry or approval of instructor. *Mitchell, Jacobson.*

686 *Swine Nutrition.* (3) I
A study of the nutritional requirements of the non-ruminant animal with special reference to swine and their various stages of growth, lactation and reproduction. An evaluation of the relative value of feed ingredients and mixed feed formulation. Prereq: ASC 580. *Hays.*

688 *Equine Nutrition.* (2)
Detailed study of anatomical, physiological and microbiological factors influencing the nutritive requirements of the equine for maintenance, growth, reproduction, lactation and work. Two class hours per week. Prereq: One course in Nutrition and Physiology or Biochemistry or consent of instructor.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Animal Sciences Seminar.* (1) I, II
May be repeated to a maximum of three credits. *Staff.*

780 *Special Problems in Animal Derived Foods.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits.

781 *Special Problems in Genetics or Physiology.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits

782 *Special Problems in Animal Nutrition.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits

790 *Research in Animal Derived Foods.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine hours.

791 *Research in Genetics or Physiology.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine hours.

792 *Research in Animal Nutrition.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine hours.

COOPERATIVE EXTENSION EDUCATION

The University offers a graduate program in Cooperative Extension Education leading to the degrees of Master of Science in Agriculture and Master of Science in Home Economics.

With the two exceptions listed below, the requirements for this major are the same as those for all masters' degrees offered by the University (see the introductory portion of this Bulletin) and for other programs leading to the degrees of Master of Science in Agriculture and Master of Science in Home Economics. To those following the program in Extension Education the following regulations apply: (1) instead of the work being concentrated in one department, 15 semester-hours will be considered as a minimum to be taken from the applied and theoretical subject matter areas of Education, Psychology,

Economics, Anthropology, Sociology, English, Speech, Journalism and Extension Methods; and (2) no set schedule of required courses will be established for all students, but instead a complete program will be worked out in advance between the student and his adviser, subject to the approval of the Director of Graduate Programs in Cooperative Extension Education.

501 *Principles of Cooperative Extension.* (3) I, II
Philosophy, history and development of the Cooperative Extension Service; evaluation of instructional techniques; leadership training; and practice in use of Extension methods. Lecture, 3 hours. Open to juniors, seniors, and graduate students. ***Utz.***

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. ***Staff.***

790 *Special Problems in Extension Research.* (1 to 4) I, II, S
Directed independent study of research relative to a particular problem in extension and the study of a selected problem. Lecture, 3 hours by appointment. May be repeated to a maximum of twelve credits. ***Staff.***

ENTOMOLOGY

The Department of Entomology offers the Master of Science, Master of Science in Agriculture, and the Doctor of Philosophy degrees. Study and research in various areas of entomology including applied entomology, behavior, biological control, host plant resistance, insect biology and ecology, insect nutrition, medical and veterinary entomology, physiology, taxonomy, toxicology, and acarology. The rules of the Graduate School apply to all programs, except that a reading knowledge of only one modern foreign language is required for the Ph.D. degree.

500 *Economic Entomology.* (3) S
For those interested in agricultural teaching and extension work. Life history, control, and means of identification of economic insects of Kentucky are considered. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100. ***Staff.***

530 *Applied Entomology.* (3) II
Principles of insect damage, populations and distributions. Various types of natural and applied control, including problems of insecticide toxicity, resistance, and residues. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100. ***Rodriguez, Thurston.***

532 *Medical Entomology.* (4) I, S
Study of Arthropod vectors of disease. Structure, collection, identification, control measures and life history studies. Given alternate years. Lecture, 2 hours; lab, 4 hours. Same as ZOO 532. Prereq: ZOO 534 or consent of instructor. ***Knapp.***

534 *Parasitology.* (4) I, S
Protozoan, helminth and arthropod parasites of man and domestic animals, emphasis on etiology, epidemiology, methods of diagnosis, control measure, and life histories. Techniques for host examination and preparation of material for study. Lecture, 2 hours; lab, 4 hours. Same as ZOO 534. Prereq: ZOO 100.

542 *Insect Taxonomy.* (4) I
Methods and principles of systematic entomology and zoology; characterization of taxonomic categories; and international rules of zoological nomenclature. Collection, preparation and identification of insect specimens. Given alternate years. Lecture, 2 hours; lab, 4 hours. Same as ZOO 542. Prereq: ENT 100 and ZOO 100. ***Freytag.***

595 *Independent Work.* (2-3) I, II, S

Special problems for individual students who are capable of pursuing independent investigations in the various divisions of entomology. Prereq: ENT 100 and any two of the following ENT 530, 532, or 650. *Staff.*

602 *Insect Morphology.* (4) I

A study of internal and external insect structure, including function, and variation of form. Given alternate years. Lecture, 2 hours; lab, 4 hours. Same as ZOO 602. Prereq: ENT 100 and consent of instructor. *Freytag.*

606 *Insect Toxicology.* (3) II

Toxic action of insecticides: preparation, use, and analysis of insecticides; residues; analytical methods in insect toxicology. Lecture, 2 hours; lab, 2 hours. Prereq: Consent of instructor. *Dorough.*

610 *Insect Ecology and Behavior.* (3)

The biotic and physical factors influencing the distribution, abundance, and behavior of insects and insect populations. Two class hours and two lab hours per week. Prereq: Consent of instructor. (Same as ZOO 610.) *Barr, Thurston.*

620 *General Acarology.* (4) II

Introduction to study of mites. Classification, morphology, physiology and ecology of mites important to the medical, veterinary and agricultural fields. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, ENT 100 and consent of instructor. Same as ZOO 620. *Rodriguez.*

630 *Insect Physiology.* (4) II

Principles of insect physiology, function of organs, circulation, reproduction, respiration, and digestion. Lecture, 2 hours; lab, 4 hours. Same as ZOO 630. Prereq: Consent of instructor. *Dahlman.*

650 *Advanced Applied Entomology.* (3) II

Bionomics of insects; representative insecticides, their characteristics, formulation, scope of use, safety factors, and methods of application. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100 or 500. *Pass.*

660 *Immature Insects.* (4)

Bionomics, structure, and classification of immature stages of insects; practice in their identification. Two class hours, four lab hours per week. Prereq: ZOO 570 or AGE 542, or consent of instructor.

670 *Experimental Methods in Entomology.* (4)

The principles and techniques of instrumentation in entomological research with emphasis on problem selection and the collection, evaluation, and presentation of data. Two class hours and four lab hours per week. *Pass, Dahlman.*

680 *Biological Control of Insects.* (3)

The history and principles of biological control and of integrated programs for insect control. The use of parasites, predators, pathogens, host resistance, electro-magnetic energy, pheromones, and their interactions with insecticide control programs will be discussed. Three class hours per week. Prereq: Consent of instructor. *Thurston.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

780 *Entomological Problems.* (2-3) I, II, S

Investigations of chosen insect problems, including original work. Discussion and assignment of current insect subjects. May be repeated for a maximum of six credits. Prereq: ENT 100, 768. *Staff.*

781 *Entomological Seminar.* (0) I, II

Current problems in the field of entomology, with special reference to technical research. Reports and discussions.

FORESTRY

400 *Wood Identification and Technology.* (3) II

General anatomy of wood, identification of commercial species of the United States based on gross and microscopic features. Properties and uses. Lecture, two hours; lab, two hours. Prereq: FOR 100; BIO 200; and approval of instructor. *Davenport.*

410 *Lumber.* (3) II

The production, processing and merchandising of lumber. *Davenport.*

415 *Wood Conditioning.* (3) I, S

The methods and principles involved in seasoning, changes in physical properties, and preservation of wood. Prereq: FOR 100. *Davenport.*

780 *Special Problems in Forestry.* (1 to 4) I, II, S

This course is designed to meet the need for advanced work. Prereq: FOR 400, 410, or 415 and approval of instructor. May be repeated to a maximum of nine credits. The department has special competence in providing opportunity for study in the Wood Science and Technology area. *Staff.*

HORTICULTURE

The Department of Horticulture offers work leading to the degree of Master of Science in Agriculture. Study and research may be concentrated in any one of the specialized fields of Pomology, Vegetable Crops, Floriculture, Ornamentals, or Landscape Horticulture, and should relate to problems in such areas as genetics, plant physiology, landscape design, etc. A thesis normally is required in all areas except that of landscape design.

The Department of Horticulture is a participant in the interdepartmental Doctor of Philosophy degree programs in the areas of plant physiology and of genetics. Members of the department are particularly well qualified to supervise research of graduate students in these areas, and the department has graduate assistantships available to support qualified graduate students in such programs.

500 *Methods of Pest Control in Horticultural Crops.* (2) I

A study of the principles and practices of spraying for the control of pests of horticultural crops including insects, diseases and weeds. Lecture, one hour, Lab, 2 hours. Prereq: HOR 300, one semester of Entomology, and consent of instructor.

502 *Pomology: Deciduous Tree Fruits.* (3) I

A course dealing with the theory and practice of commercial tree fruit production, with major emphasis on apple growing. Prereq: HOR 300. Lecture, two hours, Lab., two hours. *Lockard.*

504 *Pomology: Small Fruits.* (2) II

A detailed study of the care and management of commercial plantings of strawberries, raspberries, and other bush fruits. Lecture, one hour, laboratory, two hours, first half of course. Lecture, 2 hours, last half of course. Prereq: HOR 300. *Chaplin.*

506 *Greenhouse Design, Management and Environmental Control.* (3)
Functional requirements of a greenhouse and the physical laws influencing these requirements. The influence of structural, physical, and biological factors on the environmental conditions will be emphasized. Prereq: HOR 512, AEN 100, or consent of instructor. (Same as AEN 506.) *Knavel, Walker.*

510 *Vegetable Crops.* (3)
A study of the fundamental principles underlying commercial production of vegetables. Lecture, two hours; lab, two hours. Prereq: AGR 366 and HOR 300. *Fogleman.*

512 *Greenhouse Vegetable Crops.* (3) II
Principles of vegetable crop production in environmentally controlled structures; methods for controlling the environment; vegetable crops adapted to greenhouse production. Lecture, two hours; laboratory, two hours. Prereq: HOR 300. *Knavel.*

515 *Turf Management.* (3) I
Types of grasses used for turf; basic and applied principles of turf culture as they relate to the various phases of turf industry, i.e., Ornamental Horticulture, Landscaping, Sod nurseries, golf courses, and athletic fields, parks and highways. Lecture, two hours; laboratory, two hours. Prereq: One course in Botany and one in Soil Science. *Stoltz.*

522 *Landscape Planting Design.* (3) II
A detailed study of the use of various plant materials to express the principles of landscape design. Lecture, two hours; laboratory, two hours. Prereq: HOR 331, 327 and 329.

524 *Floriculture II.* (3) II
A detailed study of specific groups of florists' crops, with particular reference to methods of control of flowering and growth. Lecture, two hours; laboratory, three hours. Prereq: HOR 335.

525 *Plant Propagation.* (3) II
A detailed study of the methods of propagating certain horticultural plants. Includes cuttings, grafting, and budding. Lecture, two hours, laboratory, two hours. Prereq: HOR 327 or 335. *Stoltz.*

768 *Residence Credit for Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits.

770 *Seminar.* (1) 1, II, S
May be repeated to a maximum of three credits. *Staff.*

782 *Special Problems in Horticulture.* (1 to 4) 1, II, S
This course is designed to meet the need for advanced work. Prereq: Approval of instructor. May be repeated to a maximum of twelve credits. *Staff.*

790 *Research in Horticulture.* (1 to 4) I, II, S
Prereq: Approval of instructor. May be repeated to a maximum of nine credits. *Staff.*

PLANT PATHOLOGY

The Department of Plant Pathology offers the Master of Science, Master of Science in Agriculture, and the Doctor of Philosophy degrees. Study and research is offered in various areas of plant pathology including plant virology, host-parasite interaction physiology, plant pathogen ecology, plant nematology, and fungal toxicology. The rules of the Graduate School apply to all programs, except that

a reading knowledge of only one modern foreign language is required for the Ph.D. degree.

541 *Plant Pathology.* (3) I, II
Significance, nature, causes, and methods of control of plant diseases. Lecture and discussion, 2 hours; lab, two hours. Same as BOT 541. Prereq: BOT 101 or 125 or consent of instructor. *Chapman, Diachun.*

543 *Diseases of Plants.* (3) S
Symptoms, causes, and control of some of the more common representative plant diseases. Students may select disease problems in their major field of interest. Discussion, 1 hour; lab, 4 hours. Prereq: PPA 541 or BOT 541 or equivalent and consent of instructor. *Staff.*

656 *Virus Diseases of Plants.* (4) II
Characteristics and properties of viruses that cause plant diseases; host-virus relationships; identification and control of some important virus diseases; consideration of research methods. Lecture and discussion, 2 hours; lab, 2 hours. Prereq: PPA 541 or BOT 541 or consent of instructor. *Diachun, Pirone, Shaw.*

658 *Nematode Diseases of Plants.* (odd years) (3) I
The importance, effects, recognition and control of nematodes that cause plant diseases; physiology of plant parasitic nematodes and their relations with other nematodes and plant pathogens. Lecture, 1 hour; lab, 4 hours. Prereq: PPA 541 or BOT 541; ZOO 534; or consent of instructor. *Chapman, Williams.*

660 *Physiology of Plant Diseases.* (3) I
Lectures, discussions, and independent reading on biochemical and physiological aspects of plant disease and of disease resistance and immunity in plants. Lecture, 3 hours. Prereq: PPA 541, and BCH 511 or BOT 701. *Hampton, Wheeler.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Plant Pathology Seminar.* (1)
Reports and discussion of problems and investigations of problems in plant pathology. May be repeated for a maximum of four credits. *Staff.*

784 *Special Problems in Plant Pathology.* (1 to 3) I, II, S
Prereq: PPA 541 or BOT 541 or equivalent or consent of instructor. May be repeated to a maximum of nine credits. *Staff.*

794 *Research in Plant Pathology.* (1 to 4) I, II, S
Prereq: PPA 541 or BOT 541 or consent of instructor.
May be repeated to a maximum of twelve credits. *Staff.*

PLANT PHYSIOLOGY

The interdepartmental graduate program in Plant Physiology offers a plan of study leading to the degree of Doctor of Philosophy. Faculty members of the program are plant physiologists from the Department of Botany in the College of Arts and Sciences and the Departments of Agronomy, Horticulture, and Plant Pathology in the College of Agriculture. The program is under the general

purview of the Thomas Hunt Morgan School of Biological Sciences. Course offerings in plant physiology are listed under the Departments of Agronomy, Botany, and Plant Pathology. Work leading to the Doctor of Philosophy degree must conform to the general rules and regulations of the Graduate School, except that reading proficiency in one foreign language is required.

BIO 768 *Residence Credit for the Master's Degree* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

BIO 769 *Residence Credit for the Doctor's Degree* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

BIO 771 *Seminar in Plant Physiology.* (1)
Reports and discussions on various topics in plant physiology. May be repeated for a maximum of eight credits.

SOCIOLOGY

(For description of degrees and activities, see Sociology, p. 148)

513 *Rural Community Analysis.* (3) I
The nature of the town-country community, with special emphasis on the function of institutional and agency programs and their leaders in relation to the community. Prereq: SOC 151 or consent of instructor. (Same as HE 575)

514 *Rural Movements and Social Policy.* (3)
Social factors in selected rural movements, their organization and development, influence upon governmental policy, and the social needs met. Prereq: an introductory course or consent of instructor. *Brown.*

515 *Diffusion of Technology in Modern Society.* (3) I
A study of the personality, social structure, and change agent factors in the spread of new techniques among groups and individuals in modern society. Prereq: SOC 151, 153. *Coughenour.*

517 *Advanced Rural Sociology.* (3) II
Systematic study of the structure and function of family, informal and locality groups, social strata, religious, educational, political and occupational groups in rural society. Prereq: SOC 151 or consent of instructor.

541 *Group Organization and Leadership.* (3) II
The study of the structure and dynamics of organized groups; leadership, membership participation, and the processes of problem-solving and group development. Two hours lecture and two hours lab. Prereq: SOC 151 or consent of instructor. *Coughenour.*

565 *Special Problems in Rural Life.* (1-3) I, II, S
Supervised individual study in selected sub-fields of rural sociology. Population, standards of living, neighborhood and community change, and rural institutions are among the available fields for investigation. May be repeated to a maximum of six credits. *Staff.*

615 *Rural Urban Relations.* (3)
Interdependence of city and country; solidary and antagonistic relationships of city and country; the process of urbanization, and problems of rural adjustment to urban influences. *Brown.*

773 *Topical Seminar.* (3) I, II, S
Analysis of topics of scientific interest in rural sociology, selected from such fields as the following: criticism of research; sociological factors in land use; migration; rural social ecology of the South; highland societies. May be repeated to a maximum of six credits. *Staff.*

776 *Seminar in Rural Organization.* (3)
Basic theories of social organization, comparative study of selected systems of rural social organization, examples of purposeful organization. *Staff.*

778 *Seminar in Rural Attitudes.* (3)
The nature and genesis of rural attitudes and their relation to rural social control; analysis of contemporary rural attitudes and opinions. *Staff.*

790 *Research in Rural Sociology.* (1-3) I, II, S
Individual graduate research with correlated study of rural social research types and methods. May be repeated to a maximum of six credits. *Staff.*

For additional Courses in SOCIOLOGY *(See page 148)*

VETERINARY SCIENCE

The Department of Veterinary Science offers a program leading to the doctor of philosophy degree with majors in general pathology, veterinary microbiology, veterinary parasitology and nutritional pathology. Development of research competency and attainment of scholarly maturity in the bio-medical sciences are the general objectives. The program is designed primarily for students possessing the Doctor of Veterinary Medicine degree. Individuals electing general or nutritional pathology as major areas must be graduate veterinarians. Candidates with a Master of Science in microbiology or parasitology and choosing either of these as major areas may be admitted with faculty approval. Individual programs of study leading to this degree must conform with the general rules and regulations of the Graduate School, except that a reading knowledge of one modern foreign language is required for the Ph.D. degree.

769 *Residence credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Veterinary Science Seminar.* (1) 1, II
Required of graduate students in Veterinary Science. May be repeated for a maximum of six credits. Prereq: Permission of staff.

781 *Correlative Pathology.* (1-3) I, II, S
Supervised experience in the use of clinical, gross and histopathological technics in the differential and definitive diagnosis of diseases. Prereq: Pathology in D.V.M. curriculum or equivalent and permission of staff. May be repeated for a total of 9 credits.

782 *Nutritional Pathology.* (3) II
The pathogenesis and physiopathology of deficiency states in domestic and laboratory animals. Alternate years. Prereq: Pathology in D.V.M. curriculum or equivalent and approval of staff.

783 *Infectious Diseases of Domestic Animals.* (3) II
Etiology, pathogenesis, epizootiology, prophylaxis and therapy of selected infectious diseases of domestic animals. Alternate years. Prereq: Microbiology and pathology in D.V.M. curriculum and approval of instructor.

784 *Advanced Veterinary Immunology.* (2) I

Theory and practice of the development and standardization of vaccines, and the evaluation of their potency, safety and efficacy in the prophylaxis of infectious diseases of domestic animals. Alternate years. Prereq: Microbiology in D.V.M. curriculum or equivalent and approval of staff.

785 *Advanced Veterinary Parasitology.* (3) I

Experimental methodology and host parasite relationships of the protozoan and helminth parasites of domestic animals. Alternate years. Prereq: Parasitology in D.V.M. curriculum or equivalent and approval of staff.

786, 787 *Advanced Veterniary Pathology.* (3 each) I, II

Specialized instruction in techniques and interpretations of pathology and pathologic anatomy. Emphasis will be upon evaluation of lesions for understanding the pathogenesis of disease processes in the living animal. Alternate years. Prereq: Pathology in D.V.M. curriculum or equivalent and approval of staff.

791 *Research in Veterinary Microbiology.* (1-9) I, II, S

Independent research in veterinary microbiology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

792 *Research in General Veterinary Pathology.* (1-9) I, II, S

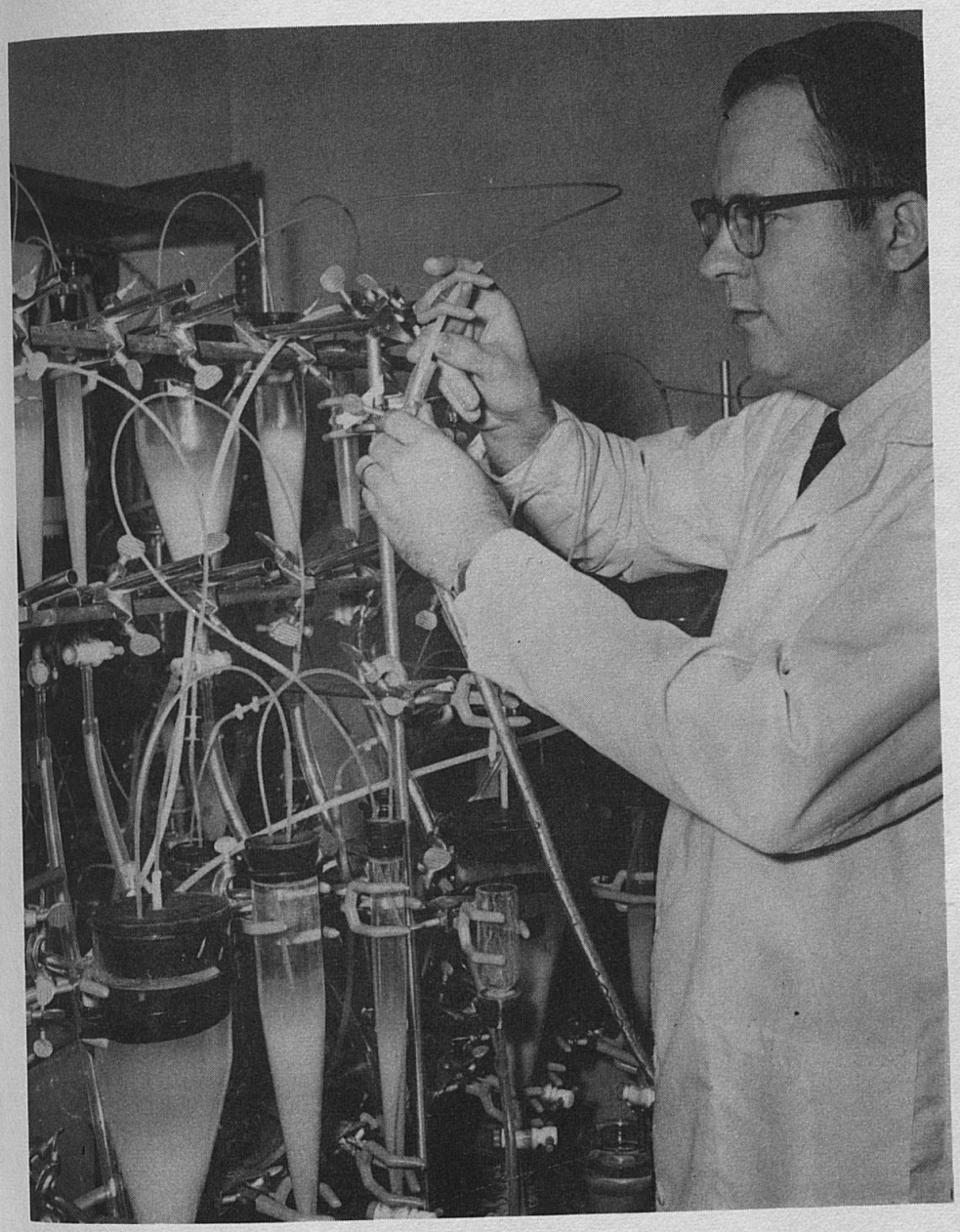
Independent research in veterinary pathology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

793 *Research in Veterinary Parasitology.* (1-9) I, II, S

Independent research in veterinary parasitology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

794 *Research in Nutritional Pathology.* (1-9) I, II, S

Independent research in nutritional pathology. Prereq: Permission of staff. May be repeated for a total of 24 credits.





Th
degree
zation
are off
only fo
studen
gradua
and ba
pology

402
This co
both of
to the
knowing
In addi
increase
skeletal
long bo

438
Survey
emphas
and 12

439
Ethnolo
on its
historic
ANT 1

442
Survey
archaeo

500
Lecture
man, r
tary la
Bio. Sc

510
Descrip
growth
Prereq:

512
Compa
in thei

514
Articul
ENG 5

II. ARTS AND SCIENCES

ANTHROPOLOGY

The Department of Anthropology offers graduate work leading to the M.A. degree in Anthropology, and to the Ph.D. degree in Anthropology with specialization in Culture History, Ethnology or Applied Anthropology. Graduate studies are offered in accordance with Graduate School policies (according to Plan A only for the M.A. degree). Individual graduate programs are planned by the student in consultation with the director of graduate study and adviser. The graduate program is designed to serve the needs of students with varied goals and backgrounds. It is open to students with undergraduate degrees in Anthropology and other academic areas.

402 *Human Identification.* (2)
This course requires of the student a detailed and systematic knowledge of human anatomy, both of the skeleton and the soft part tissues. The first half of the course will be devoted to the positive identification of all the bones of the human skeleton. This approach involves knowing each bone and its fragments, including the identification by side (left or right). In addition, sex differences and age changes will be mastered as the student's knowledge increases. And, finally, the student will be expected to determine the racial origins of skeletal remains from such skull features as the nose, palate, and its teeth, the chin and long bone proportions. Lecture, one hour; lab, 2 hours. *Robbins.*

438 *Ethnology of the Near East and North Africa.* (3)
Survey of Islamic, Christian, and Hebraic cultures of the Near East and North Africa, with emphasis on relations between religious traditions and political systems. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

439 *Circumpolar Peoples.* (3)
Ethnology of Old World and New World peoples of the circumpolar region, with emphasis on its common characteristics. Prehistoric connections between Eurasia and America and historic developments in both will be considered. Three class hours per week. Prereq: ANT 121 or consent of instructor. *Lantis.*

442 *New World Prehistory.* (3)
Survey of the origin and growth of prehistoric American Indian cultures as revealed by archaeological data. Prereq: ANT 120, 121. *Drucker.*

500 *Physical Anthropology.* (4)
Lecture-laboratory course on the biological nature of man. The fields of the primates, fossil man, races, race mixture, constitutional anthoropology and human growth with supplementary laboratory exercises will be covered. Prereq: ANT 120 or three hours in any other Bio. Science. *Robbins.*

510 *History of Anthropological Theory.* (3)
Description and analysis of significant anthropological ideas in their historical context; the growth of the theoretical concepts in physical anthropology, archaeology, and ethnology. Prereq: Consent of instructor. *Bacdayan or Adams.*

512 *Comparative Civilizations* (3)
Comparison of complex societies of the past and present, stressing similarities and differences in their historical development and culture achievements. Three class hours per week. *Adams.*

514 *Descriptive Linguistics: Phonetics.* (3)
Articulatory description of speech sounds; practice in recognition and control. (Same as ENG 514.) Prereq: consent of instructor. *Faust.*

515 *Descriptive Linguistics: Phonemics.* (3)
An investigation of speech-sounds and systems of speech-sounds. Also attention to both speech and writing as communication systems. (Same as ENG 515). Prereq: consent of instructor. *Faust.*

516 *Descriptive Linguistics: Morphemics.* (3)
An explanation of some of the ways speech-sounds are put together in patterns so as to form languages. (Same as ENG 516). Prereq: consent of instructor. *Faust.*

521 *Ethnology of the New World.* (3)
Cultures and physical types of the American Indians during and after white settlement. (Northwestern North America is not included.) Prereq: ANT 241 or equivalent course on Near East. *Essene.*

522 *North Pacific Coast Cultures.* (3)
Ethnology of the Maritime peoples of Western North America and Northeast Asia. Cultural connections between America and Asia will be stressed. Prereq: ANT 121, *Essene, Drucker.*

523 *Ethnology of Oceania.* (3)
A survey of the various cultures on the islands of the Pacific. Both aboriginal and modern acculturated societies will be considered. Prereq: ANT 120, 121. *Essene, Drucker.*

524 *Mythology.* (3)
The unwritten literature of primitive peoples: themes, diffusion, style, literary devices, and function of myths. *Essene.*

525 *Applied Anthropology.* (3)
Application of anthropological methods to contemporary practical problems such as acculturation, colonial administration, intercultural education, and race relations. Prereq: ANT 121. *Gallaher.*

526 *Culture and Personality.* (3)
The cultural basis of personality. Personal character considered as the result of culturally fostered patterns. The ideal personality in several selected societies. Three class hours per week. (Same as SOC 526.) *Hochstrasser, Robbins, Lantis.*

527 *Culture Change.* (3) I
Internal change and contact change in cultures; agents and conditions promoting change; an analysis of innovation, dissemination, integration, diffusion, acculturation, and related concepts. Prereq: ANT 121. *Gallaher.*

530 *Contemporary Latin American Cultures.* (3) I
Detailed survey of societies and cultures of contemporary Latin America, utilizing contributions from anthropological research. Prereq: Consent of instructor. *Dobyns.*

533 *Social Anthropology.* (3) II
History and theory of social anthropology with special emphasis on the comparative approach to analysis of structure, function. and change in social and cultural systems. Prereq: Consent of instructor. (Same as SOC 533). *Dobyns, Bacdayan.*

536 *European Peasantries.* (3)
Comparison of peasant populations and their modernization, with emphasis upon the dynamics of cultural stability and change encountered in relationships between national elites and peasantries in various countries. Prereq: ANT 410; Junior classification. *Gallaher.*

541 *Archaeological Theory and Methods.* (3)
The concepts and aims of archaeology, its history as a scientific discipline, and its present role in the social sciences. Attention to basic principles in field work, and to recent advances. *Drucker.*

542 *North American Archaeology.* (3)
Origin and growth of prehistoric American Indian cultures north of Mexico as revealed by archaeological data. *Drucker.*

546 *Prehistoric Mesoamerica and Peru.* (3)
An intensive study of the native American civilizations: their origins, development and achievements. Three class hours per week. *Drucker.*

547 *Cultures of the Southwestern United States.* (3)
Development of sedentary and nomadic Indian peoples, from earliest times to the present. Emphasis on Puebloan, Mogollon, and Hohokam Archaeology and continuity with modern Indians. *Adams, Dobyns.*

548 *European and Near Eastern Archaeology.* (3)
Prehistoric cultural development in Europe and the Near East, from the earliest times to the beginning of civilization. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

555 *Eastern North American Archaeology.* (3)
Detailed analysis of prehistoric cultures of eastern United States with emphasis on interpretation of prehistory of Ohio River Valley. Prereq: ANT 120, 121, and 442 or consent of instructor.

560 *Ethnographic Principles and Practice.* (3)
Exposition of the principles of ethnographic data collection, and practice in the acquisition and use of censuses, genealogies, personal histories, maps, specialized recordings, specimen collection, and other materials. Three class hours per week. Prereq: ANT 410. *Lantis, Dobyns.*

561 *Anthropology: Man and His Works.* (3)
Survey of the major fields of anthropology: physical, prehistory, and ethnology and a guide to source material. Designed for students not contemplating further work in anthropology. *Staff.*

575 *Prehistory of Eastern Asia.* (3)
Prehistoric cultures of the East Asian mainland from the Old Stone Age to the beginnings of Chinese civilization, and their diffusion to Japan, Australia, and Oceania. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

581 *Independent Work in Anthropology.* (1-4)
Individual research problems in archaeology, ethnology, or physical anthropology.
May be repeated to a maximum of twelve credits. Prereq: Major and standing of 3.0 in department. *Staff.*

582 *Tutorial Seminar.* (2)
Anthropological methods and theory.
May be repeated to a maximum of eight credits. Prereq: Major in Anthropology. *Staff.*

601 *Proseminar in Anthropology.* (4)
Survey of contemporary anthropology and its constituent subfields, with emphasis upon its core concepts. Four class hours per week. *Staff.*

602 *Contemporary Anthropological Theory Seminar.* (3)
Systematic survey of significant theories current in anthropology, the primary concepts employed, and important contributors to anthropological theory. Emphasizes distinctive characteristics of the discipline. Three class hours per week. Prereq: ANT 601. *Dobyns.*

610 *History of Anthropology.* (3)
Traces the development of anthropology in historic perspective, with particular attention to major theorists. Three class hours per week. Prereq: ANT 601 or consent of instructor. *Bacdayan.*

614 *Field Methods in Linguistics.* (3)
Analysis of a language by working directly with a native informant. Prereq: ANT (Eng.) 514 or 515 and ANT (Eng.) 516. *Faust.*

641 *Middle and South America Seminar.* (3)
Current trends in change and modernization in Latin America. Deals with social, economic, ideological and political aspects of contemporary Latin American culture. Prereq: ANT 601, or consent of instructor. *Dobyns.*

658 *Seminar on African Societies.* (3)
Analysis of differing sociocultural factors in sub-Saharan Africa and their influence upon patterns of modernization, nationalism, and changing tribal structures. Prereq: ANT 601; ANT 431 or consent of instructor.

661 *Seminar on Near Eastern Cultures.* (3)
Analysis of social and cultural factors resulting in differing patterns of change, modernization, nationalism in Islamic countries and Israel. Prereq: ANT 601; ANT 438 or consent of instructor. *Adams.*

670 *Seminar on Role Theory.* (3)
An exploration of differences and similarities in the utilization of the concept of role in Sociology, Anthropology and Psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Three class hours per week. (Same as BSC 670.) *Gallaher.*

727 *Seminar on Socio-Cultural Change.* (3)
A seminar for advanced students. Emphasizes economic, religious, political, technological, psychological, etc. factors in change, and social and cultural patterns and processes of change. Prereq: ANT 527 or SOC 518, or permission of instructor. (Same as SOC 727.)

730 *Seminar in Comparative Religious Systems.* (3)
A seminar on principles in the comparative study of religious behavior and religious institutions and principles of change in religion as a cultural form. Deals mainly with religious of non-literate peoples. Three class hours per week. Prereq: Consent of instructor. *Lantis.*

731 *Seminar in Comparative Social Organization.* (2) II
A seminar for advanced students. Emphasizes principles in the comparative study of social systems; the role of kinship, age, sex, locality, and voluntary associations in determining relationships between individuals and between groups in non-literate and literate societies. (Same as SOC 731.) May be repeated once. *Gallaher, Bacdayan.*

765 *Research Problems in Medical Anthropology.* (3)
History and theory of medical anthropology, with attention to research design, field work, analysis of data, and report writing. Prereq: Graduate status in Anthropology, Sociology, or Psychology, and a Concentration or minor in Medical Behavioral Science. Two class hours, 3 lab hours per week. *Pearsall.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar.* (2)
Intensive work in particular fields of anthropology. All students during a given semester will be assigned related phases of the same problem. Designed primarily for students working toward a master's degree in Anthropology. May be repeated once. *Staff.*

790 *Research Problems in Anthropology.* (3)
Intensive study in the fields of Physical Anthropology, Archaeology, and Ethnology with qualified staff members. Term papers required. May be repeated three times. *Staff.*

ART

The Department of Art requires as prerequisite to the Master's Degree undergraduate work equivalent to that offered in the Department for its art majors. Work toward the Master's Degree may be undertaken in three areas: (1) creative work in studio, (2) art history and criticism, (3) art education.

For admission to the program in creative work the student must present an acceptable portfolio of work (slides or photographs). The Master's Degree will be given under Plan B (see page 21) on the satisfactory completion of 24 hours in studio work and 6 hours of art history, a Master's Exhibition approved by a Departmental committee, and the submission of a photographic record of the Exhibition in approved form.

Students admitted to the program in Art History are expected to have completed course work equivalent to an undergraduate major in art history. Work toward the Master's Degree is undertaken under Plan A (see page 19), with a total of 24 hours work, completion of the thesis and the language requirement. It is required that the student offer either course work or substantial proof of ability to use more than one foreign language.

The program for the Master's Degree in Art Education, is undertaken under Plan A, with a thesis based on substantial research, or theory in art education. No courses required for certification in a 48-hour area of concentration may be admitted as course work relevant to the Master's Degree in Art Education.

STUDIO COURSES

A-S 502 *Advanced Drawing.* (3)
Introduction and exploration into experimental materials and media. Relation of traditional and contemporary drawing attitudes to other areas investigated. Independent work projects encouraged. Nine studio hours per week. Prereq: A-S 302. *Mock.*

A-S 510 *Advanced Painting.* (3) I, II, S
Individual development in creative painting. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 311. *Suzuki.*

A-S 525 *Advanced Printmaking.* (3) I, II, S
Individual development in creative printmaking. Media and procedures within the general areas of lithography, intaglio, relief, and serigraphy will be chosen or devised as a means of creative expression, and/or new processes of printmaking will be devised. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 320, A-S 325. *Jones.*

A-S 540 *Textiles: Advanced Weaving.* (3) I or II
Woven and non-woven techniques combined in creating fabrics in relation to architectural demands. Aesthetic exploration in depth of materials, color and texture. Nine studio hours per week. Prereq: A-S 340, A-S 342. *Green.*

A-S 555 *Advanced Casting.* (3) I or II
Furthering of technical competence with the introduction of bronze alloying. Development of a professional and personal point of view toward cast sculpture will be stressed. Independent projects of architectural scale will be encouraged. Nine studio hours per week. Prereq: A-S 356. *Hall.*

A-S 560 *Advanced Welding.* (3) alt. yr.
All types of welding in all metals. A course for the expert welder, showing great promise as a sculptor. Personal, individual directions encouraged with professional quality work expected. Nine studio hours per week. Prereq: A-S 361. *Hall.*

A-S 565 *Advanced Wood Sculpture.* (3) I or II
Independent projects at professional level expected. Combination of wood and other materials to be investigated. New industrial products and methods will be utilized. Nine studio hours per week. Prereq: A-S 366. *Johnson.*

A-S 570 *Theory of Glazes and Refractories.* (3) alt. yr.
Theory and application in calculation of low and high fire glazes and clay bodies. Studying the properties of raw materials, and exploring the possibilities of various firing ranges. Original development of clay and glazes is encouraged and results analyzed. Nine studio hours per week. Prereq: A-S 371. *Tuska.*

A-S 571 *Advanced Problems in Ceramics.* (3) alt. yr.
In addition to doing advanced wheel problems, students concentrate on the creation of "new" functional forms and the problems of one-man production methods. Personal development of clay and glazes is encouraged. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 570. *Tuska.*

A-S 595 *Independent Work: Painting, Printmaking.* (3) I, II, S
Individual work in drawing, painting, and printmaking. May be repeated for a maximum of 9 credits. Prereq: Major and standing of 3.0 in the Department. *Suzuki.*

A-S 596 *Workshop.* (1-6) S
Summer workshops in sculpture or ceramics dealing with advanced problems. Three studio hours per credit. Prereq: Consent of instructor. *Staff.*

A-S 597 *Independent Work: Advanced Sculpture and Other Three Dimensional Media.* (3) I, II
Individual research and experimental work. May be repeated for a maximum of 9 credits. Prereq: 3.0 standing in the Department and the consent of the instructor. *Staff.*

A-S 610 *Traditional and Experimental Media in Painting.* (3) I, II, S
A survey of historical and contemporary procedures and materials with sustained problems in mural and easel painting. Preparation of grounds and consideration of permanency in pigments, vehicles and supports. Prereq: 3 credits in advanced painting, consent of the instructor. *Suzuki.*

A-S 798 *Problems in Sculpture, Ceramics and Design.* (3) I, II, S
Sustained individual problems and experimental work in the technical and theoretical problems of design. May be repeated for a maximum of 9 credits. Prereq: 12 credits in upper division studio work and consent of the instructor. *Hall.*

A-S 799 *Problems in Painting and Printmaking.* (3) I, II, S
Sustained individual problems in drawing, painting, and printmaking. May be repeated for a maximum of 9 credits. Prereq: 12 credits in upper division studio work and consent of the instructor. *Staff.*

ART HISTORY COURSES

A-H 505 *Roman Art: 5th Century BC to 4th Century AD.* (3) alt. yr.
Painting, sculpture, and architecture of the Roman Empire from the Etruscans through the Age of Constantine. Three class hours per week. Prereq: A-H 200, or consent of the instructor.

A-H 506 *Greek Art.* (3) alt. yr.
The development of architecture, sculpture, painting and minor arts of Classical Greece. Greece from its beginning to the end of the Hellenistic period. Three class hours per week. Prereq: A-H 200, or consent of the instructor.

A-H 530 *Medieval Art of Italy and Sicily.* (3) alt. yr.
While emphasizing the architectural developments and the mural and mosaic decoration, much attention given to the small scale major arts of stone and metal sculpture, ivory carving, gold and enamel work and manuscript illumination from the 4th to the 14th centuries. Three class hours per week. Prereq: A-H 334. *Freeman.*

A-H 550 *Italian Renaissance Painting:* 1350-1550. (3) alt. yr.
Painting in Italy from the time of Giotto and Duccio to Mannerism. Painting in Tuscany, Umbria, Rome, and the creation of Venetian painting and the spread of Mannerist tendencies. Three class hours per week. *Amyx.*

A-H 551 *Italian Renaissance Architecture: 15th and 16 Centuries.* (3) alt. yr.
The history of architecture in Italy from Brunnelleschi to Palladio. Three class hours per week. Prereq: A-H 201, or consent of the instructor.

A-H 555 *Italian Renaissance Sculpture.* (3) alt. yr.
A concentrated study of Renaissance Sculpture in Italy from 1400 to 1600; from the beginnings of the "new humanism" to Michelangelo, tracing the philosophical, social, artistic and historical influences upon the major sculptors of this era. Three class hours per week. Prereq: A-H 201, or consent of the instructor.

A-H 565 *Roman Baroque Art.* (3) alt. yr.
The Arts in Rome from the beginning of the 17th through early 18th centuries; the diffusion of Roman Baroque forms in Central and Northern Italy. Three class hours per week. *Amyx.*

A-H 570 *19th Century Architecture: Neo-Classicism to the Chicago School.* (3) alt. yr.
European and American architecture from Ledoux to Louis Sullivan. Three class hours per week. Prereq: A-H 201, or consent of the instructor. *Sandvik.*

A-H 576 *Art in America.* (2) II
A survey of American architecture, sculpture, painting, handicrafts, industrial design, etc., from Colonial time to the present. *Amyx.*

A-H 580 *French Painting: 19 Century.* (3) alt. yr.
The history of French painting from David to Cézanne. Three class hours per week. *Sandvik.*

A-H 590 *The History of Western Graphic Arts.* (3) alt. yr.
The origin in the 15th century and the subsequent developments in the Relief and Intaglio methods of printmaking, principally in Italy, Germany, and the Netherlands; the significant artists contributing to the extension of the medium as a fine art with the highest creative possibilities; the later invention and various developments in the Planographic method. Three class hours per week. Prereq: A-H 201, or consent of the instructor. *Freeman.*

A-H 591 *Seminar in Art History.* (2) I
An intensive study of a particular medium, area, period, or style in art history, with special emphasis on interpretation of sources, and the handling of visual and bibliographical materials. Required of majors in the History of Art. Required for all candidates for M.A. Degree in Art History. Two class hours per week. Prereq: Two courses in art history at 300 level. *Amyx.*

A-H 592 *Aesthetics.* (3) II
Problems of method in aesthetic; major types of aesthetic theory. Aesthetic materials of the arts, in literature, music, and the space arts. Form and types of form. Meaning in the arts. Interrelations of the arts. (Same as PHI 592.) *Amyx.*

A-H 593 *Seminar in Art.* (1) I, II
Current problems in art; correlations of theory and practice; discussions and reports. For seniors and graduates majoring in art. The seminar is prerequisite to the comprehensive examination. May be repeated to a maximum of 4 credits. *Staff.*

A-H 594 *Criticism of Art.* (3) I
History and theory of criticism in the Visual Arts. A survey of major types of critical theory, historical and contemporary. Required of majors in art history; open to majors in philosophy, literature, and the arts. *Amyx.*

A-H 599 *Independent Work: History, Criticism.* (3) I, II, S
Individual research: history, criticism, aesthetics. Prereq: Major and standing of 3.0 in the Department. May be repeated for a maximum of 9 credits. *Amyx.*

A-H 600 *Studies in Ancient Art.* (3) alt. yr.
Special studies: Ancient Art to emphasize the material and stylistic factors in the development of art, and the relevant cultural factors within a given area or period. Prereq: Graduate standing and consent of the Department. Three class hours per week.

A-H 630 *Studies in Medieval Art.* (3) alt. yr.
Intensive study of specific topics in Western European art between Constantine and Giotto, roughly 300 to 1200 A.D., according to the special interests and needs of individual students. May be repeated for a maximum of 6 credits. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Freeman.*

A-H 650 *Studies in Italian Renaissance Art.* (3) alt. yr.
Special studies in the Art of Italy between 1300 and 1600, with emphasis on the material, stylistic factors in the development of art, and the relevant cultural factors within a given area or period. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Amyx.*

A-H 670 *Studies in Modern Art.* (3) alt. yr.
Special studies in selected topics in 19th and 20th Century European and American art. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Sandvik.*

A-H 781 *Problems in Art History and Criticism.* (3) I, II, S
Sustained individual research and interpretation in history, criticism, aesthetics. May be repeated to a maximum of 9 credits. Prereq: 12 hours in art history and criticism and the consent of the instructor. *Amyx.*

ART EDUCATION COURSES

A-E 575 *Art in Elementary Schools.* (3) I, S
Study of perceptual and aesthetic awareness in children. Methods and materials appropriate to the teaching of art in the elementary school. Prereq: Major in Art Education. *Frederick.*

A-E 577 *Art in Secondary Schools.* (3) II, S
Art for teachers in secondary schools. The literature of art education. Courses of study. Teaching materials. Lectures, conferences, and reports. *Harris.*

A-E 579 *Seminar in Art Education.* (2)
A relationship of current philosophies of art education and aesthetics; a consolidation of art education ideas with a formation of criteria for making value judgments; a development of a vocabulary consistent with education and art. Prereq: Major in Art Education.

Art 768 *Residence Credit for Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

BIOLOGICAL SCIENCES
BIOLOGY

The Thomas Hunt Morgan School of Biological Sciences provides a program in Biology leading to the degree of Doctor of Philosophy. The program draws upon the various courses and faculty members in the biological sciences. The

purpose of this graduate program is to train participants as well-rounded biologists familiar with the main branches of the biological sciences and the auxiliary fields of mathematics, physics, and chemistry. Only one modern foreign language is required.

A student who receives his degree under this program also will be sufficiently well-trained in one of the major branches of biology to be able to conduct research in that special field, as well as broadly enough trained to participate in the teaching program of a department of biology. Students will be expected to have a background of course work in botany, zoology, genetics, physiology, calculus and organic chemistry before starting their doctoral program. All students accepted in this program will be required to take courses in biochemistry or physiological chemistry.

Major work under the biological sciences program would be arranged to suit the preparation, needs and interests of the individual student. The work could be, for example in genetics and cytogenetics, ecology and evolution, vertebrate zoology, invertebrate zoology, entomology, developmental biology, histology, parasitology, plant physiology, plant morphogenesis, algalogy, systematic botany, mycology, cellular biology, radiation biology, etc.

Laboratory facilities and equipment are quite adequate for doctoral work in all branches of biology. An excellent biology library containing over 10,000 volumes, and including many important American and foreign periodicals is available and is supplemented by over 200,000 volumes concerned with biology in the libraries of the College of Agriculture, the College of Medicine and the Departments of Chemistry, Physics, and Geology.

For appropriate courses see the Departments offering courses in the various areas of biology.

Additional graduate programs offered within the Thomas Hunt Morgan School of Biological Sciences are Biochemistry, Botany, Genetics, Microbiology, Physiology and Biophysics, Plant Physiology, and Zoology. Detailed descriptions of these programs, and courses offerings, are listed elsewhere in this catalog.

BOTANY

Botany, a department in the Thomas Hunt Morgan School of Biological Sciences, offers a program in Botany leading to the Master of Arts or Master of Science degree. Plan A is ordinarily required for the Master's degree but Plan B is permitted under certain circumstances.

A program in Biology which leads to the degree Doctor of Philosophy is offered in cooperation with other departments in the Morgan School. The Department of Botany also participates with other departments in the university in a program in plant physiology which awards the Doctor of Philosophy degree. Fields of study within the department include: algology, anatomy, cytology, morphogenesis, mycology, plant ecology, plant physiology and systematics.

400 *Fundamentals of Biology for Secondary School Teachers.* (4) S

A course designed to aid the teacher in the selection of subject matter and in the presentation of modern biology to high school students. Lectures, discussions, laboratories, 10 hours per week; Prereq: Employment as a high school teacher. (Same as ZOO 400.) *Carpenter and others.*

402 *Advanced Topics in Biology for Secondary School Teachers.* (4) S
A treatment of selected topics from the point of view of modern developments designed to aid the high school teacher to keep abreast of changes in theory and practice, to increase his knowledge of subject matter, and to provide better motivation for his students. Lectures, discussions, and demonstrations, 8 hrs. per week. Prereq: Employment as high school teacher and consent of instructor. (Same as ZOO 402).

501 *Plant Physiology.* (3-5)
Basic principles of plant physiology; the physiological processes of green plants and the effect of the environment on these processes. Lecture, 3 hrs. per week; laboratory, 2 two-hour per week during regular session. Prereq: Six credits in Botany or Biology and two semesters of inorganic chemistry. *Henrickson.*

506 *Special Problems.* (1-3) I, II
Independent work in some phase of advanced Botany. Prereq: consent of instructor. May be repeated to a maximum of twelve credits. *Staff.*

507 *Algology.* (4)
A survey of the physiology, structure ,life histories, genetics and relationships of the various groups comprising the algae, with the main emphasis upon the fresh-water green algae. Prereq: six credits in Biology. Lectures, 2 hours per week; laboratory, 2 hours per week. *Harris.*

513 *Ecology.* (4) I
The relationships of plants to the physical, chemical and biotic factors of their environment. Adaptations of species to these environmental factors are emphasized.

515 *Seminar.* (1) I, II
Readings and reports of special topics. Required of all Senior Botany Majors. May be repeated to a maximum of two credits. *Staff.*

521 *Anatomy of Vascular Plants.* (4) I
The nature and origin of primary and secondary tissues and their distribution in plant organs; the use of anatomical information in phylogeny, pathology, ecology and other research areas. Lectures, 2 hours per week; two two-hour labs per week. Prereq: six credits in Botany. *Sabharwal.*

524 *Mycology.* (4) I
The structure, life history, and physiology of the fungi. Lectures, 2 hours per week; laboratory, 4 hours per week. Prereq: BOT 101, 102 or its equivalent. *Leonard.*

526 *Advanced Mycology.* (4) II
The genetics and physiology of fungi. Lectures, and recitation 2 hours per week; laboratory, 4 hours per week. Prereq: BOT 524-525 or equivalent and consent of instructor. *Leonard.*

528 *Plant Cytology.* (4) I
The structure of plant cells; mitosis and meiosis. Lectures, 2 hrs. per week; two two-hour labs per week. Prereq: 3 credits in the biological sciences. *Riley.*

530 *Introduction to Heredity.* (3) II
The principles of heredity and their physical basis; lectures, 3 hours per week. Prereq: 3 credits in the biological sciences. *Riley.*

541 *Plant Pathology.* (3) II
Significance, nature, causes, and methods of control of plant diseases. Lectures, discussion, 2 hours per week; laboratory, 2 hours per week. Prereq: BOT 101, or 125 (Same as PPA 541.) *Diachun or Chapman.*

542 *Laboratory to Accompany* 541. (Same as PPA 542). (0)

551 *Taxonomy of Vascular Plants.* (4) I

A study of the principles and practices of taxonomy and a detailed consideration of the families of vascular plants. Lectures, 2 hours per week; laboratory, 4 hours per week including field trips. Prereq: BOT 101, 103, BIO 101, or BIO 202, 203 or consent of instructor. *Meijer.*

560 *Plant Microtechnique.* (3) I

The principal methods used in the preservation and preparation of plant materials for microscopic examination; basic microscopy; histochemistry; techniques for measurement and illustration. Laboratory, 6 hours per week. Prereq: BOT 101, 102, or 125. *Sabharwal.*

575 *Botanical Problems of Southern and Central Africa.* (3) II

Vegetative regions, significant plant families, plant migration, and climatic factors affecting the distribution of plants in South Africa, Central Africa, and adjacent territories. Prereq: 6 credits in Botany. *Riley.*

600 *Plant Morphogenesis.* (5)

Culture of isolated plant organs in test tubes containing synthetic media. Study of the effect of auxins, vitamins, amino acids and many other chemicals on the physiology and development of single cells, tissues and organs. Lectures, 2 hours per week; laboratory, 6 hours per week. Prereq: BOT 501, 502, 521, 522, or BOT 560 or consent of instructor. *Sabharwal.*

620 *Topics in Modern Botany.* (1-3)

A course for students in the biological and related sciences to be taught on various topics by specialists in their fields. Designed to give the student the most up-to-date information on the various topics. May be repeated three times for credit, but each time the course is taken, it must be under a different instructor. The type should be indicated by parentheses. Prereq: consent of instructor.

634 *Cytogenetics.* (4) I

Cytological and genetic evidence for the chromosome theory; chromosome aberrations and their importance in heredity and evolution. The effect of ionizing radiation on chromosomes. Lectures, 3 hours per week; laboratory, 2 hours per week. Prereq: BOT 528-529, 530 or equivalent. *Riley.*

701 *Plant Metabolism.* (3) II

Various aspects of plant metabolism including photosynthesis, respiration, nitrogen and protein metabolism; enzyme kinetics; and relation of molecular structure of cell components to function. Lecture, 2 hrs. per week; laboratory, 2 hrs. per week. Prereq: CHE 236 or 232, BOT 501, or consent of instructor. *Eley.*

732 *Mineral Nutrition of Plants.* (3)

Discussion of the accumulation, translocation and utilization of mineral elements by higher plants. Emphasis will be placed on the relationships between these processes and plant metabolism. Lectures and discussion, 2 hrs. per week; laboratory, 3 hrs. per week. Prereq; BOT 701 or BCH 515 or consent of instructor. (Same as AGR 732). *Hiatt.*

734 *Physiology of Growth and Development.* (3) II

A critical evaluation of research in selected aspects of plant growth and development. Emphasis will be on effects of growth environment. Lecture and discussion, 3 hrs. per week. Prereq: BOT 701 or consent of instructor. (Same as AGR 734). *Kasperbauer.*

735 *Biosystematics.* (3) II

Principles in the application of data from the fields of ecology, genetics, cytology, morphology, phytogeography, and physiology to the solution of taxonomic problems. Lectures, 3 hrs. per week. Prereq: BOT 551-552 and 530. *Riley.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
(In Biological Sciences). May be repeated indefinitely. *Staff.*

770 *Seminar.* (1)
Reports and discussions on various topics in botany. *Staff.*
May be repeated to a maximum of six credits.

790 *Research in Botany.* (1-6)
May be repeated indefinitely, at the discretion of the department. Type of research to be enclosed in parentheses, e.g., (Plant Morphology), (Mycology), (Systematic Botany), (Cytogenetics), etc.

GENETICS

The Thomas Hunt Morgan School of Biological Sciences provides a program in genetics leading to the degree of Doctor of Philosophy. The program draws from various courses and faculty members in the College of Agriculture, Arts and Sciences, and Medicine. The purpose of the program is to develop geneticists who are well trained in genetics, and in the related fields of plant physiology, biochmistry, cell biology, microbiology, statistics, or mathematics.

All students in the program, regardless of their minor areas, are expected to complete courses listed below or their equivalents; students not having the prerequisites will be expected to make up these deficiencies.

BOT 634 Cytogenetics
BIO 620 Genetics Structure of Populations
MB 714 Microbial Genetics
BIO 760 Developmental Genetics
BIO 770 Seminar in Genetics

The major will be fully developed by adding to the core curriculum, courses in such areas as cytogenetics, molecular, human or developmental genetics, and plant and animal genetics and breeding.

At least one minor area must be selected from such Doctoral Program areas as Biochemistry, Biology, Microbiology, Physiology, and Biophysics, Anatomy, Behavioral Science, Animal Sciences, Plant Pathology, Plant Physiology, Statistics, and Veterinary Science.

BIO 620 *Genetic Structure of Populations.* (3)
A discussion of the development, theory and practice of experimental and theoretical population genetics, including the basic dynamics and integrating properties of populations, factors which produce changes in populations and their effects on population structure and evolution. Three class hours per week. Prereq: An introductory course in genetics and in statistics, and consent of instructor.

BIO 760 *Developmental Genetics.* (3)
Discussion of metabolism, phenogenesis, immunogenicity, and molecular evolution as relates to gene action and its modification in basic development and physiological processes of higher organisms. Three class hours per week. Prereq: Adequate background in genetics and biochemistry and/or consent of instructor.

BIO 770 *Seminar in Genetics.* (1)
Review of current literature in genetics; presentation of papers on research in progress or on assigned topics; reports on meetings of scientific societies. Required of all graduate students in Genetics. May be repeated to a maximum of 10 credits. One class hour per week. Prereq: ASC 562 or BOT 532 or consent of instructor.

MICROBIOLOGY

The Department of Microbiology offers the Master of Science degree in the various fields of Microbiology, and the Doctor of Philosophy degree in the fields of morphology and physiology of microorganisms, immunology and serology, and medical and public health microbiology. Areas of research specialization include Microbial Biochemistry and Bioenergetics, Virology, Ecology, Microbial Genetics, Taxonomy, Gnotobiotics (germ-free animal research), and Electron Microscopy of microorganisms.

Masters Plan B is permitted with departmental approval; all graduate students including those under Plan B are required to engage in graduate level research.

400 *General Bacteriology.* (4) I, II, S
Microorganisms; their morphology, classification, physiology, relation to certain fermentations, to food, to soil fertility, and to disease. Lecture and recitation, two hours; lab, 4 hours. Prereq: CHE 104 or 112. *Weaver.*

410 *Applied Bacteriology.* (2) I, II, S
A course in bacteriological analysis to supplement Courses 200 and 400. Laboratory, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Wiseman and others.*

500 *Pathogenic Bacteriology.* (4) I, S
Human and animal pathogenic microorganisms, especially their morphological, cultural and pathogenic properties. Lecture, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Humphries, Ruchman and Hashimoto.*

512 *Growth and Death of Bacteria.* (4)
Physiological aspects of bacterial growth and death; Chemotherapy and disinfection. Lecture, two hours. Prereq: MB 102 or 200, CHE 232, and consent of instructor.

520 *Metabolism of Microorganisms.* (4)
Chemical changes produced by microorganisms; properties of their enzymes; the physiology of their growth. Lectures or conferences, two hours; lab, four hours. Prereq: CHE 232 and a reading knowledge of German or French. *Aleem and Wiseman.*

550 *Immunology and Serology.* (5) II
The theories and mechanism of infection and immunity; preparation, standardization, and uses of biological products; serology. Lecture, two hours; lab, six hours. Prereq: MB 500. *Humphries, Ruchman, Hashimoto.*

610 *Bacteriology of Foods.* (4) I
Dairy and miscellaneous food products; food preservation; food poisoning, standard methods for official food and public health laboratories. Lectures, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Weaver, Edwards.*

620 *Bacteriology of Water and Sewage.* (4) II
Microbiology of water; methods of purification. Sewage disposal methods. Operation of swimming pools. Standard and other methods for examination. Lecture, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Weaver, Edwards.*

635 *Clinical Mycology.* (2) I
Methods and techniques for isolating and propagating pathogenic actinomycetes and fungi. Lab. diagnosis of fungous infections. Lab., four hours a week. Prereq: MB 550, reading knowledge of one foreign language.

651 *Immunochemistry and Advanced Immunology.* (4) II
Chemistry of antigens and antibodies; of the reaction between them in vitro and in vivo; immune and hypersensitive reactions. Lecture and conferences, two hours; lab, four hours. Prereq: MB 550; CHE 232 and 444. *Humphries.*

660 *Electron Microscopy.* (3) II
Theory, operation and uses of the electron microscope; ultramicrotome and vacuum unit for metal shadow casting. Lecture, one hour; lab, four hours. Prereq: Physics 232 and 242. *Edwards, Conti, Hashimoto.*

670 *Viruses and Rickettsiae.* (4) II
Nature, activities, and methods of laboratory cultivation of viruses and rickettsiae; their relation to bacteria, plants, and animals. Lecture, two hours; lab, four hours. Prereq: MB 550. *Ruchman.*

700 *History of Bacteriology.* (2) I
Conferences, two hours. Prereq: MB 550. *Weaver.*

712 *Bacterial Anatomy, Taxonomy and Nomenclature.* (3) I
Study of anatomical structure of various groups of bacteria and fungi, theories of staining, principles of taxonomy, code of nomenclature of bacteria and viruses. Cytochemical procedures used in laboratory. Lectures and conferences, two hours. Lab, two hours. Prereq: MB 550, CHE 232, MB 660 recommended. *Hashimoto, Weaver.*

714 *Microbial Genetics.* (4) I
The nature and action of genetic material in microorganisms. Lectures and conferences, two hours; lab, four hours. Prereq: Basic courses in Genetics and Microbiology; CHE 232. *Gray.*

722 *Metabolism of Microorganisms.* (4) II
Continuation of 520. Lectures or conferences, two hours; lab, four hours. Prereq: MB 520. *Aleem.*

768 *Residence Credit for Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar.* (1) I, II
Review of current literature in MB; presentation of papers on work in progress in the department or on assigned topics; reports on meetings of national and international scientific and professional societies and symposia. Required of all graduate students. Two hours. May be repeated to a maximum of ten credits. *Staff.*

790 *Research in Bacteriology.* (3 to 6) I, II, S
Laboratory, 10 hours. May be repeated to a maximum of twelve credits. *Staff.*

795 *Research in Bacteriology.* (3 to 6) I, II, S
Laboratory, 10 hours. Prereq: Master's Degree or equivalent.
May be repeated to a maximum of twenty-four credits. *Staff.*

ZOOLOGY

Graduates of accredited colleges with a bachelor's degree in zoology or biology who satisfy the requirements of the graduate school may apply for admission to the graduate program for work leading to degrees of Master of Science or Master of Arts in Zoology according to Plan A or Plan B or a Doctor of Philosophy in Biology (see The Biological Sciences).

400 *Fundamentals of Biology for Secondary School Teachers.* (4)
A course designed to aid the teacher in the selection of subject matter and in the presentation of modern biology to high school students. Lectures, discussions; lab, 10 hours per week. Prereq: Employment as a high school teacher. (Same as BOT 400.)

402 *Advanced Topics in Biology for Secondary School Teachers.* (4)
A treatment of selected topics from the point of view of modern developments designed to aid the high school teacher to keep abreast of changes in theory and practice, to increase his knowledge of subject matter, and to provide better motivation for his students. Lectures, discussions, and demonstrations, 8 hrs. per wk. Prereq: Employment as high school teacher and consent of instructor. (Same as BOT 402)

502 *Principles of Physiology Lectures.* (3) I
A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems. Three class hours per week. Prereq: One year Physics and Organic Chemistry. Same as PGY 502.

503 *Principles of Physiology.* (5) I
A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems and laboratory experience with major experimental techniques. Prereq: One year Physics and Organic Chemistry. Same as PGY 503.

504 *Heredity.* (4) I
Lectures and laboratory on principles of heredity, variation and eugenics. *Carpenter.*

506 *Embryology.* (4) II
A general course in ontogeny. Studies in maturation, fertilization, cleavage, organogenesis and anomaties of development with laboratory work based on the chick and pig. *Birge.*

508 *Evolution.* (3) II
An advanced lecture course on some of the fundamental principles of organic evolution. *Carpenter.*

509 *Zoology Seminar.* (1) I, II
Reports on: Technical papers in scientific journals, book reviews, recent developments in Zoology, scientific meetings. Required of all majors in Zoology. May be repeated for a maximum of 4 credits.

510 *Independent Work.* (3)
Special problems for individual students who are capable of pursuing independent investigations. May be repeated for a maximum of 12 credits. Prereq: Major and a standing of 3.0 in the department.

512 *Physiology of Development.* (3)
A review of theories of differentiation and a consideration of the genetic environment, and correlative physiological factors in differentiation. Lectures, assigned readings and literature reports. Prereq: ZOO 200 or 506.

513 *General Histology.* (4) I
A course in the technique of preparation of animal tissues for microscopic study. Practice in imbedding, staining, sectioning, mounting, and identification of tissues. Prereq: CHE 112, ZOO 100 or ZOO 104 or BIO 200-202. *Dale.*

518 *Ornithology.* (4) II

A study of the life-histories, habits, identification, structure, adaptations, and physiology of birds. Special emphasis upon migrations, songs, nests and economic importance of our native birds. Lectures; field excursions; laboratory studies. Given alternate years. Prereq: ZOO 100 or ZOO 104 or BIO 200-202. *Barbour.*

520 *Mammalogy.* (4) I

Designed to acquaint the student with the mammals of eastern North America, their classification, adaptations and natural history. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100 or ZOO 104 or BIO 200-202. Given alternate years. *Barbour.*

522 *Herpetology.* (4) II

Designed to acquaint the student with the amphibians and reptiles of eastern North America, their classification, adaptations and natural history. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, or ZOO 104 or BIO 200-202. Given alternate years. *Barbour.*

524 *Ichthyology.* (4) I

Taxonomy of fishes with life-histories and biology of types. Fish structure and physiology, habits, ecology. Fish-culture and economic Ichthyology; care of fishes, aquaria, etc. Elements of fresh-water fishery administration. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100 or 104 or BIO 200-202. Given alternate years. *Kuehne.*

526 *Limnology.* (4) II

Detailed analysis of fresh water environment with special emphasis upon biological productivity. Two hours lecture, four hours field and laboratory. Prereq: CHE 110, 112, PHY 211, 213; consent of instructor. *Kuehne.*

528 *General Entomology.* (4) II

Introduction to the Class Insecta. Morphology, physiology, developments, systematics, and ecology of insects; procedures and techniques of insect identification; preparation of insect collections for research purposes. Lecture, two hours; lab, four hours. Prereq: ZOO 100 or ZOO 104 or BIO 200-202 and three additional credits in ZOO 570 or 502. *Barr.*

530 *Vertebrate Zoology.* (4) II

An intensive survey of the vertebrate classes, with emphasis on morphology, classification, phylogency, trends in evolution, and adaptations. Two lecture and two lab periods per week. *Barbour.*

532 *Medical Entomology.* (4) I

Study of Arthropod vectors of disease. Structure, collection, identification, control measures and life history studies. Given alternate years. Prereq: ZOO 534 or consent of instructor. Same as AGE 532. *Knapp.*

534 *Parasitology.* (4) I

Protozoan, helminth and arthropod parasites of man and domestic animals, emphasis on etiology, epidemiology, methods of diagnosis, control measures, and life histories. Techniques for host examination and preparation of material for study. Prereq: ZOO 104 or BIO 200-202. Same as AGE 534. *Edney.*

536 *Medical Protozoology.* (4)

The etiology, epidemiology, pathology, diagnosis, prophylaxis and control of parasitic protozoa, with special emphasis on life cycles and detailed studies of the protozoan parasites of man. Given alternate years. Prereq: ZOO 534 or consent of instructor.

538 *Helminthology.* (4) II

The etiology, epidemiology, pathology, diagnosis, prophylaxis and control of trematode, cestode and nematode parasites of vertebrates, with special emphasis on those of veterinary and medical importance. Lecture 2 hours; lab, 4 hours per week. Given alternate years. Prereq: ZOO 534 or consent of instructor. *Edney.*

540 *General Radiation Biology.* (4) II

A basic course devoted to a study of radiation techniques and research and their application in the various fields of biology. Lectures devoted to basic background and health hazard aspects followed by more comprehensive treatment of biological aspects. Laboratories devoted to use of radioisotopes and techniques of their measurement using various radiation detectors and counters. Lecture, 2 hours; lab, 4 hours per week. Prereq: Two years of biological sciences, one year of chemistry, and consent of instructor. *Carpenter, Calkins.*

542 *Insect Taxonomy.* (4) I

Methods and principles of systematic entomology and zoology; characterization of taxonomic categories; and international rules of zoological nomenclature. Collection, preparation and identification of insect specimens. Given alternate years. Lecture, 2 hours; lab, 4 hours. Same as AGE 542. Prereq: AGE 100 and ZOO 100 or ZOO 104 or BIO 200-202. *Freytag.*

550 *Comparative Physiology.* (5) II

Physiological mechanisms by which animals cope with different environmental stresses. Osmoregulation, respiration, temperature regulation and tolerance, sensory reception, circulation, etc. Prereq: One year college chemistry, ZOO 570, one year college physics or consent of instructor. *Crawford.*

554 *Animal Ecology.* (4) I

An analysis of the environment and the respective adjustments of animal life to the environmental complex. Habitats, food, respiratory needs and mechanisms, life histories, animal associations, adaptations. Lecture, 3 hours; lab, 2 hours per week. Prereq: ZOO 100 or ZOO 104 or BIO 200-202, or consent of instructor. *Kuehne.*

570 *Invertebrate Zoology.* (4) I

An intensive survey of the invertebrate phyla, including morphology, classification, phylogeny, general trends in the evolution of organ systems, and adaptations to varied modes of existence. Lecture, two hours; lab, 2 hours per week. Prereq: ZOO 100 or ZOO 104 or BIO 200-202. *Barr.*

598 *Protozoology.* (4) II

A comprehensive study of the Phylum Protozoa emphasizing current concepts of classification, phylogeny and evolution, ultrastructure, reproduction, nutrition, growth and motile behavior. The laboratory involves collection, identification, cultivation and physiology of Protozoa with extensive observation and analysis of cellular function. Lecture, 2 hours; lab, 4 hours. Prereq: CHE 230-232, MA 113, 211, PHY 211-213 and at least eight hours in Zoology. *Gittleson.*

602 *Insect Morphology.* (4) I

A study of internal and external insect structure, including function, and variation of form. Given alternate years. Same as AGE 602. Prereq: AGE 100 and consent of instructor. *Freytag.*

604 *Advanced Animal Ecology.* (3) II

Selected topics from recent studies on the energy flow concept of ecology, population ecology and community ecology. Prereq: Zoology 554 or BOT 513, 1 year of physics, organic chemistry and one year of mathematics; calculus and statistics recommended. *Davis.*

610 *Insect Ecology and Behavior.* (3)

The biotic and physical factors influencing the distribution, abundance, and behavior of insects and insect populations. Two class hours and two lab hours per week. (Crosslisted as Entomology 610.)

611 *Speciation.* (3) I, II

Mechanisms of evolution. A discussion of modern theories and problems concerning the formation of animal species. Three hours per week. Same as AGE 611. *Barr.*

615 *Seminar in Animal Navigation.* (2) I

Discussions of original literature on home range, homing ability and migration of animals. Prereq: Some reading knowledge of German. *Barbour, Davis.*

617 *Advanced Microtechnique.* (3) I, II
Special methods in histological technique for students of Zoology, Pathology or Anatomy. Prereq: ZOO 513, 515.

620 *General Acarology.* (4) II
Introduction to study of mites. Classification, morphology, physiology and ecology of mites important to the medical, veterinary and agricultural fields. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100 or ZOO 104 or BIO 200-202, AGE 100 and consent of instructor. Same as AGE 620. *Rodriguez.*

630 *Insect Physiology.* (4) II
Principles of insect physiology, function of organs, circulation, reproduction, respiration, and digestion. Lecture, 2 hours; lab, 4 hours. Same as AGE 630. Prereq: consent of instructor. *Dahlman.*

640 *Biological Effects of Radiation.* (3) I
A consideration of the biological action of ionizing radiations and ultra-violet light at progressively higher levels of organization. Recent experiments and current theoretical concepts will be emphasized. Three class hours per week. Prereq: ZOO 540-541, or 2 years in Chemistry, Physics, and Biological Sciences and consent of instructor. *Calkins.*

642 *Vertebrate Natural History.* (4) I
Behavior of vertebrate animals in their natural habitats as related to shelter, food, reproduction, and other aspects of survival. Adaptations contributing to behavioral patterns will be considered. Lecture, 2 hours; lab, 2 hours per week. Prereq: ZOO 530, 554. Given in alternate years. *Barbour.*

660 *Special Topics in Endocrinology.* (2)
A lecture-seminar course designed to explore in depth certain areas not covered in the introductory course. Usually invertebrate endocrinology, plant hormones, and physiology of reproduction will be covered. Two class hours per week. Prereq: ZOO 560 or equivalent.

709 *Graduate Seminar.* (1) I, II
Discussions of current research in Zoology. Prereq: Graduate standing in Biological Sciences.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. (In Biological Sciences). *Staff.*

790 *Research in Zoology.* (1-6 hrs.) I, II
Independent research work under direction, with conferences on objectives, principles, materials, methods, analysis of data and conclusion. Progress reports required at intervals. May be repeated indefinitely at discretion of department. Type of research to be enclosed in parenthesis, e.g. (Genetics), (Ecology), (Embryology). Prereq: Undergraduate degree in biological sciences.

CHEMICAL PHYSICS

The Department of Chemistry and the Department of Physics and Astronomy jointly provide a program in chemical physics leading to the degree of Doctor of Philosophy. Chemical physics is an overlapping area of the fields of chemistry and physics and, because of its relevance to such fields as Astrophysics, Thermonuclear physics, and Biophysics, it currently enjoys a position of considerable esteem at a number of institutions. Experience shows that most exciting progress

is made when members of the traditional fields of Chemistry and of Physics join together to form an operating unit of wide scope without the sacrifice of depth in the specialized areas. Students of either department are encouraged to follow a broader and richer curriculum by crossing departmental boundaries, both in the selection of courses and in the pursuit of independent research. Students and faculty frequently meet for informal seminars in chemical physics, encouraging exchange of information in the following research components of the chemical physics program: atomic and molecular theory, atomic and molecular processes, solid state theory and experiments, surface state physics, x-ray crystallography, and mass spectroscopy. Course offerings in chemistry and in physics, including the special offerings in chemical physics (CHE 755 or PHY 755, Topics in Chemical Physics) are listed under the Department of Chemistry and the Department of Physics and Astronomy.

CHEMISTRY

The Department of Chemistry offers the Master of Science and the Doctor of Philosophy degrees. Normally only Plan A is accepted for the Master of Science degree. Students may major in areas of chemistry such as analytical, inorganic, organic, physical and radio-nuclear as well as in fields like chemical physics and mass spectrometry. All candidates for the Ph.D. degree are required to serve as a teaching assistant for one semester.

A satisfactory reading knowledge of German is required for the M.S. and Ph.D. degrees. For the Ph.D. degree a satisfactory reading knowledge of an additional foreign language such as French or Russian is required.

All new graduate students must take proficiency examinations in analytical, inorganic, organic and physical chemistry. The results of these examinations are used as a guide in establishing the student's program of courses.

402,404 *Orientation in Modern Chemistry for Teachers.* (3 ea.) S
A review of the fundamentals of chemistry and a study of recent developments. The relation of chemistry to various aspects of modern life is considered. Prereq: Employment as high school science teacher.

406 *Fundamentals of Chemistry for High School Teachers.* (4) S
A course to aid the teacher in the selection of subject matter and in the presentation of modern chemistry to high school students. Lectures, discussions, six hours. Prereq: Employment as high school teacher.

440,442 *Physical Chemistry.* (3 ea.) I, II
The fundamental principles of physical chemistry are studied with emphasis on the application of these in the correlation of natural phenomena. Lectures and recitations, three hours. Prereq: PHY 242. *Sands.*

441,443 *Physical Chemistry Laboratory.* (2 ea.) I, II
Laboratory studies in physical chemistry to accompany CHE 440, 442. Six hours. *Bruner.*

444 *Physical Chemistry.* (5) II
For students in Agriculture and in the Biological Sciences. Lectures and recitations, three hours. Lab, six hours. Prereq: CHE 236; PHY 213 and MA 113. *Dawson.*

506 *Advanced Topics in Chemistry for High School Teachers.* (4) S
A course in selected topics and modern developments to enhance the competence of the high school teacher. Lectures and discussion, twelve hours. Prereq: Employment as a high school teacher and consent of instructor.

510 *Advanced Inorganic Chemistry.* (3) I
A course dealing with the concepts of inorganic chemistry with emphasis on atomic structure, periodicity, nomenclature, bonding, chemistry of the non-transition elements and acid-base theories. Prereq: 232 or consent of the instructor. *Sears.*

520 *Elementary Radiochemistry.* (3) I
An introduction to the use of radionuclides in chemistry. Topics include principles of radioactive decay, interaction of radiations with matter, detection, hot-atom chemistry and specific applications. Lectures and lab, five hours. Prereq: CHE 226 or equiv. *Ehmann.*

522 *Instrumental Analysis.* (4) I, II
The theory and application of instrumental methods of analysis. Lectures, two hours; lab, six hours. Prereq: CHE 442. *Christian.*

528 *Principles of Analytical Chemistry.* (2) II
An intermediate study of the theory and practice of quantitative analysis. Lectures and discussion, two hours. Prereq: CHE 548 or consent of instructor. *Wagner.*

532 *Qualitative Organic Analysis.* (3) I, S
A systematic study of the separation and identification of organic compounds. Lecture, one hour; lab, six hours. Prereq: CHE 232, 233. *W. T. Smith.*

538 *Principles of Organic Chemistry.* (3) I
A general survey of the field of organic chemistry. Lecture, three hours. Prereq: CHE 232 and consent of instructor. *S. L. Smith.*

548 *Principles of Physical Chemistry.* (3) I
An intermediate course dealing with the fundamental principles of physical chemistry. Prereq: College physics, integral calculus and one course in physical chemistry. *Plucknett.*

550,552 *Physiological Chemistry.* (4 ea.) I, II
A study of the chemistry of living processes. Lectures and recitations, three hours; lab, three hours. Prereq: CHE 226 or equiv. and 232. *W. T. Smith.*

572 *Seminar.* (1) II
Reports and discussions on recent research and current chemical literature.

582 *Chemical Literature.* (1)
Training in the use of chemical literature. One hour per week. Prereq: junior or senior standing. *Black.*

610 *Chemistry of the Transition Metals.* (3) II
A detailed treatment of the chemistry of the transition elements, the lanthanides and actinides, including the structure of coordination complexes, bonding, reaction mechanisms and preparations. Lectures, three hours. Prereq: CHE 510 or equivalent. *Sears.*

612 *Inorganic Chemistry of the Non-metals.* (3) II
A detailed treatment of the inorganic chemistry of the nonmetals. Topics include theories of bonding, spectral characteristics, reaction mechanisms, preparations, physical methods of characterization and structural determination, and applications. Three class hours per week. Prereq: CHE 510 or equivalent. *Niedenzu.*

616 *Radiochemistry.* (2) II
An advanced study of nuclear chemistry and radiochemistry. Lectures, two hours. Prereq: CHE 442, 443, 520. *Hofstetter.*

625 *Optical Methods of Analysis.* (3) II
An intensive study of the theory and applications of the following methods: emission spectroscopy, absorption spectrophotometry, colorimetry, refractometry, and polarimetry. Laboratory, six hours. Prereq: CHE 522. *Wagner.*

626 *Advanced Analytical Chemistry.* (3) I
An advanced study of the theory and practice of quantitative analysis. Lectures and discussions, three hours. Prereq: CHE 528 or equiv. *Hammaker.*

633,635 *Advanced Organic Chemistry.* (3 ea.) II, I
Fundamental organic chemistry as interpreted by modern theory. Prereq: CHE 538 or consent of instructor. *Patterson.*

640 *Electrochemistry.* (2) I
Adsorption and potential distribution at the electrode surface. Mechanism and kinetics of electrode processes. Kinetic interpretation of such phenomena as reversibility and overvoltage. Lectures, two hours. Prereq: CHE 442 or 548. *Bauer.*

643 *Chemical Crystallography.* (2) I
An introduction to crystallography for chemists. Topics include the physical and chemical properties of crystals, crystal geometry, symmetry, x-ray diffraction, and crystal structure analysis. Prereq: CHE 442. *Sands.*

645 *Chemical Thermodynamics.* (3) II
Principles and applications of chemical thermodynamics. Lectures, three hours. Prereq: CHE 442. *Sands.*

646 *Chemical Kinetics.* (3) I
Studies of chemical reactions from the standpoint of velocity and mechanism. Lectures, three hours. Prereq: CHE 442. *Plucknett.*

647 *Quantum Chemistry.* (3) I
An introduction to quantum mechanics with emphasis on the aspects closely related to chemistry. Lectures, three hours. Prereq: MA 431 and consent of instructor. *Bruner.*

710 *Topics in Inorganic Chemistry.* (2) I
Discussion of topics of recent interest in inorganic chemistry, including physical methods, syntheses, and structural theories. Lectures, two hours. Prereq: CHE 610 or 612 or consent of instructor. May be repeated to a maximum of 6 credits. *Niedenzu.*

714 *Non-Aqueous Solutions.* (2) II
A study of the properties of non-aqueous solutions and reactions in non-aqueous media. Lectures, two hours. Prereq: CHE 442. *Dawson.*

720 *Electrochemical Methods of Analysis.* (3) II
Classification of methods. Inherent and practical limits of sensitivity. Polarographic, voltametric and pulse methods. Lectures and laboratory, seven hours. Prereq: CHE 522 and 640. *Bauer.*

726 *Topics in Analytical Chemistry.* (3)
Selected topics which may include nuclear magnetic resonance, mass spectrometry, x-ray diffraction and spectroscopy, microscopy, and recent advances in analytical chemistry. Lectures, three hours. Prereq: CHE 522.

730 *Theoretical Organic Chemistry.* (3) I
The application of the principles of kinetics, thermodynamics and quantum mechanics to the problems of organic chemistry. Lectures, three hours. Prereq: CHE 635 and MA 431.

733 *Stereochemistry of Organic Compounds.* (3) I
The steric aspects of fundamental organic processes; the application of optical rotatory dispersion to the problems of stereochemistry. Prereq: CHE 635.

736 *Topics in Organic Chemistry.* (2-4)
Selected topics which may include heterocyclic organic compounds, natural and synthetic dyes, carbohydrates, nitrogen compounds, and recent advances in the field of organic chemistry. Lectures, two to four hours. May be repeated to a maximum of 12 credits. Prereq: consent of instructor.

743 *Molecular Structure.* (3) II
Applications of quantum theory to chemical problems, theories of the chemical bond, structure an dspectra of molecules. Lectures, two hours. Prereq: CHE 742. *Bruner.*

744 *Statistical Thermodynamics.* (3) II
The study of chemical thermodynamics from the viewpoint of the statistical treatment of systems rather than from the empirical classical approach. Lectures, three hours. Prereq: CHE 645 and MA 431. *Plucknett.*

746 *Topics in Physical Chemistry.* (2-4)
Selected topics which may include photochemistry, structure of crystals, molecular spectra, nature of the chemical bond, and recent advances in the field of physical chemistry. Lectures, two to four hours. May be repeated to total of 12 credits. Prereq: CHE 548 or consent of instructor.

747 *Advanced Quantum Chemistry.* (3) II
An advanced treatment of quantum chemistry with emphasis on the methods and procedures used in its applications. Lectures, three hours. Prereq: CHE 647. *Bruner.*

755 *Topics in Chemical Physics* (3)
An introduction to current research areas in chemical physics. Topics may include theory of atomic spectra, atomic and molecular processes, molecular theory, electrons and phonons in crystals, and optical properties of metals. Lectures, 2 or 3 hours. Prereq: Consent of instructor. May be repeated to a total of 12 credits. (Same as PHY 755.)

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

776,778 *Graduate Seminar.* (1 ea.) I, II
Reports and discussions on recent research and current literature. Required of all graduate students.

780 *Individual Work in Chemistry.* (1-5) I, II, S
Selected library and laboratory problems in conformance with the student's interest will be attacked and pursued under the direction of a suitable staff member who is proficient in the area under investigation.

790 *Research in Chemistry.* (1-5) I, II, S
Work may be taken in the following fields, subject to the approval of the Departmental Graduate Committee: Analytical Chemistry, Inorganic Chemistry, Organic Chemistry Radiochemistry, or Physical Chemistry. May be repeated indefincitely.

SCHOOL OF COMMUNICATIONS

The School offers a program leading to the Master of Arts degree which is designed to serve the needs of students with varied goals and backgrounds. Goals may include teaching, research, professional work on the media, or a

combination of these. The program is open to students with previous work in journalism, radio-television-films, speech, or other academic areas. Students with no previous work in a communications area will be required to take from 5 to 10 hours of undergraduate work without graduate credit.

From 15 to 24 of the required hours of graduate credit will be taken in communications courses. A minimum of 12 credits in 600 level or higher communications courses, including CMO 651 and CMO 665, are required.

Students can elect, with the approval of their adviser, to work under Plan A or Plan B as described in this bulletin. Students primarily interested in communications research would normally follow Plan A which consists of 24 hours of course work plus a thesis. The course work will include 12 hours of communications core work and related courses in communications and other areas of the University. Students electing to follow Plan B will take 30 hours of course work consisting of 12 hours of communications core work, plus 3 to 12 hours of communications options and 6 to 15 hours of options in some other area of the University. Eighteen of the minimum 30 credits must be in 600 level or higher courses.

COURSES IN COMMUNICATIONS

550 *Introduction to Communications Research* (3) II

To introduce undergraduate students to the philosophy of research—particularly as it applies to communications; and to study the principal types of communications research so that the student will be able to do simple projects and interpret research findings in his field. Three class hours per week. ***Staff.***

551 *The Communications Process* (3) II

Considers the communication process and effects of communications on the individual. Draws upon research in these areas from the fields of communication, political science, psychology, sociology, and journalism. ***Donohew.***

553 *Mass Communication and Social Issues* (3) I, II, S

A course devoted to examination of criticism of the mass media and an evaluation of the relationship of mass communication to contemporary social issues. ***Donohew.***

554 *Seminar in Communications* (2)

Intensive study of a communication topic in professional, theoretical, and research (methodology) areas. May be repeated to a maximum of six credits. ***Staff.***

607 *Evaluating and Communicating Information.* (3) I, S

A study of the communications systems with which students will work, of the effect of the communications systems on public decisions, and of the means by which students work efficiently with communications systems. ***Murphy.***

608 *Mass Communications and Society.* (3) I, S

A study of the ways in which the communications media play their roles in contemporary society with special attention to the major functions, rights, and responsibilities of media and individuals. ***Thorp.***

613 *Introduction to Information Sciences* (3) I, S

Introduction to the major aspects of scientific and technical information centers, documentation and the use and users of scientific information. Knowledge of systems analysis would be helpful. Prereq: CS 220 or equivalent. (Same as LS 613) ***Sanderlin.***

614 *Information Storage and Retrieval Systems.* (3) II

Review of the various solutions for storing and retrieving information, ranging from traditional records and devices to modern computers. Emphasis upon modern electronic equipment for information handling. Prereq: LS 613. (Same as LS 614) ***Sanderlin.***

615 *Informations Systems Design.* (3) I, S
Principles and problems of information systems: systems analysis applied to informations systems. Design of information systems with particular attention to equipment, training of personnel, and evaluation. Prereq: LS 614. (Same as LS 615) *Sanderlin.*

651 *Communications Theory.* (3) II
Major theories of the communications process and review of experiments and field studies on communications. Readings, discussion, and student experiments testing theoretical propositions about communications. Prereq: Course in statistics or in design of social research. *Donohew.*

665 *Communications Research Methods* (3) II
The scientific method. Communications research as a part of social science research. Study and practice of advanced behavioral research techniques which apply to communications. Prereq: A behavioral research course and permission of instructor. *Murphy.*

705 *Seminar: Information Sciences.* (3)
An investigation of the parameters of the information sciences from an interdisciplinary approach. Investigation and analysis of the literature of communications, management science, cybornetics, information theory to identify the similarities and differences. From this investigation, both qualitative and quantitative concepts of the directions of information science will be derived. Three class hours per week. (Same as LS 705).

730 *Seminar in Mass Media and Public Policy.* (2) II
The role of mass communications media in making public policy and the effects of public policies on the mass media. One subject area will be investigated each semester; typical topics are: (a) political campaign communications; (b) censorship; (c) controversial public issues; (d) rights; (e) international and world agreements. Prereq: Graduate standing. *Staff.*

781 *Directed Study in Communication.* (1-6)
To provide advanced students with an opportunity for independent work to be conducted in regular consultation with the instructor. May be repeated for a total of six credits. (To be used for independent work.) Prereq: Consent of instructor.

COURSES IN JOURNALISM

501 *News Reporting.* (3) I, II
A reporting course which emphasizes special fields of information, news gathering, and news evaluation. *Thorp.*

503 *Copyreading and Editing.* (3) I, II
Instruction and practice in newspaper desk work. Preparation of local, state, telegraph, and radio news and features; picture editing, and page makeup. Lecture, one hour. Prereq: JOU 501. *McCauley.*

507 *Feature Writing.* (3) I, II
Instruction and practice in writing features. Lectures, readings, and reports directed toward discovering, gathering, organizing, writing, and marketing feature articles. Prereq: senior standing or permission of instructor. *Moore.*

509 *Magazine Article Writing.* (3) II, S
Lectures, personal conferences and practice in writing and submitting material for publication in magazines; study of the markets for this material; free-lance article writing. Prereq: senior or graduate standing or permission of instructor. *Moore.*

511 *Editorial Writing.* (2) I, II
A study of editorials, editorial columns, and editorial pages. Publication of copy encouraged. *McCauley.*

513 *Supervision of High School Publications.* (1-3) S
A study of the problems that confront the adviser of the high school newspaper or magazine. Open to advisers or prospective advisers with consent of the instructor. *McCauley.*

531 *Law of the Press.* (2) II
A study of the special laws of libel, copyright, and regulatory provisions that pertain to the press. *Plummer.*

535 *History of Journalism.* (3) II
A study of the rise and development of American journalism and newspaper. Prereq: senior standing. *Thorp.*

537 *Seminar in Public Opinion.* (3)
A detailed examination of techniques developed and used by the press in influencing public opinion. Specific cases studied. Latter part of course devoted to the preparation of newspaper campaigns dealing with current problems of society. Prereq: senior or graduate standing. *Moore.*

539 *Reporting Public Affairs.* (3) II
Instruction and practice in reporting the news originating in courts and other public institutions. Prereq: JOU 501, senior standing.

541 *Public Relations.* (3) II, S
Lectures and practice dealing with the aims and methods of writing news and special articles for public relations programs of business, schools, colleges, libraries, and of the social service organizations. *McCauley.*

561 *Newspaper and Magazine Advertising.* (3) I, II
Relation of newspapers and magazines with advertisers, with emphasis upon the preparation of local display and national advertising. *Wild.*

563 *Advertising Procedures.* (3) I, II
Study of organizations and functions of advertising institutions and of product analysis, and research, consumer motivation, production methods, copy and layout. Lecture, two hours; lab, two hours. Prereq: JOU 561.

571 *Community Journalism.* (3) I, S
A study of the problems which confront the community weekly and the small city daily. *Staff.*

573 *Newspaper Administration.* (3) II
A study of the business, circulation, advertising, and accounting divisions of the newspaper with special emphasis on the community newspapers. *Staff.*

575 *Typography.* (2) I, II
Instruction and practice in typographic composition. Use of type faces in news editing. Study of typography in the make-up of American newspapers. Laboratory, four hours. *Wild.*

581 *Introduction to Press Photography.* (3) I, II, S
Use of cameras, printers, enlargers and laboratory equipment in modern press photography, and a study of selected readings on photographic methods and skills. *Staff.*

591 *Radio News Scripts.* (2) I, II
Instruction and practice in writing news and features material for radio presentation. *Moore.*

599 *Advanced Writing for the Mass Media* (3) II
A course designed to provide communications majors advanced training in reporting and writing articles on current events, public issues, personalities, culture and entertainment for newspapers, magazines and the broadcast media. Twice weekly seminars. Lecture, one hour; laboratory and independent work by students as needed to complete assignments; individual consultation between instructor and students. Prereq: Consent of instructor. *Staff.*

COURSES IN TELECOMMUNICATIONS

421 *Television Production.* (2)
Translation of ideas into television programs. Students prepare, produce, and direct different program types designed to illustrate the process of solving problems of creative work in television. Lecture, 1 hour; lab, 4 hours per week. Prereq: RTF 312.

432 *Film Production.* (2)
Integration of visual images with emphasis on idea presentation, form, and structure for motion pictures. Lecture, 1 hour; lab, 4 hours per week. Prereq: RTF 312.

500 *Program and Audience Analysis.* (3)
Course designed to assist students to develop criteria for analyzing structure and content of programs, for analyzing audience size and composition, for analyzing the relationship of audience, program, and the American system. Lecture, 2 hours; lab, 2 hours per week.

501 *Broadcasting Regulations.* (3) I
A study of the governmental regulations of broadcasting by the FCC, and other federal, state, and local agencies: licensing, libel and slander, copyrights, illegal practices and self regulation. Lecture and recitation, three hours. *Staff.*

505 *Broadcast Program Policies.* (2)
The determination of program policies, program scheduling, and program planning for a community. Two class hours. Prereq: RTF 500.

507 *The Public Affairs Program.* (2)
The role of broadcasting in politics, public affairs, education and the arts. A consideration of the factors which determine the form, function, and method used by documentaries, interviews, newscasts, and their program forms. Two class hours, 2 lab hours. Prereq: RTF 500.

510 *Broadcast Advertising.* (2) I
The data and technique of radio and television advertising, including problems of coverage and circulation, spot campaigns, testing, time buying, the agency, measuring broadcast effectiveness, merchandising radio and television advertising, and time selling. Lecture and recitation, two hours. *Staff.*

530 *Pro-Seminar in Radio and Television.* (2) II
Discussion and reports on current broadcasting highlights and problems. Required of all seniors. Lecture and recitation, 2 hours. *Staff.*

COURSES IN SPEECH

581 *Communication Processes in Discussion.* (3)
A study of the communication processes in small group discussions; emphasis on empirical research findings concerning leadership, interpersonal relations, and the logical and psychological aspects of group problem-solving.

582 *Persuasion.* (3)
The principles and methods of persuasion. Of particular benefit to teachers, lawyers, business majors, and other persons whose work is concerned with motivating human conduct. *Blyton, Patterson.*

583 *Studies in Argumentation.* (3)
A study of the theories of argumentation and debate as derived from rhetorical, philosophical and psychological sources; critical examination of representative examples of oral argument.

584 *Teaching of Speech.* (3)
An analysis of the field of speech education as related to the teacher of speech. *Blyton, Patterson.*

585 *American Public Address to 1865.* (3)
An historical and critical study of public discussion in the United States, from the Colonial Period to 1865, through the analysis of major speakers, speeches, and debates. Prereq: Permission of instructor. *Patterson.*

586 *American Public Address since 1865.* (3)
An historical and critical study of public address in the United States from 1865 to the present. Prereq: Permission of instructor. *Patterson.*

588 *Oral Interpretation of Drama.* (3)
The cutting and adapting of the three-act play for oral presentation. *Sterrett.*

687 *Studies in Ancient and Medieval Rhetoric.* (3)
A comparative and critical study of the major treatises on the art of speaking, from the time of Aristotle to the Renaissance, with attention to the rhetorical practice, criticism, and pedagogy of the succeeding periods.

688 *Studies in Renaissance and Modern Rhetoric.* (3)
A comparative and critical study of the major contributions to the body of rhetorical theory from the Renaissance to the present. *Patterson.*

780 *Directed Studies.* (3)
Independent work devoted to study and research on specific subjects and problems according to the interests and needs of individual students. May be repeated to a maximum of nine credits. *Staff.*

782 *Special Topics in Speech.* (3)
Study and research on specific topics and problems according to the interests and needs of individual students. Normally offered as an independent work course. *Staff.*

COMPUTER SCIENCE

420 *Algorithmic Languages and Compilers.* (3)
This course acquaints the student with the formal description of procedure-oriented languages and techniques useful in the translation of these languages into computer programs. Prereq: CS 320.

440 *Information Processing Systems.* (3)
An introduction to structures of information sets covering syntactic or semantic relations. The generation, development and processing of structures and their interrelationships, machine instructions and storage hierarchies. Prereq: CS 320 or equivalent.

472 *Seminar.* (2)
Weekly report on current research papers. Discussion of new advances in computer science. (May be repeated to a maximum of 6 hours.) Prereq: CS 320 or 440, or consent of instructor.

525 *Analog and Hybrid Computer Techniques.* (3)
Application of analog and hybrid computers in the solution of systems of integro-differential-difference equations. Prereq: MA 431 or equivalent.

530 *Computational Methods.* (3)
A study of computational methods from the user's standpoint rather than from the designer's. Lecture, 2 hours; lab, 2 hours. Prereq: MA 421 or instructor's consent, plus ability to program a digital computer.

540 *System Simulation.* (3)
Computer simulation techniques including building and utilizing deterministic and stochastic models for digital and analog computers. Prereq: CS 220 or equivalent and a course in statistics.

560 *Non-numerical Applications of Computers.* (3)
Introduction to and training in non-numerical techniques by digital computers. Prereq: CS 220 or equivalent.

570 *Computers and Programming Systems.* (3)
Advanced concepts in software design, development, and implementation including priority, executive, and real time computer systems. Prereq: CS 420.

DIPLOMACY AND INTERNATIONAL COMMERCE

Under the auspices of the Patterson School of Diplomacy and International Commerce, the University offers extensive graduate training in International Affairs. Doctoral programs are available in the following areas:

International Relations:

Students who wish to study International Relations from a political perspective may do so under M.A. or Ph.D. programs available in the Department of Political Science. The exact details of such programs are determined in each case by the student and his advisors. Recent programs in this area have involved work in conflict and decision theory, international organization, political development, foreign policy, and comparative government. Related work has been taken in Anthropology, Economics, History, Psychology, and Sociology. Departmental policy permits the exact mix of Political Science and related work to reflect, primarily, the interest of the student.

Diplomatic History:

The student who desires to work for the Master's or Doctor's degree in Diplomatic History may do so by shaping his program to meet the requirements of the Department of History. Such a program will entail some work in related courses in other Departments. The details of each program are worked out by the student and his advisor at the Master's level and by the student and his special committee at the Doctoral level. Under Doctoral fields, the student would choose a speciality preparation in diplomatic history, and would write his dissertation in this field.

International Economics and Economic Development:

Advanced study in Economics related to International Commerce is available in the Department of Economics. The Master's degree requires a minimum of thirty credit hours of course work plus either a foreign language or appropriate courses in mathematical sciences. Considerable flexibility of course selection is allowed in the Master of Science Program, whereas the Master of Arts program is essentially the first part of the Ph.D. program. Two elective areas in International Economics and Economic Development, together with two areas in economic theory and history and other requirements, form the program for a Ph.D. degree in Economics with specialization in International Commerce.

International Business and Commerce:

The College of Business and Economics offers Master of Business Administration and Doctor of Business Administration degrees. The M.B.A. requires a

core of work in administrative and behavioral policy. An additional six hours in international management and administrative theory serves as a concentration in international commerce. Study in the areas of administrative science, research methodology, economic theory and quantitative analysis is basic to the D.B.A. degree. A major may be selected in the area of international business and a minor in a closely related field.

ENGLISH

All candidates for the master's degree in English will be required to attain a reading knowledge of one modern foreign language (ordinarily, French, Italian or German) before receiving the degree.

The Department offers the master's degree according to both Plan A and Plan B. (See pages 19-21.) A statement of detailed requirements is available from the department on request.

A knowledge of two modern foreign languages (normally French and German) is required of all applicants for the Ph.D. A statement of departmental requirements, including the preliminary, qualifying, and final examinations and the dissertation is available on request.

412 *History of the English Language.* (3)
A survey emphasizing the characteristics of English from the times of Alfred, Chaucer, Shakespeare, and Johnson to the present. ***Cutler and others.***

425 *Shakespeare Survey.* (3)
A study of ten to twelve of the major plays of Shakespeare, including comedies, tragedies, and histories. ***Black and others.***

501 *Workshop in Imaginative Writing.* (2)
For advanced students. This course assumes that the student has already acquired competence as a writer. Prereq: English 207, and consent of the instructor. May (with consent of the instructor) be repeated once for a total of four credits. ***Berry.***

509 *Composition for Teachers.* (3)
The basic studies helpful to high school teachers of composition. The teaching of grammar, punctuation, usage, etc., and of theme planning, correction, and revision. Students are required to do quite a bit of writing. ***Crabb, Hatch, Van Gelder, Pival.***

510 *Modern British and American English.* (3)
A survey of modern British and American English with respect to pronounciation, syntax, spelling, and usage. Historical developments will be examined insofar as doing so sheds light on modern practice. ***Cutler.***

512 *Grammar of Structure and Usage.* (3)
Descriptive grammar for advanced students. Analysis of sentence structure; consideration of standards of usage; investigation of current practice. ***Faust, Pival.***

514 *Descriptive Linguistics: Phonetics.* (3)
Articulatory description of speech sounds; practice in recognition and control. (Same as ANT 514.) Prereq: Consent of instructor. ***Faust.***

515 *Descriptive Linguistics: Phonemics.* (3)
An investigation of speech-sounds and systems of speech-sounds. Also attention to both speech and writing as communication systems. (Same as ANT 515.) Prereq: Consent of instructor. ***Faust.***

516 *Descriptive Linguistics: Morphemics.* (3)
An explanation of some of the ways speech sounds are put together in patterns so as to from languages. (Same as ANT 516.) Prereq: ENG 515; consent of instructor. *Faust.*

520 *Chaucer.* (3)
Extensive readings in the principal works of Chaucer, with particular attention to *The Canterbury Tales* and *Troilus and Criseyde. Staff.*

522 *English Literature: 1500-1600.* (3)
Literature of the Elizabethan period exclusive of the drama. Foreign sources of the English Renaissance. Major writers such as More, Ascham, Wyatt, Sidney, Spenser, Raleigh, and Marlowe. *Stroup, Evans.*

523 *English Literature: 1600-1660.* (3)
Selected non-dramatic works of such writers as Bacon, Donne, Ben Jonson, George Herbert, Izaak Walton, Herrick, Sir Thomas Browne, Vaughan, Traherne, and Milton. *Stroup, Rickey.*

524 *Pre-Shakespearean Drama.* (2)
A course in English origins, beginning with the *Quem Quaeritis Trope* and extending through the works of the early Elizabethans. *Stroup.*

525 *Elizabethan Drama, Exclusive of Shakespeare.* (3)
A survey of English drama from the early Elizabethans until the closing of the theatres. *Stroup.*

526 *Shakespeare: the Comedies.* (3)
Shakespeare's comedies will be studied in detail. *Black, Evans, Rickey, and others.*

527 *Shakespeare: the Tragedies.* (3)
Shakespeare's tragedies will be studied in detail. *Black, Evans, Rickey, and others.*

528 *Milton.* (3)
A study of all of Milton's poetry and of his more important prose; readings from contemporary thinkers; studies in thought currents of the time and Milton's relation to them. *Stroup.*

530 *Age of Pope.* (3)
Addison and Steele, Swift, Pope, Defoe, and other contemporary figures. *Cooke and others.*

531 *Age of Johnson.* (2)
Johnson and his circle; Burke, Goldsmith, Gray, Walpole, Cowper. The Pre-Romantic movement. *Cooke and others.*

532 *Restoration and Eighteenth-Century Drama.* (3)
A study of the dramatic types that arose between the closing of the theatres in 1642 and the death of Sheridan. *Cooke.*

533 *Eighteenth-Century British Novel.* (3)
Study of the novel from its beginnings in English literature through the eighteenth century. *Cooke, Adelstein and others.*

535 *The Romantic Movement: 1780-1815.* (3)
A study of the poetry and prose of the first half of the romantic movement. The emphasis is on the poetry of Blake, Wordsworth, and Coleridge. *Ward, Gordon, and others.*

536 *The Romantic Movement: 1815-1830.* (3)
A study of the poetry and prose of the second half of the romantic movement. The emphasis is on the poetry of Keats, Shelley, and Byron. *Ward, Gordon, and others.*

538 *Victorian Literature: 1830-1860.* (3)
Poets and essayists—Macaulay, Mill, Carlyle, Newman, Tennyson, Mrs. Browning, Browning, Ruskin, and Arnold—in their historical setting. *Staff.*

539 *Victorian Literature: 1860-1900.* (2)
Poets and essayists—Rossetti, Swinburne, Meredith, Huxley, Pater, Wilde, Davidson, Henley, Stevenson, Housman, Hardy, Kipling, and some others—in their historical setting. *Staff.*

540 *Nineteenth-Century British Novel.* (3)
Study of the novel in English literature from Scott through Gissing. *Staff.*

541 *Twentieth-Century British Novel.* (3)
A study of the content and technique of the best twentieth-century British novels, with some consideration of these in relation to significant social, philosophical, and literary trends. *Evans.*

542 *Twentieth-Century British Literature.* (3)
British literature of the 20th century, with particular attention to poetry, to literary movements, and to critical theory. *Moore.*

550 *American Literature Before 1800.* (2)
A survey of the development of American life, thought, and letters from the beginnings to 1800. *Staff.*

551 *American Literature: 1800-1860.* (3)
A survey of the development of American life, thought, and letters from 1800 to 1860. *Ringe, Jacobs, and others.*

552 *American Literature: 1860-1900.* (3)
A survey of the development of American life, thought, and letters in the later years of the 19th century. *Ringe, Jacobs, and others.*

553 *American Literature Since 1900.* (3)
A survey of the development of American life, thought, and letters in the 20th century. *Jacobs and others.*

554 *American Novel before 1900.* (3)
Study of the American novel from the beginnings to Henry James. *Ringe, Jacobs, and others.*

555 *Modern American Novel.* (3)
Novels chosen for their enduring value rather than historical importance. Attention to shifting techniques of fiction and to contrasting interpretation of the American scene. *Jacobs and others.*

560 *Comparative Literature I.* (3)
A study of Greek and Latin Literature from Homer to the Middle Ages. *Evans, Davenport.*

561 *Comparative Literature II.* (3)
Study in English of major works of continental European Literature. Late medieval period to mid-Seventeenth Century. *Evans.*

562 *Comparative Literature III.* (3)
Study in English of major works of continental European literature written in modern languages, especially French, German, Spanish, Italian, Russian, mid-Seventeenth Century to end of Nineteenth Century. *Evans, Davenport.*

563 *Comparative Literature IV.* (3)
Masterpieces and examples of twentieth-century Western World literature, with emphasis on the emergence of new forms and techniques invented to express the complexity of modern life. The course will study novels, poems, and plays in their traditional development and in experimental and divergent forms. *Davenport.*

565 *The Lyric in English.* (2)
A critical examination of selected lyrics from the Middle Ages to the present. *Moore.*

566 *Modern Drama.* (3)
Continental, British, and American dramatic literature from Ibsen to the present. *Adler and others.*

568 *History of Literary Criticism I.* (3)
Literary criticism in the Western World from Plato through the eighteenth century. Application of critical principles to literary works. *Adler.*

569 *History of Literary Criticism II.* (3)
Literary criticism in Europe and America from Wordsworth to the present. Application of critical principles to literary works. *Adler, Jacobs.*

570 *Literature of the Old Testament.* (3)
Critical analysis of the canonical and apocryphal Old Testament in English, with particular attention to Biblical ideas and symbols helpful to students of literature. *Rickey, Cobb.*

571 *Literature of the New Testament.* (3)
Critical analysis of the canonical and apocryphal New Testament in English, with particular attention to Biblical ideas and symbols helpful to students of literature. *Rickey, Cobb.*

572 *Studies in English for High School Teachers.* (1 to 3)
Specialized topics in language, literature, and composition designed to increase the high school teacher's knowledge of subject matter, to aid him in meeting major problems in the curriculum, and to enlarge his understanding of new developments and approaches to the teaching of high school English. Prereq: Employment as a high school teacher. May be repeated to a maximum of six credits. *Staff.*

573 *General Introduction to Folklore.* (3)
An introduction—on a world-wide scope—to the types of folklore. Emphasis upon folklore as a cultural phenomenon in its own right and upon its relations to literary types. The development of the science of folklore. *Jansen.*

574 *American Folklore.* (2)
A study of the major materials in American folklore. The use of this material in other forms. Experience in actual collecting and in the cataloging of materials. *Jansen.*

600 *Bibliography and Methods of Research.* (3)
Studies in enumerative bibliography and in the methods and materials of scholarly and critical investigation. Required of M.A. candidates in English. *Ward.*

610 *Old English.* (3)
Introduction to Old English language and literature. *Moore, Manning.*

611 *Beowulf.* (3)
Chiefly a study of *Beowulf*, though with some reference to allied literature and the Germanic background. *Moore, Manning.*

612 *History of the English Language.* (3)
A survey tracing the development of modern standard English from its Indo-European origin. Emphasis will be placed on the history of sounds, inflections, and vocabulary and on varying concepts of "correctness." *Cutler, Manning.*

620 *Middle English Literature.* (3)
Survey of Middle English literature, exclusive of Chaucer, with collateral reading of non-English monuments in English translation. *Moore, Manning.*

622 *Studies in English Literature: 1500-1600.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Stroup.*

623 *Studies in English Literature: 1600-1660.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. ***Stroup, Rickey.***

630 *Studies in English Literature: 1660-1720.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. ***Cooke.***

631 *Studies in English Literature: 1720-1780.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. ***Cooke.***

635 *Studies in Literature: 1780-1815.* (3)
A study in depth of selected writers and movements. ***Ward, Gordon.***

636 *Studies in Literature: 1815-1830.* (3)
A study in depth of selected writers and movements. ***Ward, Gordon.***

638 *Studies in English Literature: 1830-1860.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. ***Staff.***

639 *Studies in English Literature: 1860-1900.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. ***Staff.***

651 *Studies in American Literature before 1860.* (3)
A study in depth of selected writers and movements. ***Ringe, Jacobs.***

652 *Studies in American Literature since 1860.* (3)
A study in depth of selected writers and movements. ***Ringe, Jacobs.***

660 *Modern Critical Theory.* (3)
Examination of the theories supporting the modern version of genre, genetic, and formalist criticism. ***Moore.***

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. ***Staff.***

770 *Seminar in English Literature.* (3)
Intensive study and research centering upon such subjects as the following: a particular author or group of authors, a literary *genre*, a literary movement, a restricted period of time. May be repeated to a maximum of twelve credits. *Graduate Staff.*

772 *Seminar in American Literature.* (3)
Intensive study and research centering upon such subjects as the following: a particular author or group of authors, a literary *genre*, a literary movement, a restricted period of time. May be repeated to a maximum of six credits. *Graduate Staff.*

774 *Seminar in Comparative Literature.* (3)
Intensive study and research centering upon the relationship between English or American literature and that of some other country. May be repeated to a maximum of six credits. *Graduate Staff.*

780 *Directed Studies.* (1-3)
Independent work devoted to study and research on specific subjects and problems according to the interests and needs of individual students. May be repeated to a maximum of nine credits. *Graduate Staff.*

FRENCH LANGUAGE AND LITERATURE

The Department of French Language and Literature requires, as a prerequisite to candidacy for the master's degree, attainment in French equivalent to that required for an undergraduate major in that field. The number of language courses required for the M.A. degree varies, depending in part upon the advanced courses which the student may be asked, or permitted, to take in related departments. Usually, a minimum of 24 semester hours of French and allied subjects must be offered, including French 553, and all candidates will be required to demonstrate a reading knowledge of another foreign language before receiving the degree.

The Department offers the master's degree according to both Plan A and Plan B. (See pages 19-21.)

Applicants for the doctor's degree are required to complete at least two years of residence work beyond the M.A. The applicant's program must include, among other courses, French 553 and French 606. A reading knowledge of two other Romance languages (Latin included) or of one other Romance language and German or Russian is required of all applicants. The candidate must have completed a period of study in France at some point in his undergraduate or graduate education before he may be awarded the Ph.D. degree. For information concerning the qualifying examinations, the final examination, and the dissertation, see the discussion of these elsewhere in this bulletin, or consult the Department.

Students should note that courses in literature are usually given in French.

412 *Advanced French Conversation.* (2)
A study of intonation and elocution in French. Three minute speeches in French will be prepared for each recitation. Some reading in French poetry will also be practiced. Prereq: FR 209.

414 *Twentieth Century French Literature in Translation.* (3)
A study of selected prose and poetry (in English translation), representative of the major trends in modern French literature. No knowledge of French is required. Not open to French majors. Three class hours per week. *Staff.*

415 *Masterpieces of French Literature in Translation.* (3)
A study of outstanding works of French poetry and prose to the end of the Nineteenth Century, with particular emphasis on movements in the Seventeenth and Nineteenth Centuries. No knowledge of French is required. Not open to French Majors. Three class hours per week. *Staff.*

450 *La Civilization Française au XXeme Siècle.* (3)
A survey of French culture in the XX century with emphasis on the period following World War II. Conducted in French. Prereq: FR 202. (Alternate years). *Staff.*

502 *Survey of XIX Century French Literature.* (3)
A study of the representative writers of the XIX Century and the more important literary movements. Outside reading and written reports on assigned topics. Three class hours per week. Prereq: FR 204, 205.

503 *Studies in XIX Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XIX century. Three class hours per week. Prereq: FR 204, 205. *Duncan.*

504 *Survey of XVII Century French Literature.* (3)
A study of the representative writers of the XVII century and the more important literary movements. Outside reading and reports on assigned topics. Prereq: FR 204, 205. *Charron.*

505 *Studies in XVII Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XVII century. Prereq: FR 204, 205. *Charron.*

506 *Advanced French Composition.* (3)
The course aims to present vocabulary and structures necessary in critical writing but not common to conversational French as well as to encourage logical thinking. Short weekly papers will be written and discussed in class. Reading material will be kept to a minimum and will serve as a subject matter for essay work. Three class hours per week.

508 *Survey of XVIII Century French Literature.* (3)
A study of the representative writers of the XVIII Century, with special attention given to Voltaire, Rousseau, Monesquieu, and Diderot. Prereq: FR 204, 205.

509 *Studies in XVIII Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XVIII century. Prereq: FR 204, 205. *Mueller.*

510 *Survey of XX Century Literature* (3)
A study of representative writers of the XX century and the more important literary movements. Outside reading and reports on assigned topics. Prereq: FR 204, 205. *Langlois.*

511 *Studies in XX Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XX century. Prereq: FR 204, 205. *Langlois.*

513 *Tutorial Seminar for Majors in the Romance Languages.* (1) I, II
A survey of French literature. Required of all majors in French during the senior year. May be repeated to a maximum of two credits. *Staff.*

516 *Introduction to Old French.* (3) I
An introduction to the study of early French, especially of the eleventh through the thirteenth centuries. Emphasis will be on understanding the language, with readings from selected literary works and discussion of Old French phonology and grammar. Prereq: FR 204, 205. *Rea.*

517 *Introduction to the Linguistic Structure of French.* (3) I, II, S
An outline of the structure of spoken French along with an introduction to the pertinent concepts of descriptive and contrastive linguistics. Prereq: FR 203 (two semesters) or equivalent; consent of instructor. *Rea.*

553 *The Teaching of Modern Foreign Languages.* (3) I, II, S
A course for teachers and prospective teachers of Spanish, French, or German. *Mueller.*

601,602 *French Literature of the Renaissance.* (3 ea.) I, II, S
A course starting with François Villon and including such writers as Marot, Rabelais, Calvin, Montaigne, Ronsard, DuBellay, Belleau and Regnier. Given in French. Prereq: 21 semester hours of college French. *Keating.*

603 *The Development of the French Language.* (3) I, II, S
A history of the phonology and grammar of French from the origins to the present, with analysis and study of appropriate documents, literary and otherwise, to illustrate these developments, along with some introduction to the basic concepts of historical linguistics. Prereq: FR 516. *Rea.*

604 *Medieval Literature I: to the Thirteenth Century.* (3)
Selected works of the major epic cycles; the elaboration of the romantic lyric; courtly love and courtly romance; satirical and realistic tendencies in the fabliaux and the *Roman de Renart*. Readings in the original texts.

605 *Medieval Literature II: 13th to 15th Centuries.* (3) I
The new *ars poetica*: Machaut and Deschamps. Later lyric developments: Christine de Pisan, Charles de'Orleans, Villon, les grands rhetoriqueurs. The literary chronicles. The development of prose as a literary medium: *Lancelot-Graal, Quinze joies du mariage, Les Cent nouvelles nouvelles*. Three class hours per week. Prereq: Consent of instructor.

606 *Studies in Bibliography and Research Methods.* (3) I, II
Designed to serve the needs of students beginning graduate work in French by acquainting them with the tools of research. Prereq: Consent of instructor. *Charron.*

610 *Romance Philology.* (3) I, II, S
Study of the historical development of the various Romance languages with reading of texts chiefly from the medieval period. Special attention will be given to historical phonology and morphology. May be repeated to a maximum of six credits. Prereq: FR 603 or 641 or equivalent. *Rea.*

702 *Seminar in the History of the French Language.* (3) I, II, S
A thorough presentation of the development of the French language with special attention to morphology and syntax and to developments since the middle ages. Prereq: FR 604. *Rea.*

703 *The Old French Chanson de Geste.* (3)
A study of the medieval French Epic, with special emphasis on works of the twelfth century, and embrading a detailed discussion of theories of the origin of the genre, with special emphasis on recent work. Three class hours per week. *Rea, Hicks.*

704 *Seminar in The Classical Drama.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Charron.*

705 *Seminar in Classical Prose and Poetry.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Charron.*

708 *Seminar in The Literature of the Enlightenment.* (3) I, II, S
Intensive study of selected works of one or more representatives of this area of French literature. Prereq: Consent of instructor. *Staff.*

709 *Seminar in The Eighteenth Century Novel and Drama.* (3) I, II, S
Intensive study of one or more authors who made significant contributions in these literary genres during the XVIII Century. Prereq: Consent of instructor. *Staff.*

710 *Seminar in Romanticism.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Staff.*

711 *Seminar in The Realist Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. May be repeated to a maximum of six credits. Prereq: Consent of instructor. *Duncan.*

712 *Seminar in Post-Romantic Poetry of the Nineteenth Century.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Luszczynski.*

713 *Seminar in the Naturalist Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Duncan.*

716 *Seminar in Contemporary Drama.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Staff.*

717 *Seminar in Contemporary Poetry.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Luszczynski.*

718 *Seminar in The Contemporary Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Langlois.*

719 *La Littérature engagée: Malraux, Sartre, Camus, etc.* (3) I, II, S
Intensive study of works selected from the literature of commitment in the IX Century. Prereq: Consent of instructor. *Langlois.*

723 *The Medieval French Drama.* (3)
The ecclesiastic origins of the drama, semi-liturgical drama, miracle plays of the twelfth and thirteenth centuries, secular works and the jongleurs, late farces and the development of the mystery play. Three class hours per week. Prereq: FR 604. *Hicks.*

724 *Didactic Literature of the Middle Ages.* (3)
The development of allegory as a mode of expression, its adaptation to didactic ends and particularly to those of courty love, with concentration in the *Roman de la Rose* of Guillaume de Lorris. The development of scholastic method and its encroachment upon the domain of allegory; its triumph over the latter in the continuation of the *Rose* by Jean de Meung, with consideration of other "scientific" works of encyclopaedic tendencies. Three class hours per week. Prereq: FR 604. *Hicks.*

730 *Seminar in French Literature of the Renaissance.* (3)
Intensive study of a single author or group of authors representing the period of the French Renaissance. Three class hours per week. Prereq: FR 601. *Keating.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated once to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

778 *Seminar—Main Currents of Romance and German Literatures.*
(3) II
Studies of the principal works of the French, German and Spanish literature. Lectures, student reports. *Duncan, Server, Whitaker.*

780 *Special Studies in French.* (3) I, II, S
Selected studies and investigations in the French language and literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. Prereq: consent of instructor. May be repeated to a maximum of six credits. *Staff.*

GEOGRAPHY

The graduate program in geography stresses three areas of the discipline: (1) Spatial analysis of economic and social systems with concentrations in

urban studies, settlements, location analysis, transportation, and political geography; (2) Natural environment studies with concentrations in climatology including urban and microclimatology, and resource analysis; and (3) regional analysis with emphasis upon Anglo-America, Australia, the pacific, the Middle East, the Indian Subcontinent and Southeast Asia.

The program emphasizes training in two of the foremost requirements for present day geographers—theoretical and quantitative skills. This emphasis complements the traditional methodologies and techniques which the student is expected to acquire and develop. Students concentrating on regional geography are expected to develop competence in one of the topical or systematic fields.

In addition to large geographic holdings including over 500 periodicals or series of utility in geographic research, the University of Kentucky library is a depository for all U. S. Government publications and Army Map Service maps. An unusual library resource is the collection of works of the prominent Kentucky geographer—the late Professor Ellen Churchill Semple. Graduate students have access to the University's Computing Center. The University's Center for Developmental Change provides excellent opportunities for the graduate student for inter-disciplinary research involving changes in economic and social systems.

THE DEGREE OF MASTER OF ARTS IN GEOGRAPHY

Work for the M.A. degree in geography consists of:

(1) the completion of a group of required core courses (12 hours) in basic geographic theory, quantitative techniques and methodology necessary to the professional geographer;

(2) additional elective courses in geography (6 hours) and cognate disciplines (6 hours) according to the student's career objectives such as (a) research analyst in geography with a private firm or governmental agency, (b) university or college teaching, (c) international development or intelligence work; and (d) specific professional work in an Agency for Urban, Community, or Regional Development;

(3) the completion of a Master's thesis. At the discretion of the Department a non-thesis degree (Plan B) may be permitted on the student's background and career objective.

All M.A. students must pass *one* foreign language. The M.A. student may not take *more than six hours* of course work below the 600 level. The student is expected to demonstrate skill in critical analysis, scientific abstraction and accurate verbalization as part of his degree requirement.

520 *Regional Geography of Anglo-America.* (3) I, S

A regional study of the physical, economic, and cultural characteristics of the various areas of the United States, including Hawaii and Alaska. Prereq: one geography course. *Withington.*

522 *Geography of Kentucky.* (3) II, S

A study of how the people of Kentucky adjust themselves to the location, surface, climate, and other natural resources of their state. Prereq: one geography course. *Field.*

524 *Regional Geography of Latin America.* (3) I

Study of the countries and geographic regions of Mexico, Central America, and South America. Prereq: one geography course. *Staff.*

526 *Regional Geography of Europe.* (3)
A study of Western Europe's major geographic regions, climate, soil, terrain, mineral, and biotic factors. Population problems, economic adjustments, and political significance of resources. Prereq: One geography course. *Staff.*

528 *Regional Geography of Asia.* (3) I
A regional study of the countries of Asia including European U.S.S.R., China, Japan, and India. Role of the Orient in the international landscape. Prereq: one Geography course. *Karan.*

530 *Intermediate Field Studies.* (3) S
An intensive study of a particular geographic area with emphasis on such specific skills as filling in a base map and recording data for map composition and report. May be repeated to a maximum of six credits. *Karan.*

534 *Regional Geography of Australia and the Pacific Islands.* (3) I
A study made of the geographic problems and adjustments of the peoples and countries of the Pacific area. Reference to the strategic nature of the location. Prereq: One geography course. *Field.*

536 *Regional Geography of Africa.* (3) II
A study of Africa as a complete continent and not as an example of European imperialist policy; as a series of geographic regions. Prereq: one course in Geography. *Field, Albaum.*

538 *Geography of Natural Resources and Resource Development Problems.* (3)
A study of the distribution and management of particular resources, resource development problems in specific regions. Estimation of resource availability, tools for determining economic efficiency, the influence of institutional constraints on resource development, and the role of perception and attitudes in decision making related to man's use of natural resources. Prereq: GEO 255. *Withington.*

540 *Geography of Urban Areas.* (3) I
A study of the location and growth of cities and urban areas in relation to environmental factors. Prereq: GEO 255 or consent of instructor. *Withington.*

542 *Political Geography.* (3) I
A study of politico-geographic phenomena in their areal context, such as the analysis of boundaries, geographical patterns resulting from the application of governmental authority, the political viability of state units, and the spatial (territorial) variations and interrelationships of political activities and systems. *Karan.*

544 *Climatology.* (3) II
A study of the elements and controls of climate and of world climatic patterns. Prereq: GEO 151 or consent of instructor. *Staff.*

545 *Independent Work in Geography.* (3) I, II, S
Individual research involving such problems as: (a) materials and methods in teaching geography; (b) the historical evolution of geography; (c) map reading and interpretation; (d) special areas studies; (e) other topics may be elected by consent of instructor. Prereq: Major and a standing of 3.0 in the department. May be repeated to a maximum of six credits. *Staff.*

547 *Cartography.* (3) I
A course in the construction and interpretation of maps. Prereq: GEO 151. *Field.*

550 *Regional Geography of South Asia.* (3) II
A regional study of India, Pakistan, and the Himalayan Kingdoms with emphasis on politico-geographic, and socio-economic problems of the countries in the region. Prereq: GEO 151, 152 or 255, or permission of instructor. *Karan.*

552 *Regional Geography of Southeast Asia.* (3) I
A study of the Southeast Asia region (between India-Pakistan to the west; China to the north; and Australia to the south) focusing on the politico-geographic, socio-economic, and resource potential problems of its countries. Prereq: GEO 151, 152 or 255, or permission of instructor. *Withington.*

560 *Regional Geography of the Caribbean.* (3) II
A regional study of Central America and the West Indies. Prereq: GEO 151, 152 or 255, or permission of instructor. *Staff.*

610 *Seminar in Theoretical Geography.* (3) I
A systematic review of the theoretical nature and character of geographic patterns with the use of mathematics. Application of geometry, primarily topology, to probe the geographic concept of spatial relation, spatial arrangements and spatial processes. Three class hours per week. Prereq: MA 521 or equivalent. *Blome.*

643 *Urban Transportation Planning.* (3) I
A detailed review of the transportation planning process; inventory methodologies; trip generation, distribution and assignment with associated mathematical models and theories; prediction of future travel; land and use models; model split; developing and testing proposed systems; simulation. Three class hours per week. Prereq: CE 543 or equivalent and MA 521, AEC 630 or equivalent statistics course. (Same as CE 643.)

648 *Applied Cartography.* (3)
An analysis of cartographic presentation including mapping of areal relationships, and studies of the ways in which designs and scales of maps can influence the portrayal of geographical patterns and associations. *Field.*

650 *Regional Study of Special Areas.* (3) I, II, S
The application of the methods of regional interpretation to special areas such as the U.S.S.R., Mediterranean Basin, Caribbean Region, Mexico, Central Europe, etc. May be repeated once. Prereq: A prior major or minor in Geo. or consent of instructor. *Staff.*

655 *Special Study in Systematic Geography.* (3) I, II, S
The application of the methods of systematic geography to particular special studies in topical areas, such as conservation, urban areas, climatology, cartography, or others. May be repeated for a total of 6 credits. Three class hours per week. Prereq: Appropriate 500-level course work in Systematic or Topical Geography (e.g., Conservation, Urban, Climatology, Cartography.) *Staff.*

660 *Advanced Field Studies.* (3) S
Field study and preparation of a report which shall include both manuscript and graphic material. This field study will be based upon the work done in the field of Geography 530, but will be carried forward to include the more difficult problems of preparation of graphic material, map composition, and manuscript preparation, such as later can be used in thesis preparation and publication. Prereq: GEO 151, 547 or 548 and 530 for Geo. students or consent of instructor for students offering field experience in allied subjects, such as Geology. May be repeated once to a maximum of 6 credits. *Karan.*

700 *Quantitative Methods in Geography.* (3) II
A survey of the applications of quantitative techniques to geographical problems, with emphasis on the use of models in current geographic literature. Special emphasis will be given to the interpretation of recent findings in physical, urban, economic, and regional geography, and in the preparation of the student for the further use of certain techniques in his own research. Three class hours per week. Prereq: An elementary course in statistical methods. *Blome, Albaum.*

710 *Research Problems in Geography.* (3)
A comprehensive review of the problems involved in designing geographical research, planning field work, analysis of data, and in writing geographic reports. Alternate fall or once a year as required. Prereq: GEO 545 or equivalent. *Karan.*

750 *Applied Geography in Developmental Analysis.* (3)
A systematic review and critical evaluation of the application of geographic concepts and methods of survey, analysis and interpretation in the study of regional developmental problems with particular reference to the developing nations and underdeveloped areas in the United States, Canada, and Europe. (Alternate fall semesters.) Prereq: GEO 545 or equivalent. *Karan.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

770 *Seminar—Development of Geographic Thought.* (3) II
Series of topics selected in order to acquaint the graduate student of geography or of related subjects with the basic literature and evolution of the broad field of geography. Prereq: Geography major or consent of instructor. *Staff.*

GEOLOGY

The Department of Geology offers graduate work leading to the M.S. degree under Plan A. Admission to candidacy is governed by regulations of the Graduate School and particular programs are established by consultation with the department. Deficiencies in geology and allied sciences must be removed by such course work as the department may specify. Each candidate must submit an acceptable thesis which demonstrates his ability to conduct sound research.

The principal fields of study offered are mineralogy-petrology, geochemistry, sedimentology-stratigraphy and paleontology, but other geological fiields are available and interdisciplinary studies are encouraged.

Resources for the conduct of advanced studies in the way of a fine library, reference collections, well-equipped laboratories and appropriate field equipment are available.

401 *Paleontology.* (3) I
A study of fossil invertebrates, their nature, classification, and geological distribution. Lecture, two hours, two hours laboratory per week. Prereq: GLY 142. *Campbell.*

420 *Elementary Structural Geology.* (3) I
An introduction to earth structures. Advanced geological map interpretation. Prereq: GLY 142; PHY 213. *Nelson.*

450 *Stratigraphy and Sedimentation.* (3) II
Basic principles and concepts of stratigraphy and sedimentation. Lithologic correlation and the interpretation of geologic history and paleogeography. Field and laboratory analysis of sedimentary rocks including magascopic and microscopic methods. Two class hours per week; laboratory, two hours per week. Prereq: GLY 142. *MacQuown.*

460 *Elementary Mineralogy.* (4) I
A study of fundamentals of mineralogy including crystallography, occurrence and identification of common and abundant minerals. Two class hours per week; lab, four hours per week. Prereq: CHE 112 or consent. *Fisher.*

461 *Elementary Petrology.* (3) I
The elementary study of igneous, sedimentary, and metamorphic rocks. Prereq: GLY 440. *Fisher.*

501 *Stratigraphic Paleontology.* (3)
The use of fossils and fossil assemblages for zonation and correlation; and the problems arising from the application of this method as illustrated by specific examples. Practice in the analysis of sample invertebrate faunas for purposes of correlation. Lecture, two hours per week; lab, two hours. Prereq: GLY 401, 420. *Campbell.*

506 *Advanced Principles of Geology.* (4) II
A general study of geological processes. Lecture, three hours; lab, one hour conference. Prereq: Restricted to senior major students in geology or by permission of the instructor. *Dennen.*

510 *Economic Geology.* (4) II
Mineral deposits other than petroleum and natural gas. Distribution, mode of occurrence, origin, methods of search for, and uses. Lecture, 3 hours, lab, 2 hours. Prereq: GLY 142, 440. *Brown.*

511 *Petroleum Geology.* (2) I
The origin and accumulation of petroleum and natural gas. A study of geological methods used in exploratory work. Geology of the principal producing fields. Prereq: GLY 210, 211. *Roberts.*

520,521,522,523 *Advanced Field Geology.* (2 ea.) I, II
A field course in geological mapping involving problems of local structure and stratigraphy. Six hours a week in the field. Special fee. Prereq: GLY 226. *Nelson.*

524,525 *Field Work in Regional Geology.* (7 ea.) S
Eight weeks in the field in Colorado. The course is an effort to bring the student into contact with diverse geological phenomena and problems. Geological field methods. See special announcement. Required of major students. Special fee. Prereq: GLY 210, 211. *Staff.*

526, 527 *Report on Field Work in Regional Geology.* (1 ea.)
Staff.

530 *Low Temperature Geochemistry.* (3)
An introduction to the geochemistry of sediment deposition and diagenesis, weathering, and other topics in aqueous geochemistry. Three lectures per week. Prereq: GLY 443, MA 211, or consent of instructor. *Thrailkill.*

531 *Geochemistry of Igneous and Metamorphic Processes.* (3)
A discussion of the processes and principles of chemistry as they apply to the mineralogic and petrologic problems associated with the formation of igneous and metamorphic rocks. Prereq: GLY 540. *Blackburn.*

532 *Independent Work in Geology.* (3) I, II, S
Directed work in independent investigations. Thesis required. May be repeated to a maximum of twelve hours. Prereq: Major and a standing of 3.0 in department. *Staff.*

550 *Hydrogeology.* (3) II
An introduction to hydrologic processes and systems in geology, including topics in fluvial geomorphology and geophysical and geochemical aspects of ground water. Prereq: GLY 104 or 200, MA 113, or consent of instructor. *Thrailkill.*

560 *Optical Mineralogy.* (3) I
A study of the optical properties of minerals by means of the petrographic microscope. Prereq: GLY 440, PHY 213. *Brown.*

562 *Petrology of the Igneous Rocks.* (3) II
The occurrence, origin and classification of igneous rocks. Identification with the petrographic microscope. An introduction to metamorphic rocks. One hour lecture, four hours laboratory per week. Prereq: GLY 443. *Brown.*

564 *Petrology of Metamorphic Rocks.* (3) I
The conditions of metamorphism. The occurrence, classification and origin of metamorphic rocks. Metamorphic differentiation and equilibrium relations in metamorphic rocks will be discussed. Two class hours per week; laboratory, two hours. Prereq: GLY 443. *Blackburn.*

570 *Geology Seminar.* (1)
Reading and discussion of classical and contemporary books and papers having relevance to geology, varying in scope and content to meet the special needs and interest of the participants. May be repeated to a maximum of four credits. Prereq: GLY major with junior standing. *Staff.*

607 *Topics in Igneous and Metamorphic Petrology.* (2) II
Review of classic works and recent developments in important and controversial aspects of igneous and metamorphic petrology. Two class hours per week. Prereq: GLY 605; consent of instructor. *Blackburn.*

612 *Advanced Economic Geology.* (3) I
Lecture, two hours; laboratory, two hours. *Nelson.*

620 *Structural Geology.* (3) II
A study of the structural features of the earth's crust with an analysis of the mechanics involved. Three lectures and recitations, or two lectures and one laboratory per week. Prereq: PHY 211, 213, GLY 430. *Nelson.*

640 *Advanced Low-temperature Geochemistry.* (3)
Topics in low-temperature and aqueous geochemistry, including chemical aspects of deposition, diagenesis, and weathering. Prereq: GLY 540, HE 442, or consent of instructor. Lecture, 2 hours; lab, 2 hours. Offered every other spring. *Thrailkill.*

650 *Sedimentology.* (3)
The classification and interpretation of sedimentary rocks, and study of sedimentary processes. Prereq: GLY 420. *Roberts.*

652 *Stratigraphy.* (3)
Regional stratigraphy with emphasis on field relationships in Kentucky and stratigraphic equivalence of Paleozoic rocks in North America. Lecture, two hours; lab, two hours. Prereq: GLY 420. *MacQuown.*

653 *Stratigraphy.* (3)
Regional stratigraphy with emphasis on world-wide stratigraphic equivalence and Mesozoic and Cenozoic rocks. Lecture, two hours; lab, two hours. Prereq: GLY 420. *MacQuown.*

662 *X-Ray Mineralogy.* (3) I
The use of x-ray diffraction and spectroscopy in the qualitative and quantitative analysis of minerals and rocks. Emphasis will be placed upon the rock forming minerals. One class hour per week; lab, four hours per week. Prereq: GLY 443, PHY 213. *Fisher.*

710 *Mineral Exploration.* (1)
Techniques and applications of mineral exploration. Oreguides, sampling patterns and techniques, evaluation of data and related topics. One class hour per week. Prereq: GLY 606.

711 *Evaluation of Mineral Properties.* (1)
Procedures in property evaluation. Tonnage and grade calculations, political and economic factors, and related topics. One class hour per week. Prereq: GLY 606.

730 *Graduate Geology Seminar.* (1)
Discussion of current research or advanced topics in geology and related fields. Subject matter will vary from term to term. May be repeated to a maximum of six credits. Prereq: Geology major with graduate standing. *Staff.*

733 *Petrology Geochemistry.* (3)
Application of thermodynamics to geological problems, melt and aqueous equilibria, phase transitions and the geochemical differentiation of igneous and metamorphic rock systems. Prereq: GLY 541, 562, 564, CHE 442. Offered in alternate years. *Blackburn.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

782 *Individual Work in Geology.* (3)
Problems involving independent laboratory and/or library study conforming to the student's special interest under the direction of an appropriate staff member having proficiency in the area selected. May be repeated for a total of 9 credits. Prereq: Geology major with graduate standing. *Staff.*

GERMANIC AND CLASSICAL LANGUAGES AND LITERATURE

The Department of Germanic and Classical Languages and Literatures offers graduate work in ancient civilization, Greek, Latin, German, and Scandinavian leading to the M.A. degree in Classics and the M.A. and Ph.D. degrees in German (literature or linguistics).

Plan A or plan B is available for the M.A. degree (see pages 19-21).

Departmental graduate studies are offered in accordance with overall policies of the Graduate School. Individual graduate programs are planned by the director of graduate study and adviser in consultation with the student. Additional information about graduate programs is available upon request from the Department.

LATIN

509,510 *Latin Literature.* (3 ea.) I, II, S
Courses in various authors, periods, or types to suit the needs of the class. Prereq: Three years of high school Latin or three semesters college Latin or permission of instructor.

511, 512 *Studies in Roman Philology.* (3 ea.) I, II, S
Courses to meet the needs of students in various areas of Roman philology, *e.g.,* in Latin literature, in Roman civilization, in Latin linguistics, etc. Prereq: permission of instructor.

514, 515 *Latin Composition.* (1 ea.) I, II, S
The writing of Latin prose of moderate difficulty. Prereq: CL 203 or permission of instructor.

521 *Roman Civilization.* (2) II, S
Special reference to the relation to modern life. Topics in literature, art, philosophy, and religion as well as in political history. No knowledge of Latin necessary.

530 *The Teaching of Latin.* (3) II, S
The place of Latin and the classical humanities in general education. Objectives, materials and methods. The reading approach to learning Latin. Evaluation of textbook and other teaching materials. Prereq: senior standing.

Note: See also "Classics in General."

GREEK

520 *Greek Civilization.* (2) II, S

Special reference to relation to modern life. Emphasis placed on literature, art, philosophy and religion, rather than on political history, and the student may concentrate his reading in any field. No knowledge of Greek necessary.

556 *Greek Tragedy.* (3) I

Selected plays from Aeschylus, Sophocles, and Euripides. Lectures on Greek tragedy and its effect on the Western World. Prereq: CLA 254 or 255 or consent of instructor.

559 *Greek Comedy.* (3) II

Selected plays of Aristophanes. Lectures on Greek comedy and its effect on the Western World. Prereq: CLA 556 or consent of instructor.

561, 562 *Studies in Greek Philology.* (3 ea.) I, II, S

Courses to meet the needs of students in various areas of Greek philology, e.g., in Greek literature, in Greek civilization, in Greek linguistics, etc. Prereq: permission of instructor.

652 *The Greek of the New Testament.* (3) I, II, S

Class and/or individual work. Reading and research in the vocabulary and syntax of the *Koine*, in the text of the New Testament and in other fields. Prereq: Two years of College Greek or consent of instructor.

Note: See also "Classics in General" below.

CLASSICS IN GENERAL

524 *Greek Literature in Translation.* (3) I

Extensive reading in the most important works. Discussion of the significance of the works in their own and later times to the present. No knowledge of Greek necessary. *Thompson.*

525 *Latin Literature in Translation.* (3) II

Extensive reading in the most important works. Discussion of the significance of the works in their own and later times to the present. No knowledge of Latin necessary. *Thompson.*

580 *Independent Work in Classics.* (3) I, II, S

Courses to meet the needs of the student will be arranged in various areas. Prereq: major standing of 3.0 in department. May be repeated to a maximum of twelve credits.

632 *Comparative Greek and Latin Grammar.* (3) I, II, S

Studies and research in comparative linguistics, historical syntax, semantics, and other aspects of linguistics in the Greek and Latin area. Prereq: Necessary command of languages involved.

633 *Intensive Study of an Author.* (3) I, II, S

Studies and research in the work of an author (*e.g.*, Plato, Aristotle, Lucretius, Caesar, Ovid, or Horace): sources, milieu, purposes, technique, language, and his influence on later periods. Prereq: Necessary command of languages involved.

636 *Intensive Study of a Period.* (3) I, II, S

Studies and research in a period of significance (Age of Pericles, Hellenistic Age, Ciceronian Age, Augustan Age, Silver Age, Christian Latin, or Medieval Latin): with emphasis on literary, social, and linguistic trends, with consideration of sources, and of influence on later periods. Prereq: Necessary command of languages involved.

637 *Intensive Study of a Literary Genre.* (3) I, II, S

Studies and research in a genre (epic, tragedy, comedy, satire, history, or the novel) in the ancient world, with some attention to its effect on later periods. Prereq: Necessary command of languages involved.

638 *The Transmission of Classical Texts.* (3) I, II
Preservation and transmission of Greek and Latin texts. Introduction to epigraphy and paleography. Introduction to the history of Classical scholarship. Prereq: Reading knowledge of Greek and Latin. *Thompson.*

768 *Residence Credit for the Master's Degree.* (1 to 9 wks. residence)
May be repeated once. Maximum of nine weeks can be applied toward master's degree with thesis. *Staff.*

790 *Research in the Teaching of Classical Languages.* (3) I, II, S
Problems in the teaching of Latin and/or Greek in secondary and/or higher education. Objectives, methods, preparation of materials, development of curricula or the history of the field. Prereq: CLA 530 or equivalent.

GERMAN

412 *Modern German Literature in Translation.* (3) I, II
A study in depth of the authors' artistic development and of the structure and content of their major works. Authors treated are novelists Kafka, Hesse, and Mann or dramatists Brecht, Frisch, and Durrenmatt. The course is conducted in English and may be repeated for a total of six hours. Three class hours per week.

520 *Germanic Proseminar.* (3) I, II, S
The proseminar is designed primarily to introduce graduate or advanced undergraduate students into the methods of scholarly research based upon the study of a specific area of Germanic language or literature. Topic will vary, and will be announced. Representative components which may be treated in this course are Lessing, Schiller, Goethe, Buchner, Kleist, Grillparzer, Hebbel, Hauptmann, 18th (19th, 20th) century prose narrative, 18th (19th, 20th) century drama, semantics, and expressionism. Three class hours per week. Prereq: GER 205-206 and 9 additional hours of German beyond GER 222. The course may be repeated for a total of twelve hours. *Staff.*

532 *The German Lyric.* (3) II
An intensive study of the German lyrical poem from the Age of the Baroque to the present. Prereq: Six semesters of German. *Wonderley.*

534, 535 *Life and Works of Goethe.* (3 ea.) I, II, S
This course follows the unfolding of Goethe's genius from his first lyrics through Faust. His principal literary works will be read and attention devoted to autobiographical material, letters and diaries. Prereq: Six semesters of German. *Staff.*

536 *Introduction to the History of the German Language.* (3) I
This course in Germanic Philology acquaints the student with the position of German in the European language group and traces the development of the language to the present. Special emphasis is given to the relationship of German and English words. Prereq: Six semesters of German. *Binger.*

537 *Introduction to Middle High German.* (3) II
This is a literary course with a necessary minimum of Middle High German grammar. Selections will be read from epic and lyric poetry of the period and reports will be given on assigned topics. Prereq: Six semesters of German. *Binger.*

538 *Advanced German Conversation and Composition.* (3) I, II
This course is primarily for German majors. It involves intensive practice in the writing of German prose, with some review of German grammar. Prereq: Six semesters of German. *Riester.*

539 *Structure of the German Language.* (3) II
An introduction to the phonology, morphology and syntax of modern German by means of concepts and methods of linguistic science. Prereq: Six semesters of German or permission of instructor. *Kratz.*

553 *The Teaching of German.* (3) II

The course is designed for teachers and prospective teachers of the language. Theory and practice, with emphasis upon modern methodology and practical problems encountered by the teacher of beginning German. Prereq: GER 222, 205, and 206 or equivalent. Required of graduate students in German. *Riester.*

621 *Introduction to German Bibliographical Studies.* (2) I

An introduction to bibliography, original research, and textual criticism. Prereq: Six semesters of German. Required of graduate students in German.

622 *Theories of Literature in German.* (2) II

An introduction to theories of literature with emphasis upon those of Germany and continental Europe.

623 *Medieval German Literature.* (3) I

A survey of the literature of the Middle High German period, with special attention to one major genre or author, and involving extensive readings in the texts of the period. Prereq: GER 537. *Staff.*

624 *German Literature of the 16th and 17th Centuries.* (3)

A survey of the major literary documents of the German Reformation, Renaissance, and Baroque, with special attention given to one period, and involving extensive readings in the texts of the period. *Staff.*

625 *German Literature of the 18th Century.* (3) I

A survey of the literary themes and forms of the *Aufklärung* and *Sturm und Drang,* with special emphasis on selected aspects of German letters of the period 1700-1775. *Staff.*

626 *The Age of Goethe (1770-1830).* (3) II

A seminar devoted to the investigation of one or more topics in the literature and social development of Germany during the period 1770 to 1830. *Staff.*

627 *German Drama of the 19th Century.* (3) I

This course is a study of the German Drama from Schiller's "Die Braut von Messina" to 1870. Prereq: Six semesters of German. *Whitaker.*

628 *The German "Novelle."* (3) II

This course traces the origin and development of the German Novelle from Goethe to Thomas Mann. Prereq: Six semesters of German. *Whitaker.*

630, 631 *20th Century German Literature.* (3 ea.) I, II

Extensive readings, discussions and comprehensive reports on the leading literary minds and movements of this century. Prereq: Six semesters of German.

635 *Gothic.* (3) I

Readings; phonology and morphology of Gothic. Prereq: Reading knowledge of German and GER 536, or consent of instructor. *Kratz.*

636 *Old High German.* (3) II

Readings; Phonology, morphology, and dialects of Old High German. Prereq: Reading knowledge of German and GER 536, or consent of instructor. *Kratz.*

640 *Studies in Germanic Language and Literature.* (3) I, II, S

Exploration in some depth of a theme, genre, author, or period. Topic will vary, and will be announced. Representative components which may be treated are earlier German literature, medieval epic, medieval German lyric, early New High German language and literature, late romanticism, idealism, realism, naturalism, impressionism, expressionism, symbolism, textual criticism, historical linguistics, structure of modern German, dialectology. The course may be repeated for a total of 12 credits with the approval of the Departmental director of graduate studies. *Staff.*

768 *Residence Credit for Master's Degree.* (0)
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (0)
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

778 *Seminar—Main Currents of Romance and German Literatures.* (3)
Studies of the principal works of the French, German and Spanish literature. Lectures, student reports. *Staff.*

781 *Special Studies in German.* (3) I, II, S
Selected studies and investigations in the German language and literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. May be repeated to a maximum of twelve credits. *Staff.*

790 *Germanic Seminar.* (4) I, II, S
Topic to be selected from a Germanic literary or linguistic area. The seminar may be repeated for a total of 12 hours with the approval of the Departmental director of graduate studies. *Staff.*

SCANDINAVIAN

500 *Swedish.* (alternate years in fall) (3)
Rapid coverage of morphology, phonology and syntax of modern Swedish and reading of selected literary texts. Prereq: Reading knowledge of German; consent of instructor. Three class hours per week. *Staff.*

501 *Swedish Literature from Bellman to the Present.* (3)
(alternate years in spring)
Readings in Swedish Literature of the period. Prereq: GER 500. Three class hours per week. *Staff.*

504 *Danish.* (alternate years in fall) (3)
Rapid coverage of morphology, phonology, and syntax of modern Danish and reading of selected literary texts. Prereq: Reading knowledge of German; consent of instructor. Three class hours per week. *Staff.*

505 *Danish Literature from Holberg to the Present.* (3)
(alternate years in spring)
Readings in Danish Literature of the Period. Prereq: GER 504 or equivalent. Three class hours per week. *Staff.*

610 *Old Icelandic.* (3) I
Rapid coverage of morphology, phonology and syntax of Old Icelandic, with some attention to linguistic affinites within the Indo-European and Germanic groups of languages. Prereq: Reading knowledge of German; consent of instructor. *Thompson.*

611 *Old Icelandic.* (3) II
Reading of selected saga texts and Elder Edda, with attention to the development of Icelandic literature from the Tenth Century to the present. Prereq: GER 610. *Thompson.*

HISTORY

THE MASTER'S PROGRAM IN HISTORY

Students should submit evidence of good undergraduate preparation in history, preferably an undergraduate major. Some background in at least one

modern foreign language is required for admission. No person will receive the M.A. degree in history unless he has passed an examination in a modern foreign language approved by the Department of History and by the Graduate School.

The M.A. degree in history may be obtained by Plan A or Plan B.

Under Plan A, the student must complete 24 credit hours and must write an acceptable thesis. At least 12 hours must be in courses above the 500-course group level.

Under Plan B, no thesis will be required but the student must complete 36 credit hours. At least 15 of the 36 hours must be in courses above the 500-course group level, and of those 15 hours at least six will be in courses of the 700 category. The decision whether a student will follow Plan A or Plan B will normally not be made until he has completed the equivalent of at least one semester of full-time graduate study.

The Final Master's Examination under both plans will be oral. The Master's Committee has the authority (1) to fail the student, (2) to pass the student and to decide that the master's degree will be terminal, or (3) to pass the student and permit him to continue toward the doctoral degree at the University of Kentucky.

THE DOCTOR OF PHILOSOPHY PROGRAM IN HISTORY

Those who seek the doctorate in history should follow carefully the general directions governing the subjects of residence, courses, and foreign language requisites set forth in the first part of this Bulletin. The *applicant* does not become a candidate until he has passed two modern foreign language examinations approved by his Special Committee, and until he has passed the Qualifying Examinations and has been approved by the Graduate School.

The student's work for the doctorate in history is directed by a Special Committee composed of representatives of his areas and fields under three preparation requirements (*See below.*) The committe's chairman will be the major professor who directs the dissertation. The student should consult this person at his earliest convenience. The Special Committee will outline the student's course of study, advise him throughout his residence, conduct the Qualifying Examination, and generally supervise the writing of his dissertation.

Requisites for the Ph.D. candidacy in history will be met as follows:

1. *General Preparation.* The student will pursue guided reading and course work in *two* of the following *areas*:

   I. Ancient History
   II. Medieval History
   III. Early Modern Europe (1450-1770)
   IV. Modern Europe (since 1770)
   V. United States History
   VI. Britain and the Empire (1485 to present)
   VII. Russia and East Europe
   VIII. The Far East
   IX. Latin America

2. *Intensive Preparation.* The student will pursue course work and guided reading in *two* of the following *fields,* neither of which will duplicate *areas* chosen for General Preparation:

I. Renaissance and Reformation (to 1648)
II. Modern Europe (1600-1770)
III. Modern Europe (1770-1870)
IV. Modern Europe (1870 to present)
V. United States to 1865
VI. United States since 1865
VII. Britain and the Empire, 1485-1815
VIII. Britain and the Empire, 1815 to present

3. *Specialty Preparation.* The student will prepare himself in a third *field.* Requirements for this field may be satisfied in one of the following ways:

I. Achieving competence in some discipline other than history but in one closely related to his major *field* of history.
II. Achieving competence in a special *field* chosen from within the student's program of Intensive Preparation. Examples of such a *field* might be United States Intellectual History or the History of Germany. The special *field* will normally require course work or directed reading in one or more outside disciplines. The choice of the special *field* will be initiated by the student and his major professor. Final acceptance will rest with the student's Special Committee.

The student's success in his General Preparations will be evaluated by written examinations. His success in his Intensive and Specialty Preparations will be evaluated by both written and oral examinations.

I. EUROPEAN HISTORY

490 *Modern Europe.* (3)
This course is offered to meet a demand for a broader course which will equip students who are going out to teach European history in the present high school curriculum. Prereq: HIS 104 and 105.

500 *Pre-Classical and Classical Greece.* (3)
A History of Greece from Earliest Times to the Death of Alexander the Great.

501 *Fourth Century Greece and the Hellenistic World.* (3)
A history of Greece and the Greek World from the Death of Alexander to the Roman Conquest of Egypt. Prereq: HIS 500 or consent of instructor.

502 *A History of the Roman Republic.* (3)
A history of Rome from earliest times to the fall of the Republic. Emphasis will be placed upon the territorial expansion of Rome and the effects of this expansion on republican institutions.

503 *A History of the Roman Empire.* (3)
A study of the foundation of the Roman Empire, the development of Imperial institutions, social and intellectual developments of the Graeco-Roman world, the decline of Rome and the barbarian invasions of the fourth century. Prereq: HIS 502 or consent of instructor.

510 *Medieval Civilization to 1100.* (3)
The formation of a new civilization—our own—in Western Europe between the decline of the Roman Empire and the First Crusade is the central stress in this study of the cultural interests and achievements of the period 300-1100. Prereq: HIS 270 or consent of instructor.

511 *Medieval Civilization since 1100.* (3)
Medieval culture at its height (1100-1350) is considered as the first notable achievement of European Civilization. Major topics are: Latin and vernacular literatures, the fine arts, philosophy, and science.

512 *Medieval Institutions to 1049.* (3)
A survey of medieval political, social, economic and ecclesiastical institutions from the fourth century to the papal reform movement. (Alternating in the fall semester with HIS 510.) Prereq: HIS 270, 271.

513 *Medieval Institutions Since 1049.* (3)
A survey of medieval political, social, economic and ecclesiastical institutions from the beginning of the papal reform to the middle of the 15th Century. Prereq: HIS 270, 271.

519 *The Era of the Renaissance.* (3)
An historical description and analysis of the development of political, economic, social, religious, intellectual and cultural institutions of Europe from Petrarch to Erasmus. Prereq: HIS 104.

520 *The Era of the Reformation.* (3)
An historical description and analysis of the development of the religious, intellectual, cultural, political, economic and social institutions of Europe from Luther to the Treaty of Westphalia. Prereq: HIS 104.

521 *The Age of Absolutism.* (3)
A study of the development of absolute monarchies from Louis XIV; the European rivalries at home and abroad; benevolent despotism, and the Age of Enlightment. Prereq: HIS 104 or equivalent.

523 *Europe 1814-1870.* (3)
This course treats the successive political changes in 1823, 1830, 1848, and 1870, together with the outstanding commercial, cultural, and scientific developments of European life after 1815.

524 *Europe, 1870-1918.* (3)
A balanced treatment of the political, social, cultural, economic, and intellectual life of Europe in the period indicated. Special emphasis placed on diplomatic and military developments leading to the first World War.

525 *Europe since 1919.* (3)
A study of the origins and consequences of the two World Wars together with the revolutionary movements of fascism and communism and their challenge to liberal democracy.

528 *Cultural and Intellectual History of Europe from the Renaissance to the French Revolution.* (3)
An interpretive analysis of the growth of ideas in Europe within their cultural setting. Emphasis upon the 17th and 18th Centuries.

530 *Social History of Europe in the Eighteenth Century.* (3)
A study of the life and manners of the people of Europe in the 1700's. Special attention will be given to Western and Southern Europe.

531 *The French and European Revolutions, 1760-1795.* (3)
The origins, development, institutions, consequences, and interactions of the French and other European revolutions, counter-revolutions and wars and their impact upon France, Europe and the modern world. Presented in alternate years.

532 *Napoleonic Europe, 1796-1815.* (3)
A study of France and her European neighbors during the epoch of Napoleon. Political, institutional, social, economic, cultural, religious and international conditions, relationships and changes are analyzed within the historical context of the period. Prereq: HIS 105 or equivalent.

534 Russian Revolutions and the Soviet System I. (3)
Study of the fundamental factors leading to the collapse of the monarchy, with emphasis upon the reforms and the governmental policies, their short-comings, and the pressures of discontent that generated revolutionary movements. Prereq: HIS 286 or graduate status or consent of instructor. Presented in alternate years.

535 *Russian Revolutions and the Soviet System II.* (3)
A continuation of 534, this course examines the ideological bases and *raison d'etre* of the Soviet state, before undertaking analyses of those conditions and policies which have molded the totalitarian system during the past four decades. Prereq: HIS 286 or graduate status or consent of instructor. Presented in alternate years.

536 *Intellectual History of Modern Russia, 1789-1917.* (3)
A survey is made of the main intellectual currents from the 18th century to 1917, as expressed in political concepts, socio-economic doctrines and literature. Particular attention is given to the ideologies of revolutionary movements and to the interaction between ideas and the politico-economic background. Prereq: HIS 286 or equivalent or consent of instructor.

538 *Political and Diplomatic History of East Central Europe from the French Revolution to the End of World War I.* (3)
A survey of the major factors and events which conditioned the political life and identity of the predominantly Slavic peoples inhabiting the region from Poland south to the Balkans, excluding the Eastern Slavs. Prereq: HIS 104, 105 or consent of the instructor.

539 *Political and Diplomatic History of East Central Europe since World War I.* (3)
A comparative study is made of the political institutions and policies of these states located in the north-south corridor stretching from the Baltic to the Aegean-Adriatic Seas, their intra-regional relations and roles in European diplomacy. Prereq: HIS 104, 105 or consent of the instructor.

540 *History of Modern France to 1815.* (3)
The course of French history to 1815, including the development of French political, administrative, legal, social, economic and cultural achievements and institutions and their contribution to the modern world. Prereq: Permission of instructor.

541 *History of Modern France Since 1815.* (3)
Continuation of History 540.

542 *German History, 1815-1914.* (3)
This course is designed as a study of domestic development in Germany. While political history is emphasized, due consideration is given to social, economic and intellectual trends. Prereq: HIS 104, 105 or consent of instructor.

543 *German History since 1914.* (3)
Examines the fall of Imperial Germany, the Weimar Republic, Hitlerian period, and the post 1945 era. The course is primarily concerned with internal affairs, but attention is directed to the international scene when crucial. Prereq: HIS 104, 105 or consent of instructor.

544 *A History of Italy 1789-1890.* (3)
An examination of the developments leading to Italian unification and analysis of the problems faced during the nation's first twenty years. Prereq: HIS 104-105.

545 *A History of Italy, 1890 to the Present.* (3)
A continuation of HIS 544, this course will deal with political, economic, social and cultural developments in Italy since 1890, including an examination of Fascism and post-World II Italy. Prereq: HIS 104-105.

547 *Byzantine Empire.* (3)
A study of Byzantine history from the time of Constantine the Great to the capture of Constantinople by the Turks in 1453. Prereq: HIS 104 and 247, or consent of instructor.

548 *The Ottoman Empire.* (3)
The rise and expansion of the Ottoman Empire, its relationships with the European States, its position in the Near East, and the Turkish State in the 20th Century. Prereq: HIS 104-105 and 247-248, or consent of instructor.

II. ENGLAND AND THE BRITISH EMPIRE

550 *English Constitutional History to 1603.* (3)
A study of the backgrounds of the English constitution. Prereq: HIS 202 or equivalent.

551 *English Constitutional History since 1603.* (3)
A continuation of HIS 550. The constitutional struggle between the Stuart kings and Parliament; triumph of constitutional monarchy; rise of the Cabinet; effect of democracy in recent times. Prereq: HIS 203 or equivalent.

552 *British Social History During the Tudor Period, 1485-1603.* (3)
A study of British life, manners, and customs in town and country. Particular emphasis will be placed upon the age of Elizabeth, with political events subordinated to social changes. Prereq: HIS 202.

554 *British History 1815-1901.* (3)
A detailed study of Britain's political, social, diplomatic and industrial development in the nineteenth century.

555 *British History since 1901.* (3)
A detailed study of Britain in the twentieth century with special consideration of Britain in World War I and World War II, and her position in the contemporary world.

556 *The British Empire to 1860.* (3)
Origin of the British Empire, 1783 to 1860; development of British sea power; the early growth and development of Canada, Australia, New Zealand, South Africa, and India.

557 *The British Empire and Commonwealth.* (3)
A continuation of HIS 556. Great Britain and the growth of the Dominions and the Commonwealth since 1860.

558 *History of Canada.* (3)
A brief survey of Canada under the French; the development under British control; evolution of the Dominion; relation with the United States and British Commonwealth of Nations. Prereq: One year of college history.

III. AMERICAN HISTORY

560 *Colonial America to 1748.* (3)
A study of the origins and development of the English colonies; their relations with England and European states. Emphasis on imperial policies and colonial autonomy. Prereq: One year of American or European History.

561 *Colonial America and Independence, 1748-1789.* (3)
This course deals with America's triumph over France in the New World, the drastic change in her colonial policy, and the rise of opposition to it, the war for American independence, and the establishment of the United States under the Constitution. Prereq: One year of American or European history.

562 *The New Nation, 1789-1828.* (3)
An intensive study of the most significant men, events, and trends in the first generation of American national growth. Prereq: HIS 108.

563 *Expansion and Conflict, 1828-1865.* (3)
A study of the territorial expansion of the United States and the growth of sectional controversy over expansion and slavery, culminating in the Civil War. Prereq: HIS 108, 109.

564 *Emergence of Modern America, 1865-1912.* (3)
A study of the transformation of America from a rural society "isolated" from world affairs into a highly industrialized power. Prereq: HIS 108 and 109 or equivalent.

565 *Recent History of the United States, 1912-1939.* (3)
An intensive study of the problems of maturing America from the election of 1912, through World War I, depression, and the New Deal to our involvement in World War II. Prereq: One year of American History.

566 *Recent History of the United States since 1939.* (3)
An intensive study of the development and maturation of the United States from World War II to the present synthesizing military, diplomatic, social, economic, political and cultural changes. Prereq: One year of American History.

568 *Cultural and Intellectual History of the United States to 1865.* (3)
An interpretive analysis of the growth of ideas in the United States within their cultural setting before 1865. Prereq: HIS 108 or consent of instructor.

569 *Cultural and Intellectual History of the United States since 1865.* (3)
An interpretive analysis of the growth of ideas in the U. S. within their cultural setting since 1865. Prereq: HIS 109 or consent of instructor.

570 *Economic & Social History of the U.S., 1787-1900.* (alternate years) (3)
The emergence of the United States from an underdeveloped economy to an industrial state. Interwoven in the theme of economic growth are the social ramifications of change and the role of government in American economic activity. Prereq: HIS 108 and 109 and ECO 260 and 261 or consent of instructor.

571 *Economic and Social History of the U.S.—20th Century.* (alternate years) (3)
Emphasis is placed on 20th century economic and social changes caused by technology, internal and external business modifications, the growing affluence of the U.S., and, most importantly, the increasing role of government in American society. Prereq: HIS 108 and 109 and ECO 260 and 261 or consent of instructor.

572 *American Constitutional History to 1865.* (3)
A study of the origins and development of American constitutional institutions from 1603 to 1865, with emphasis on political, economic and social influences.

573 *American Constitutional History Since 1865.* (3)
A continuation of HIS 572 from 1865 to the present, with emphasis on constitutional problems posed by the industrial revolution and the warfare state.

574 *The Diplomacy and Foreign Policy of the United States to 1919.* (3)
A survey designed to acquaint the student with the principles of American foreign policy and its historical evolution. Prereq: HIS 108 or equivalent.

575 *The Diplomacy and Foreign Policy of the United States since 1919.* (3)
A continuation of 574. Prereq: HIS 109 or equivalent.

576 *The American Frontier.* (3)
A course dealing specifically with American westward expansion. Prereq: HIS 108 and 109 or equivalent.

577 *The American Frontier.* (3)
A continuation of 576. It will consider the Trans-Mississippi West.

578 *History of the Old South.* (3)
A study of the colonial beginnings and expansion of southern life, economics, and society. The growth of slavery, staple agriculture, and sectional politics will constitute the major interest. Prereq: HIS 108.

579 *History of the New South.* (3)
The evolution of southern life and society, agrarian politics, relationships with other sections, industrial growth, and new leadership.

580 *U. S. Urban History to 1865.* (3)
A study of urban America from colonial times to 1865, emphasizing origins and growth of cities and their impact upon the development of the United States.

581 *U. S. Urban History since 1865.* (3)
A continuation of HIS 580, tracing changes and developments which have occurred since 1865.

584 *Economic History of Latin America since Independence.* (3)
Course emphasizes Latin American efforts in the 19th and 20th centuries to promote economic and social development, the problems encountered, the role of foreign investments and diplomatic pressures, and more recently, the economic factors in Latin American social revolutions. Prereq: HIS 208 or 209; or approval of instructor.

587 *Twentieth Century Latin American Revolutions.* (3)
An historical and comparative approach to Latin American social revolutions that have greatly influenced political movements in other Latin American countries. Prereq: HIS 208, or 209, or PS 265 or consent of instructor.

IV. THE FAR EAST

590 *Japanese History to 1600.* (3)
A broad survey of the political, social, economic, and intellectual history of Japan from earliest times to the "unification" of Japan under Hideyoshi. Prereq: HIS 104 or equivalent, or consent of instructor.

591 *Japanese History since 1600.* (3)
A continuation of HIS 590 from 1600 to the present. Prereq: HIS 105 or equivalent, or consent of instructor.

592 *Diplomatic History of the Far East since 1787.* (3)
A study of the international relations between China, Japan, and Korea and their relations with the major Western Powers. Prereq: HIS 105 or consent of instructor.

593 *Far Eastern History since World War II.* (3)
A study of the revolutionary, political, economic, and social changes occurring in China, Japan, and Korea in the aftermath of World War II. Important political and institutional development and their relation to pre-war trends will be emphasized. Prereq: HIS 105 or consent of instructor.

COURSES IN THE 600 GROUP

These seminars emphasize method and bibliography. Two class hours and one conference hour.

600 *European Historiography.* (3)

603 *American Historiography.* (3)

606 *Historical Criticism.* (3)
Required of every entering graduate student in history.

611, 612 *Readings in Ancient History.* (3 each)
An intensive study of the bibliography of Greek and Roman History, primary (in translation) and secondary, criticism and analysis of selected books, and of recent articles in professional journals. Prereq: consent of instructor.

613, 614 *Readings in Medieval History.* (3 each)
A course designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: an undergraduate course in Medieval History.

621, 622 *Readings in European History 1500-1815.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: an undergraduate course in European History.

623, 624 *Readings in European History since 1815.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: an undergraduate course in European History.

625, 626 *Readings in British and British Empire History.* (c each)
An intensive study of the bibliography of British and British Empire History, primary and secondary, with readings, analyses and criticisms of selected titles in the literature of the field and of recent published research in the professional journals. Prereq: an undergraduate course in British History.

631, 632 *Readings in United States History to 1865.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of American History in the period indicated, to acquaint students with source materials and the secondary literature of the field, and to provide opportunity for critical discussion of books and issues. Prereq: an undergraduate course in American History.

633, 634 *Readings in United States History since 1865.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of American History in the period indicated, to acquaint students with source materials and the secondary literature of the field, and to provide opportunity for critical discussion of books and issues. Prereq: an undergraduate course in American History.

635 *Readings in Modern Russian History.* (3)
A guided program (with readings primarily in translation) designed to familiarize the student with the broad patterns and specific developments of the modern imperial period (beginning with Peter I), to analyze the position of Russia in international affairs, and to assess the causes and nature of the 20th century revolutions. Prereq: Consent of instructor.

636 *Readings in Modern Russian History.* (3)
A program relying considerably upon readings (mostly in translation) which will offer the student a broad comprehension of the nature of the Soviet system and of the blocs of other Marxist states by focusing upon the ideological foundations, evolutionary patterns and specific developments that comprise the history of the Soviet Union from 1917 to the present. Prereq: Consent of instructor.

637, 638 *Readings in Latin American History.* (3 each)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of colonial Latin American history or the modern period. Prereq: HIS 208 and 209 or consent of instructor.

639 *Readings in Far Eastern History.* (3)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of Chinese history during the Ch'ing Dynasty (1644-1912) and Japanese history during the Tokugawa period (1615-1867). Prereq: HIS 295 and 296 or consent of instructor.

640 *Readings in Far Eastern History* (3)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of Chinese history since 1895 and Japanese history since 1868. Prereq: HIS 295 and 296 or consent of instructor.

695 *Independent Work.*
Under special conditions selected students may investigate problems with weekly reports to the instructor. Prereq: Consent of instructor. May be repeated for a maximum of 9 credits.

COURSES IN THE 700 GROUP

Seminars—basically research in character. These are not content courses. They provide special training in historical research (collection and critical analysis of bibliography, note-taking and organization of materials, and the presentation of a properly documented research paper). Topics will be chosen in keeping with the interests of the professors in charge. Two class hours and one conference hour.

700 *Special Problems in History.* (3)
Visiting professors will conduct research seminars in topics or problems in which they have special research interests. Prereq: at least one year of graduate study in History.

705 *Seminar in Ancient History.* (3)
Select topics in Greek and Roman history, with an intensive study of a particular area or aspect of the ancient world. Prereq: reading knowledge of at least one ancient language and one modern foreign language, or consent of instructor.

706 *Seminar in Medieval History.* (3)
Directed research on a common problem. Prereq: Latin and one modern European language.

710 *Seminar in American History, 1607-1783.* (3)
May be repeated once for a total of six credits.

711 *Seminar in American History, 1783-1865.* (3)
May be repeated once for a total of six credits.

712 *Seminar in American History, 1865 to Present* (3)
May be repeated once for a total of six credits.

715 *Seminar in Latin American History.* (3)
This seminar course will consider special problems encountered in the study of Latin American History. Prereq: HIS 208, 209, 584 or consent of instructor.

720 *Seminar in Modern European History, 1500-1714.* (3)
May be repeated once for a total of six credits.

721 *Seminar in Modern European History, 1714-1870.* (3)
May be repeated once for a total of six credits.

722 *Seminar in Modern European History, 1870 to Present* (3)
May be repeated once for a total of six credits.

730 *Seminar in Modern British History.* (3)

740 *Seminar in Kentucky History.* (3)
The development of Kentucky as a Western commonwealth, with emphasis on economic and political phases from the 18th century to the present, with writing of papers based upon research among documents and other source materials.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
Topic will be chosen in keeping with interest of professors in charge. May be repeated

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

HISTORY OF EDUCATION (*See Education—Foundations of*)

MATHEMATICS

THE MASTER OF ARTS AND MASTER OF SCIENCE DEGREES IN MATHEMATICS

It is recommended that a prospective graduate student present a strong background in undergraduate mathematics, including courses in advanced calculus and modern algebra.

The Master's degree is offered under both Plan A and Plan B. The completion of Plan A requires 24 semester hours reading proficiency in one of the foreign languages, French, German or Russian and a thesis. Under Plan B, six semester hours of course work may be presented in lieu of a thesis. An examination is given which covers course work, thesis topic (if any) and related materials. A graduate student who holds a teaching assistantship is expected to complete the M.A. or M.S. program within two years.

THE DOCTOR OF PHILOSOPHY DEGREE IN MATHEMATICS

The doctorate is a research degree granted on the basis of broad mathematical knowledge and exhibited creative ability. Course work leading to the doctorate is available in the fields of algebra, analysis (classical and modern), applied mathematics, differential equations and topology. A comprehensive examination is required of each student. This examination normally is given after two years of graduate study.

In order to be admitted to candidacy for the degree a student must pass proficiency examinations in two foreign languages chosen from French, German or Russian, complete studies in a minor field (either inside or outside the department) and successfully complete the comprehensive examinations. Subsequent work becomes highly specialized through seminars, independent study, and finally, work on a dissertation which penetrates in depth in some field of particular interest.

421 *Elementary Numerical Methods.* (3)
Outline of capabilities and limitations of the computer. Number representation. Propagation of errors through basic arithmetical operations. Applications of analysis to error-estimation. Linear and non-linear equation solving. Matrix eigenvalues. (This course could serve as an introduction both for the specialist and the non-specialist). Prereq: MA 211 and 262, or equivalent.

431 *Differential Equations.* (3)
First-order equations, special second-order equations, series solutions, higher order equations and systems. Prereq: MA 262.

432 *Methods of Applied Mathematics I.* (3)
Partial differentiation, Jacobians, implicit function theorem, uniform convergence of series, line and surface integrals, Green's and Stoke's theorems. Prereq: MA 212 or MA 216.

433 *Methods of Applied Mathematics II.* (3)
Elementary complex variable theory with applications. Complex field, analytic functions, Cauchy theorem, power series, residue theory. Prereq: MA 432 or MA 470.

462 *Matrix Analysis.* (3)
Vectors, matrices, vector-valued and matric-valued functions, differentiation, integration, Jacobians, Wronskians, inversion of matrices, eigenvalues, vectors, matrices of special forms, innerproduct spaces and tensors. (This course is a prerequisite for 500-level courses in Differential Equations.) Prereq: MA 262 or consent of instructor.

470 *Advanced Calculus I.* (3)
A course for upper division majors in mathematics and the exact sciences. The sequence MA 470-570 is parallel to MA 432-433 but comprises a deeper investigation of the properties of continuity, convergence, and the Riemann integral. Prereq: MA 216 or both MA 212 and 262. MA 262 may be taken concurrently.

485 *Fourier Series and Boundary Value Problems.* (3)
This is an introductory treatment of Fourier series and its application to the solution of boundary value problems in the partial differential equations of physics and engineering. Orthogonal sets of functions, Fourier series and integrals, solution of boundary value problems, theory and application of Bessel functions and Legendre polynomials. Prereq: MA 431 and MA 432 or equivalent.

501, 502 *Seminar in Selected Topics.* (3)
Various topics from the basic graduate courses. Designed as a course for teachers of lower division mathematics and usually offered in connection with a summer institute. Prereq: Teaching experience in field of mathematics and consent of instructor. May be repeated once.

523 *Introductory Probability.* (3)
Set theory; fundamental concepts of probability, including conditional and marginal probability; random variables and probability distributions (discrete and continuous); expected values and moments; moment-generating and characteristic functions; random experiments; distributions of random variables and functions of random variables; limit theorems. Prereq: MA 212. (Same as STA 523.)

532 *Ordinary Differential Equations.* (3)
Successive approximations and elementary existence theorems for scalar and vector equations, qualitative behavior of solutions as functions of initial conditions and parameters, linear systems with constant and periodic coefficients, stability theorems for second order linear and nearly linear equations, second order boundary value problems and regular singular point theory. Prereq: MA 462 and either MA 432 or MA 470.

533 *Partial Differential Equations.* (3)
Elementary existence theorems, equations of first order, classification of linear second order equations, the Cauchy and Dirichlet problems, potential theory, the heat and wave equations, Green's and Riemann functions, separation of variables, systems of equations. Prereq: MA 532 or MA 431 and one of MA 432, MA 470.

535 *Vector and Tensor Analysis.* (3)
The algebra and calculus of vectors, cartesian tensors, curvilinear coordinates, Christoffel symbols, determinants, exterior forms, integration. Prereq: MA 212.

536 *The Operational Calculus.* (3)
The introductory theory and properties of the Laplace transformation. Applications in differential equations, difference equations and boundary value problems of mechanics, electricity and heat. Prereq: MA 431.

538 *Elementary Numerical Analysis.* (3)
Interpolation. Gaussian quadrature, orthogonal polynomials. Richardson process. Numerical treatment of ordinary differential equations and intermediate linear algebra. Linear difference equations. Prereq: MA 431.

551 *Topology I.* (3)
General topology, Hausdorff spaces, normal spaces, connectedness and compactness. Prereq: consent of instructor.

561 *Modern Algebra I.* (3)
Algebraic structures, quotient structures, substructures, product structures, groups, permutation groups, groups with operators, and the Jordan-Hölder theorem. Prereq: Consent of instructor.

565 *Linear Algebra.* (3)
Fields, vector spaces, rings of linear transformations, matrices associated with linear transformations, dual spaces, eigenvectors, canonical forms, adjoint matrices, and tensor products. Prereq: MA 262 or consent of instructor.

566 *Theory of Numbers.* (3)
Divisibility, prime numbers, congruences and residues, Diophantine equations. Prereq: consent of instructor.

570 *Advanced Calculus II.* (3)
A continuation or MA 470. Primarily a study of the calculus of mappings between sets in higher-dimensional Euclidean spaces. Prereq: MA 470 or equivalent.

571 *Analysis I.* (3)
This course is designed for advanced undergraduates and beginning graduate students. Topics include metric spaces, metric space topology, continuous functions on metric spaces, Ascoli's theorem, Stone-Weierstrass theorem and Riemann-Stieltjes integration. Prereq: MA 470 or consent of instructor.

572 *Analysis II.* (3)
Lebesgue measure in E^n, Lebesgue integration, product measure, Fubini theorem. Applications to L spaces and Fourier series. Prereq: MA 571 or consent of instructor.

573 *Applied Complex Analysis.* (3)
Boundary value problems, analytic continuation, contour integration, special functions. Prereq: MA 433.

611 *Independent Work in Mathematics.* (3-9)
Reading course for graduate students in mathematics. Prereq: Major in mathematics, a standing of at least 3.0 and consent of instructor. May be repeated to a maximum of 9 credits.

612 *Independent Work in Mathematics.* (3)
A continuation of MA 611. Prereq: Math major and a standing of at least 3.0 in department.

613 *Independent Work in Mathematics.* (3)
A continuation of MA 612. Prereq: Math major and a standing of at least 3.0 in department.

614 *Independent Work in Mathematics.* (3)
A continuation of MA 613. Prereq: Math major and a standing of at least 3.0 in department.

621 *Advanced Mathematical Statistics.* (3)
Theory of sampling, the Chi-square distribution, testing statistical hypotheses. Prereq: MA 521.

632 *Advanced Differential Equations.* (3)
General existence and uniqueness theorems, linear systems, regular and singular eigenvalue problems, stability theory, nonlinear oscillation theory, asymptotic theory, equations with retarded argument. Prereq: MA 532 or consent of instructor.

635 *Theory of Tensors.* (3)
Graded tensor algebra of a module over a ring, groups as modules over the integers, vector spaces over fields and the module of vector field germs, vector fields on open sets in vector spaces and on manifolds, graded exterior algebras, and integration of forms. Prereq: MA 561 or consent of instructor.

638 *Advanced Numerical Analysis.* (3)
Discrete approximations to the solution of boundary value problems in ordinary and partial differential equations, numerical treatment of associated systems of linear equations. Prereq: MA 538.

641, 642 *Differential Geometry.* (3 each)
Tensor products, exterior algebra, differentiable maps, manifolds, geodesics, metric properties of curves in E^n fundamental forms, surfaces. Prereq: Consent of instructor.

651 *Topology II.* (3)
Embedding and metrization, compact spaces, uniform spaces and function spaces. Prereq: MA 551.

653 *Dimension Theory.* (3)
Primarily concerned with dimensions of separable metric spaces. Will also consider the relationships between various definitions of dimensions. Prereq: MA 651.

654 *Algebraic Topology I.* (3)
Homotopy, fundamental groups, simplicial homology, axioms for homology theory. Prereq: MA 651 and MA 561, 651 or equivalent.

655 *Algebraic Topology II.* (3)
Singular homology theory and applications, homology of products, singular and Cech cohomology, with applications. Prereq: MA 654.

661 *Modern Algebra II.* (3)
Rings, fields of quotients, rings of polynomials, formal power series, modules, exact sequences, groups of homomorphisms, natural isomorphisms, algebras and tensor algebras. Prereq: MA 561 or consent of instructor.

667 *Group Theory.* (3)
A study of homomorphisms for groups, finite groups, solvable groups, nilpotent groups, free groups, and abelian groups. Prereq: MA 661.

671, 672 *Functions of a Complex Variable.* (3)
Differentiation and integration, contour integration, poles and residues, Taylor and Laurent series, conformal mapping, Riemann mapping, Dirichlet problem, multiple-valued functions, Riemann surfaces, and applications. Prereq: MA 571, 572.

673 *Several Complex Variables.* (3)
Hartogs' theorems, domains of holomorphy, pseudoconvexity, Cousin problems, differential forms, DeRham's theorem, cohomology of domtains of holomorphy, Levi problem, sheaves, Stein manifolds. Entire functions of several variables. Prereq: MA 672.

678 *Calculus of Variations.* (3)
The ordinary problem for the plane and space cases; the necessary conditions of Euler, Weierstrass, Legendre, and Jacobi. The parametric problem; the isoperimetric problem. Sufficiency conditions. Prereq: Consent of Instructor.

681 *Functional Analysis I.* (3)
General theory of normed linear spaces including the Hahn-Banach separation theorems, principle of uniform boundedness and closed graph theorem. Dual spaces and representation theorems for linear functionals. Abstract measure theory and Riesz representation theorem for C(X). Prereq: MA 572 or consent of instructor.

682 *Functional Analysis II.* (3)
Weak and weak-star topologies, reflexive spaces, convexity in linear spaces, operators, adjoint operators, spectral theory and Fourier transforms. Prereq: MA 681.

683 *Convergence and Summability.* (3)
Fundamental limit ideas applied to infinite sequences, infinite series, infinite products, etc. Summability of Cesaro, Holder, Abel, Borel and Leroy. Prereq: MA 571 or consent of instructor.

685 *Fourier Analysis.* (3)
Expression of a general periodic function as a Fourier series, sufficient conditions for convergence. Fejer's theorem, applications. Prereq: MA 572.

687 *Integral Equations.* (3)
Systems of ordinary linear equations, linear operators, orthogonal systems, linear integral equations of the second kind, theorems of Fredholm, Volterra's equation. Prereq: consent of instructor.

732 *Selected Topics in Differential and Integral Equations.* (3)
Advanced topics in the theory of differential (ordinary or partial) and integral equations such as topological dynamics, almost periodic solutions, stochastic differential equations, integro-differential and differential-difference equations, generalized functions as solutions, non-linear partial differential equations, singular integral equations. Prereq: consent of instructor.

751, 752 *Selected Topics in Topology.* (3 each)
Prereq: MA 651.

753, 754 *Selected Topics in Functional Analysis.* (3 each)
Prereq: MA 682.

755, 756 *Selected Topics in Topological Algebra.* (3 each)
Topics chosen from: Lie groups, transformation groups, topological groups, semigroups, rings, semirings and lattices. Also reports on and discussion of recent advances in topological algebra. Prereq: MA 651 or consent of instructor.

757 *Seminar in Topology.* (3)
Review of current research in topology. Prereq: Consent of instructor.

761 *Homological Algebra.* (3)
Homological algebra, modules, exact sequences, functors, homological dimension, extension problems. Prereq: Consent of instructor.

762 *Theory of Rings.* (3)
Prereq: Consent of instructor.

763 *Theory of Fields.* (3)
Separable and inseparable extensions, splitting fields, normal extensions, fundamental theorem of Galois theory, and transcendental extensions. Prereq: MA 561 and 661.

764, 765 *Selected Topics in Algebra.* (3 each)
Reports and discussion on recent advances in group theory, ring theory, and homological algebra. Prereq: MA 661 and consent of instructor.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.
Staff.

771, 772 *Selected Topics in the Theory of Complex Variables.* (3 each)
Prereq: Consent of instructor.

773, 774 *Selected Topics in Analysis.* (3 each)
May be repeated once for a total of six credits each. Prereq: Consent of instructor.

777 *Mathematical Seminar.* (3)
May be repeated once for a total of six credits.

778 *Mathematical Seminar.* (3)
May be repeated once for a total of six credits each.

MUSIC

The Department of Music offers the Doctor of Philosophy, the Doctor of Musical Arts in Music Teaching, Master of Arts degree with a major in Music Theory or Music Literature, the Master of Music with a major in Applied Music, Composition, Theory, or Music Education, and the Master of Arts in Education, with emphasis in the field of Music Education. Candidates for these degrees must present the approximate equivalent of the University of Kentucky's undergraduate requirements in music, appropriate to the prospective area of concentration on the master's level. Normally, a candidate should expect to spend a minimum of two semesters and one summer session or the equivalent in residence as a full-time graduate student to complete the requirements for a master's degree in music. The candidate for the Ph.D. and Doctor of Music Arts in Music Teaching must complete not fewer than three years of graduate work.

Graduate Record Examination scores must be presented by the end of the first semester or first summer session the student is enrolled. Candidates failing to comply with this requirement will not be permitted to register for further

course work until the Graduate Record Examination has been taken. If the results of the Graduate Record Examination reveal deficiencies in the candidate's background, additional course work may be required as determined by the Director of Graduate Studies in the Department of Music.

GENERAL REQUIREMENTS FOR MASTER'S DEGREE

Entrance Examinations—All candidates are required to take qualifying examinations in Music Theory, Music Literature, and in Applied Music and Music Education (if their area of concentration is involved). These examinations are given during the first week of each semester; students revealing unusual deficiencies in these areas are required to elect additional course work as determined by the Director of Graduate Study.

Foreign Language Requirements—The undergraduate record of Master of Music candidates must show credit for one year of foreign language study. In the event it does not, the candidate will be required to study one year of a foreign language as a graduate student. This credit will not apply toward the Master of Music degree. Candidates in Applied Music-Voice must have completed one year of study in each of two modern foreign languages. The Master of Arts degree with a major in music requires a reading knowledge of one foreign language, preferably French or German.

Thesis Requirements—The Master of Arts degree require theses. A public recital acceptable to the faculty is required in lieu of a thesis for the Master of Music degree in Applied Music. A composition of major proportions, acceptable to the faculty and publicly performed, must be submitted in lieu of a thesis by candidates for the Master of Music degree in Composition. A thesis is optional in the Master of Music in Music Education or Theory and Master of Arts in Education curricula.

MASTER OF MUSIC IN APPLIED MUSIC

A minimum of thirty graduate hours distributed as follows: (a) nine to twelve hours in Applied Music, (b) ten to fourteen hours of Music Theory, Music Literature, or Music Education, (c) two to six hours of approved electives.

A public recital of major proportions, approved by the Music faculty.

A typewritten paper dealing with the music performed on the recital, to be submitted at least one week before the comprehensive examination.

Candidates for the M.M. in wind, string or percussion instruments are required to participate in a University-sponsored performing group for two semesters unless excused by vote of the faculty.

A final comprehensive examination.

MASTER OF MUSIC IN MUSIC EDUCATION

A minimum of twenty-four hours and an acceptable thesis, or thirty hours without a thesis, distributed as follows: (a) twelve hours in the field of Music Education, (b) twelve to fourteen hours in music theory, music literature and applied music, (c) six to nine hours of approved electives. All graduate students in music education, if full-time resident students, are required to participate in

a University-sponsored performing group for two semesters unless excused by vote of the faculty.

A final comprehensive examination.

MASTER OF MUSIC IN THEORY

A minimum of twenty-four hours, and an acceptable thesis distributed as follows: (a) sixteen hours in Music Theory and Music Literature, (b) eight hours of approved electives, (c) six additional hours in theory, music literature, or composition in lieu of thesis.

A final comprehensive examination.

MASTER OF MUSIC IN COMPOSITION

Prerequisite are a Bachelor's degree with major in music or the equivalent and submission of three (3) original compositions.

A minimum of twenty-four hours, and an acceptable thesis composition. The thesis composition must be publicly performed, and the candidate is responsible for the preparation therefore of legible score and parts. Course requirements include (a) eighteen hours in Composition, Music Theory, and Music Literature; (b) six hours of approved electives.

MASTER OF ARTS IN EDUCATION *(See pages 184-193)*

MASTER OF ARTS WITH A MAJOR IN MUSIC

The usual area of concentration for this degree is in the field of Music Theory or Music Literature. The general requirements are shown under Plan A (page 19 of the Graduate Bulletin). Specific requirements may be obtained from the Director of Graduate Studies in Music.

THE DOCTOR OF PHILOSOPHY DEGREE

The Department of Music offers the Ph.D. degree in musicology. Every prospective candidate must have the A.B. in music or its equivalent. Those with a Master's degree will normally be expected to present the M.A. in music or a Master of Music degree with substantial study in musicology and languages. At the discretion of the graduate committee of the Department of Music the M.A. requirement may be waived for a student demonstrating exceptional skill in research and writing.

All applicants will be asked to provide evidence of ability to write an acceptable doctoral dissertation.

All applicants will be required to take screening examinations in aural and written theory, sight-singing, music history and literature, and keyboard proficiency. These examinations are to be taken before the pre-registration period of the second semester of graduate study. Students who show deficiencies in any of the above may repeat a given examination once.

Foreign languages required are German and French or Italian, plus any other languages required for preparing the dissertation.

CURRICULUM FOR THE PH.D. PROGRAM

Most of the courses in this bulletin will be germane to the proposed program. A core curriculum for the Ph.D. in musicology beyond the Master's degree will include:

Music 599 (Collegium Musicum)	3
Music 683 (Advanced Research Methods)	2
Music 687 (History of Performance Practices)	3
Music 776 (Notation of Renaissance Polyphony)	3
Music 777 (Seminar in Musicology)—to be repeated twice	9
	20 hours

Independent work courses in Musicology (chosen from Music 786, 787 and 788) as thought necessary by the special committee.

To meet the requirements outside the major field the student may elect

Option I: A full minor comprising four full courses in one discipline within the Humanities division

or

Option II: An inter-disciplinary program of four courses chosen from offerings in the College of Arts and Sciences amounting to a minimum of 10 hours.

THE DEGREE OF DOCTOR OF MUSICAL ARTS

At present the degree of Doctor of Musical Arts is offered only in the field of Music Teaching. This degree is intended for either the college teacher of music or for the administrator or teacher of music on the pre-college level.

The requirements for this degree are the same as for the degree of Doctor of Philosophy, with the following exceptions:

1) Only one foreign language, normally French or German, is required for the D.M.A. degree. The candidate must also demonstrate a working knowledge of music terms in French, German, and Italian prior to the qualifying examination.

2) The applicant for this degree must have at least two years of successful teaching experience.

3) The applicant must submit, prior to admission to candidacy, his Master's thesis or two papers of approximately 1,000 words each, one of the papers dealing with the teaching of music.

4) No later than the first term of study the applicant must take placement examinations in music theory, music history and literature, keyboard proficiency, performance or conducting, and any necessary special examinations in the field of proposed concentration.

The following minimum core requirements for the D.M.A. beyond the Bachelor's degree are as follows:

Music History and Literature	12 hours
Music Theory	8 hours
Research Methods 682-683	4 hours

Minor outside department ..... 1/6 of course work
Courses in area of specialization ..... at least 15 hours

The candidate will minor in either musicology or music theory, with a second minor to be taken outside the Department of Music, subject to the approval of his committee and the chairman of the department concerned.

MUSIC PERFORMANCE COURSES

Graduate courses in Music Performance carry credit hours as follows:

Series I, 1 credit hour each semester
Series II, 2 credit hours each semester
Series III, 3 credit hours each semester

All music performance courses may be repeated 3 times for credit.

All music performance courses carry 1 credit hour if taken in the Summer Session.

	Series I Secondary Courses	Series II Major Courses	Series III Major Courses
Piano	501,601	521,621	541,641
Voice	502,602	522,622	542,642
Organ	503,603	523,623	543,643
Violin	504,604	524,624	544,644
Viola	505,605	525,625	545,645
Cello	506,606	526,626	546,646
String Bass	507,607	527,627	547,647
Flute	508,608	528,628	548,648
Oboe	509,609	529,629	549,649
Clarinet	510,610	530,630	550,650
Bassoon	511,611	531,631	551,651
Trumpet	512,612	532,632	552,652
French Horn	513,613	533,633	553,653
Trombone	514,614	534,634	554,654
Baritone	515,615	535,635	555,655
Tuba	516,616	536,636	
Saxophone	517,617	537,637	
Percussion	518,618	538,638	

MUSIC COURSES

560 *Supervision of Music.* (1) II, S

A study of supervision of the school music program through curriculum planning, supervisory techniques, administrative and community relationships, the use of mechanical aids in the improvement of teaching, etc. One lecture and one laboratory each week. Prereq: MUS 360 or 362, 361 or 363. *Nash.*

561 *Music Activities in the Elementary School.* (2) I, II, S

The study of music and its contribution to child development. An analysis of instructional materials and the development of criteria for the evaluation of these materials. Advanced studies and activities in rhythms, singing, listening, creativity, and reading music to create a musical environment in the classroom. Open to classroom teachers only. Prereq: MUS 260 and 261 or equivalents and consent of the instructor. *Staff.*

562 *Conducting.* (2) I
A study of the technique and practice of the fundamentals of conducting. Two meetings a week. *Miller.*

563 *Conducting.* (2) II
A continuation of 562. Two meetings a week. Prereq: MUS 562. *Miller.*

564 *Interpretation of Choral Music.* (2) I, II, S
A study of the fundamentals of choral conducting and choral literature, emphasizing materials for the secondary school level. *Kiviniemi.*

565 *Vocal Pedagogy.* (2) I, S
For teachers of voice, supervisors of music and choir directors. The study of physical and psychological problems in the teaching of voice production, the study of breath control, diction, resonance, interpretation and repertoire. *Kivineimi, Ivey, Graham.*

568 *General Music in the Secondary School.* (2) I, II, S
Techniques and materials for general music activities in the junior and senior high schools, emphasizing the teaching of music as a humanistic discipline. *Holroyd.*

570 *Orchestration.* (2) I, S
This course includes a study of the individual instruments of the orchestra and band with practice in scoring for these instruments. Two meetings a week. *Kinney.*

571 *Orchestration.* (2) II, S
A continuation of MUS 570. Two meetings a week. Prereq: MUS 570. *Kinney.*

572 *Counterpoint.* (2) I, S
A study of Counterpoint based on 16th Century and 18th Century contrapuntal techniques, original composition and analysis. *Wright, Kinney.*

573 *Counterpoint.* (2) II, S
A continuation of MUS 572. Prereq: MUS 572. *Wright, Kinney.*

574 *Composition.* (2) I, S
A basic course in original composition and orchestration. Prereq: MUS 371. *Wright.*

575 *Composition.* (2) II, S
A continuation of MUS 574. Prereq: MUS 574. *Wright.*

577 *Acoustics of Music.* (3) I, S
A study of the musical applications of sound phenomena. Prereq: Completion of 14 hours of music theory. *Lehman.*

579 *Baroque Music.* (3) I, S
The history of vocal and instrumental music in the Baroque style from 1600 to 1750. Prereq: MUS 280, 281, or MUS 200 and permission of instructor. *Buelow.*

580 *Music in the Eighteenth-Century.* (3) I, II, S
The development of Music in the Classic style from the early 18th century to 1800. Prereq: MUS 280, 281, or MUS 200 and permission of instructor. *Longyear.*

581 *Nineteenth-Century Music.* (3) I, II, S
A study of masterworks of music composed in the nineteenth century. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Longyear, Buelow.*

582 *Piano Literature.* (3) I, S
A historical and analytical study of music written for the piano. Consideration of the emergence of the piano idiom and the development of the instrument. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Patch, Bonn.*

583 *Symphonic Literature.* (3) I, S
An intensive study of orchestral literature. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Wright, Longyear.*

584 *Music for the Solo Voice.* (3) I, S
A stylistic study of vocal music from the Troubadours to the present. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Graham, Ivey.*

585 *History and Literature of the Organ.* (2) I, S
A course of study designed to give the organ student a practical knowledge of the development of the organ, its construction, the standard literature, and teaching materials. Two meetings a week. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Blackburn.*

586 *History and Literature of the Organ.* (2) II, S
A continuation of MUS 585. Prereq: MUS 585. *Blackburn.*

587 *Twentieth-Century Music.* (3) II, S
A stylistic study of representative compositions of the twentieth century. Prereq: MUS 281 or consent of instructor. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Kinney, Wright.*

588 *History and Literature of Opera.* (3) I, S
The development of opera as an art form, and analysis of representative operas from various eras. Prereq: MUS 280; 281; MUS 200 and permission of instructor. *Longyear.*

589 *History of American Music.* (3) II, S
A study of music in America from colonial times to the present. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Henderson.*

590 *Opera Theater.* (1) I, II, S
May be repeated to a maximum of three credits. *Graham.*

591 *Music Education Workshop.* (1) S
Intensive study of advanced methods and materials in one of the following areas of music education: elementary and general music, the school orchestra, the school band, choral music. May be repeated for a total of two credits. *Staff.*

592 *Music Education Workshop.* (2) S
Intensive study of advanced methods and materials in one of the following areas of music education: elementary and general music, the school orchestra, the school band, choral music. May be repeated for a total of four credits. *Staff.*

598 *Chamber Music Ensembles.* (1) I, II, S
The study of chamber music through performance. May be repeated once for a total of 2 credits. Prereq: permission of instructor. *Staff.*

599 *Collegium Musicum.* (3) I, II, S
The study and realization of performance practices in early music. May be repeated once for credit. *Staff.*

660 *Advanced Instrumental Conducting.* (2) II, S
This course is intended to develop further the ability to interpret and conduct the larger forms written for the symphony orchestra and concert band. Prereq: MUS 562, 564. *Miller.*

661 *Advanced Choral Conducting.* (2) I, S
The art of choral conducting as applied to various styles and forms of music. Study of unaccompanied works, works with small instrumental combinations, and works for chorus and orchestra. Prereq: MUS 563. *Kiviniemi.*

662 *Advanced Band Techniques.* (2) II, S
An advanced course in band techniques with concentration on band organization and materials, the technique of band conducting, and intensive study in the field of band arranging. *Staff.*

663 *Advanced Instrumental Techniques.* (2) II, S
An advanced technical study of playing string, brass and woodwind instruments, designed for the needs of school music teachers. May be repeated once for credit. *Staff.*

667 *Current Practices in Elementary School Music.* (2) I, II, S
Contemporary philosophies and objectives of music in the elementary school. The in-service training of the classroom teacher; the music specialist as a resource person. Techniques for developing the child's musical interest and capacity for music. The status of music in America's public schools. Open to music teachers only. Prereq: MUS 360 or its equivalent. *Staff.*

668 *Introduction to Ethnomusicology* (3) II, S
Studies in the folk and tribal music of all cultures and in the functional and art music of the non-Western world. Brief consideration will also be given to specific problems and techniques of the ethnomusicologist. *Staff.*

669 *Analytic Techniques.* (2) I, S
Studies in the analysis of stylistic practices in the music of the 18th and 19th centuries. Prereq: MUS 271 and 273 or equivalent. *Kinney.*

670 *Theory Review.* (0) I, S
A review of the fundamentals of music theory. *Wright.*

671 *Advanced Musical Analysis.* (3) I, S
A course designed to show the changing aspects of musical style through analysis of representative compositions from all periods. Prereq: At least 8 hours of upper division theory or consent of instructor. *Kinney, Wright.*

672 *Advanced Musical Analysis.* (3) II, S
A continuation of MUS 671. Prereq: MUS 671. *Kinney, Wright.*

673 *Advanced Composition.* (2) I, II, S
May be repeated to a maximum of six credits. Prereq: MUS 574 and 575. *Wright.*

674 *Pedagogy of Theory.* (2) I, II, S
The teaching of music theory. *Wright, Fitzgerald.*

675 *Pedagogy of Theory.* (2) I, II, S
The teaching of music theory. *Wright, Fitzgerald.*

676 *Sixteenth Century Counterpoint.* (2)
The study of sixteenth century contrapuntal techniques through analysis and composition. Offered according to demand. *Kinney.*

680 *Medieval Music.* (3) I
The development of Western music through the fourteenth century. *Staff.*

682 *Research Methods.* (2) I, S
A course designed to acquaint the student with the basic research techniques and materials in music. *Longyear, Buelow.*

683 *Advanced Research Methods.* (2) II, S
A continuation of MUS 682 for doctoral students. Prereq: MUS 682. *Longyear, Lehman.*

684 *Renaissance Music.* (3) II
A survey of vocal and instrumental music of the 15th and 16th centuries. *Staff.*

685 *Choral Music.* (3) I, S
The history and literature of vocal ensemble and choral music from 1500 to the present. *Kiviniemi.*

686 *History of Chamber Music.* (3) I, S
An intensive study of the development of instrumental chamber music. *Kinney, Longyear.*

687 *History of Performance Practices.* (3) I, II, S
A survey of practices in the performing of European music from the later Middle Ages to 1800, based on evidence from contemporary sources. *Staff.*

742 *Administration and Supervision of Public School Music.* (3) II, S
A study of current trends in school music, curricula, testing programs, and other supervisory procedures. (Same as EDU 742). *Nash.*

744 *History and Philosophy of Music Education.* (3) I, S
A historical survey of thought concerning the place and significance of music in the education of the individual and the group. (Same as EDU 744.) *Lehman.*

760 *Psychology of Music.* (3) II, S
A study of the processes of music thinking and the effects of music on human behavior. *Lehman.*

761 *Seminar in Music Education.* (3) I, II, S
Advanced professional study in the theory and practice of music education. May be repeated once for a total of 6 credits. Prereq: Permission of instructor. *Lehman.*

762 *Music in Higher Education.* (3) II, S
Historical and comparative studies in the teaching and administration of music in colleges and universities. Includes case studies in administration, music in European high education and the relationship of music to all other elements of the academic program. Prereq: MUS 744. *Fitzgerald.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Contemporary Musical Idioms.* (3) II, S
An intensive study of compositional procedures in music since 1920. Prereq: MUS 587 (may be taken concurrently with the consent of instructor). *Wright.*

775 *Medieval Notation.* (3) I
The study and transcription of the notation of Medieval music from the earliest plainchant sources to mannered notation of the late Ars Nova in Italy and France. Prereq: MUS 680 (may be taken concurrently) and consent of instructor. Three class hours and one lab hour per week. *Staff.*

776 *Renaissance Notation.* (3) II, S
The study and transcription of the notation of Renaissance polyphony from the time of the Burgundian school through Palestrina and contemporaries, and of the various keyboard and lute tablatures of the 16th and 17th centuries. Three class hours and one lab hour per week. Prereq: MUS 684 (may be taken concurrently) and consent of instructor. *Staff.*

777 *Seminar in Musicology.* (3) I, II, S
Study and research in specific musicological problems. To be repeated twice for credit. Prereq: Four graduate level courses in musicology. *Staff.*

779 *Studies in Music History.* (2) I, II, S
Intensive studies of a musical genre, a composer, or a school of composers. *Staff.*

780 *Independent Work in Music Education.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

781 *Independent Work in Music Education.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

782 *Independent Work in Music Education.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

783 *Independent Work in Music Theory.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

784 *Independent Work in Music Theory.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

785 *Independent Work in Music Theory.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

786 *Independent Work in Musicology.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

787 *Independent Work in Musicology.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

788 *Independent Work in Musicology.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

PHILOSOPHY

A Master of Arts degree is available in philosophy. The major requirements are: 24 hours of course work, two-thirds of which must be in philosophy proper, competence in one foreign language, and a thesis.

500 *History of Ancient Philosophy.* (3) I
A survey of the philosophical thought of ancient Greece and Rome, up to the rise of Christianity.

502 *Plato and Aristotle.* (3)
Plato's development of a theory of the world and of practice, studies in selected dialogues. Analysis of passages in Aristotle's major works on natural philosophy, metaphysics, knowledge, ethics, and politics. Three class hours per week.

505 *History of Medieval and Renaissance Philosophy.* (3)
A survey of major developments in philosophy from Augustine to the seventeenth century.

510 *History of Modern Philosophy.* (3) II
A survey of modern philosophy from the seventeenth to the middle of the nineteenth century.

512 *American Philosophy.* (3)
A critical survey of American philosophical movements, notably idealism, pragmatism, realism, naturalism, logical positivism, and phenomenology. Three class hours per week. Offered in alternate years.

515 *Contemporary Philosophy.* (3) I

A study of contemporary philosophical tendencies, notably pragmatism, idealism, the analytic movement (e.g., logical atomism, logical positivism, and philosophical analysis), phenomenology, and existentialism. Three class hours per week.

516 *Phenomenology.* (3)

An account of the phenomenological movement from Husserl to the present, with emphasis on the development of a phenomenological method including elements such as Intentionality, Reduction, Constitution and their relations to the Structure of Appearance. Three class hours per week. Offered in alternate years. Prereq: PHI 510. *Staff.*

518 *Existentialism.* (3)

A systematic study of the fundamental concepts and problems of existentialism. Selected readings in Kierkegaard, Marcel, Heidegger, Jaspers, and Sartre.

520 *Introduction to Symbolic Logic.* (3) I

An introductory course in symbolic logic, dealing with truth-functions, the deductive method, quantification theory, the propositional calculus, and the logic of relations and classes.

530 *Contemporary Ethics.* (3)

A study of the major developments in the field of ethics, notably intuitionism, naturalism, emotivism, and the analysis of the logic and the language of moral statements. Prereq: PHI 230.

535 *Social and Political Philosophy.* (3)

A critical study of social and political philosophy, its subject matter and the nature of its enterprise. Readings will include extensive selections from contemporary European authors with selections out of the American political traditions.

540 *Great Religions.* (3) I, S

A descriptive survey of several religions as they developed within their culture, for example: Hinduism, Buddhism, Confucianism, Judaism, Christianity.

545 *Philosophy of Religion.* (3) II

A philosophical examination of religious ideas, including such topics as the origin of religion; the nature of religion; the various concepts of God, the soul, immortality; internal and external criticisms of religion.

550 *Metaphysics.* (3)

Study of concepts and problems important for understanding the general or ultimate factors in reality; e.g., space-time, change, causality, substance, matter, life, God.

555 *Epistemology.* (3)

A study of the origin, nature, kinds, and validity of knowledge, with a consideration of such topics as faith, intuition, belief, opinion, certainty, and probability. Also some discussion of recent developments in semantics. *Staff.*

560 *Philosophy of Science.* (3) II

An examination of the logical and epistemological foundations of empirical science, including such topics as the unity and diversity of the sciences, methodology, theory and explanation, and current studies in the language of science. Prereq: Designed especially for undergraduate and graduate majors in the sciences. Prereq: PHI 220.

565 *Philosophy of Language.* (3) I

An investigation of problems current in the philosophy of language such as meaning and reference, the nature of analysis, linguistic relativity, and the relation of linguistics to philosophy.

570 *Philosophy of History.* (3)

A critical survey of philosophies of history including representative readings from the works of philosophers such as Hegel, Marx, Spengler, Niebuhr and Ortega y Gasset. Critical attention will be directed to the problem of "explanation" in history.

575 *Philosophy of Mind.* (3)
A systematic examination of the major contributions to the philosophy of mind by contemporary thinkers. Topics to be studied will include the nature of mind and mental phenomena; the relations of mind to body and to machines; the knowledge of other minds; artificial intelligence; consciousness, will, emotions, etc. Three class hours per week. Offered in alternate years.

592 *Aesthetics.* (3)
Problems of method in aesthetics; major types of aesthetic theory. Aesthetic materials of the arts in literature, music, and the space arts. Form and types of form. Meaning in the arts. Interrelations of the arts. Lectures, discussions, reports. (Same as ARE A-H 592.)

620 *Types of Logical Theory.* (3)
An intensive study of recent and contemporary contributions to logical theory: Whitehead and Russell, C. I. Lewis, R. Carnap, John Dewey, and others. May be repeated to a maximum of six credits. Three class hours per week. *Staff.*

625 *Advanced Symbolic Logic.* (3)
A study of the theory, construction, consistency, and completeness of deductive systems. Prereq: PHI 520 or equivalent.

700 *Seminar in Ancient Philosophy.* (3)
Intensive study of original works of such major classical philosophers as Plato and Aristotle. May be repeated for a total of 9 hours. Prereq: PHI 500 or equivalent. *Staff.*

710 *Seminar in Modern Philosophy.* (3)
Intensive study in the major works of such prominent philosophers of modern times as Descartes, Locke, Hume, Kant, and Hegel. May be repeated for a total of 9 hours Prereq: PHI 510 or equivalent. *Staff.*

715 *Seminar in Contemporary Philosophy.* (3)
Intensive study of current developments in philosophy as found in books and periodicals. May be repeated for a total of 9 credits. Prereq: PHI 515 or its equivalent. *Staff.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

790 *Research in Philosophy.* (3)
This course is primarily intended for advanced students who desire and are prepared to do research in philosophy. May be repeated to a maximum of twelve credits. *Staff.*

PHYSICS AND ASTRONOMY

The Department of Physics and Astronomy offers courses and research options leading to the Ph.D. degree in the special areas of theoretical astrophysics, experimental and theoretical atomic and molecular physics, experimental and theoretical nuclear physics, experimental and theoretical solid-state physics, and many body theory, and leading to the M.S. degree in these areas and also in the special area of optics. Excellent laboratory facilities and library materials are available. A major experimental facility is the six-million volt Van de Graaff accelerator. More detailed descriptions of each of these options will be sent on request.

Plan A or Plan B may be used to satisfy the requirements for the M.S. degree.

404 *Mechanics.* (3)
A lecture and problem course covering the fundamental laws of mechanics. Newton's Laws, statics and dynamics of a particle and rigid bodies, and oscillatory motion. Prereq: PHY 232, 242, MA 212, Concur. MA 431. *Brandenberger.*

416 *Electricity and Magnetism.* (3)
A lecture and problem course covering the theory of electrostatic fields, conductors, dielectrics, and steady currents. Prereq: PHY 232, 242; and MA 212. *Woodyard.*

417 *Electricity and Magnetism.* (3)
A continuation of PHY 416. A lecture and problem course covering electromagnetic induction, magnetic fields, magnetic materials, alternating currents, and electromagnetic radiation. Prereq: PHY 416. *Woodyard.*

472 *Interaction of Radiation with Matter.* (3)
Sources of radiation; penetration of charged particles, electromagnetic radiation, and neutrons through matter; excitation and ionization processes; radiation detection and spectroscopy; domimetry of ionizing radiations. Three class hours per week. Prereq: PHY 260 or equivalent. *Hurst.*

504 *Advanced Mechanics.* (3)
A continuation and extension of PHY 404. Includes dynamics of a particle, rigid bodies, Lagrange's equations, constrained motions, and oscillations. Prereq: PHY 404, MA 431. *DeMarcus.*

508 *Optics.* (3)
A lecture and problem course covering the basic phenomena of optics. Topics include thick lenses, apertures, wave motion, interference, diffraction, polarization, double refraction and the theory of selected optical instruments. Prereq: PHY 232, 242; and MA 212. *Hanau.*

510 *Spectroscopy.* (3)
A lecture and problem course dealing with the production, recording, measuring, and interpretation of atomic and molecular spectra. Topics include basic principles of atomic structure, spectographs, photometry, interpretation of spectra in fields of atomic structure, and spectographic analysis. Prereq: PHY 232, 242; and MA 212. *Hanau.*

512 *Experimental Physics: Electricity and Magnetism.* (2)
An advanced laboratory course in electrical measurements. Special projects are elected by the student to explore certain physical relations through standard electrical measurements. Prereq: PHY 416. *Gossick.*

514 *Electronics.* (3)
A lecture and laboratory course on the theory and application of solid-state, and vacuum tube electronic devices. Two hours lecture and two hours laboratory. Prereq: PHY 416. *Brandenberger.*

515 *Theory of Measurements.* (3)
A lecture and problem course in the analysis of experimental data. Topics include finding an empirical equation to fit a set of data, quantitative graphs, approximations, probability distributions, errors and deviations, least square solutions. Prereq: PHY 504 and MA 212. *Hanau.*

519 *X-rays and Crystal Structure.* (3)
A lecture and problem course dealing with the production and properties of x-rays. Topics include absorption, scattering, polarization, etc.; wave length measurement; the Compton effect and related quantum phenomena. Prereq: PHY 232, 242; and MA 212. *Staff.*

522 *Heat and Thermodynamics.* (3)
A lecture and problem course stressing some of the fundamental principles of heat phenomena, the laws of thermodynamics, equations of state for ideal and real gases, continuity, derivation of thermodynamic relations. Prereq: PHY 232, 242; and MA 212. *Weil.*

524 *Solid State Physics.* (3)
Structure of solids, and the physical basis of the properties of materials; bonding, solid types, lattice energy; thermal, dielectric, and magnetic properties; electrons in metals and semi-conductors; theory of rectifiers, transistors and solid state devices. Prereq: PHY 232, 242; MA 212. *Gossick.*

530 *Experimental Physics: Spectroscopy.* (2)
An advanced laboratory course in the use and properties of various light sources, spectographs, photographic materials, and photometric methods; analysis of unknown materials by spectrographic methods. Prereq: PHY 510 or 508. *Hanau.*

535 *Experimental Physics: Atomic and Nuclear.* (2)
Measurement of e, e/m, h/e, resonance potentials, X-ray absorption, half-lives, beta-ray and gamma-ray absorption, gamma spectra, specific activity, alpha particle ranges, and radiation dosage. Prereq: PHY 555. *Weil.*

538 *Experimental Physics: Light.* (2)
An advanced laboratory course dealing with the properties of lenses, mirrors, prisms, gratings, and combinations of these elements in optical systems. The important phenomena of optics are studied experimentally by means of microscope, telescope, spectrometer, interperometer, polarimeter. Prereq: PHY 508. *Hanau.*

554 *Fundamental Atomic and Nuclear Physics.* (3)
Atomic models, electromagnetic radiation, special theory of relativity, X-rays and crystal structure. Compton effect, wave nature of matter, atomic spectra, vector model, Zeeman effect. Prereq: PHY 232, 242; MA 212. *Gabbard.*

555 *Fundamental Atomic and Nuclear Physics.* (3)
A continuation of PHY 554. Prereq: PHY 554. *McEllistrem.*

598,599 *Introduction to Quantum Mechanics.* (3 ea.)
A lecture and problem course providing an introduction to quantum mechanics at the undergraduate level. Primary emphasis is on one-dimensional problems so that fundamental ideas can be assimilated without complications of purely mathematical nature. Basic postulates, Schrodinger's wave equation and its applications. Prereq: PHY 232, 242; MA 431. *Schrils.*

600 *Selected Topics in Advanced Physics.* (Subtitle required) (2-3)
A course designed to cover topics of an advanced and specialized nature such as the theory of angular momentum, topics in advanced theoretical nuclear physics, topics in advanced statistical mechanics. May be repeated twice. Prereq: Consent of instructor.

604 *Classical Mechanics.* (3)
A lecture and problem course covering the methods of Lagrange and Hamilton and their application to particles, systems of particles, and continuous media; variational principles; transformation theory. Prereq: PHY 504 or equivalent; MA 431. *DeMarcus.*

605 *Kinetic Theory of Matter.* (3)
A course of lectures covering the classical kinetic theory of gases. Topics include the theorems of Clausius, Joule, Maxwell and Boltzmann; Brownian movements, development of equations of change of state. Prereq: two 500 courses in Physics, and MA 431. *DeMarcus.*

611 *Electromagnetic Theory I* (3)
A lecture and problem course treating electrostatics, boundary conditions, potential problems, energy in electric and magnetic fields, magnetic materials and Maxwell's Equations. Prereq: PHY 416; MA 431. *Knight.*

613 *Electromagnetic Theory II.* (3)
A continuation and extension of PHY 611. Includes theory of electromagnetic waves and applications to optical phenomena of reflection, refraction, polarization and absorption. Prereq: PHY 611. *Knight.*

618 *Thermodynamics.* (3)
A review of the two classical laws of thermodynamics and their dynamical and statistical mechanical support; Nernst's heat theorem; applications of classical thermodynamics to important problems, relative thermodynamics. Prereq: PHY 522; MA 431. *Staff.*

624 *Theory of the Solid State.* (3)
A lecture and problem course covering the fundamental theory of the structure and properties of complex atoms, molecules, liquids and solids. Topics include mechanical, chemical and thermal properties of matter. Prereq: PHY 714 or equivalent. *Philhours.*

629 *Nuclear Physics.* (3)
A lecture and problem course dealing with advanced experimental nuclear physics. Topics include properties of nuclei, nuclear transformations, observational methods, radioactivity and interaction of radiation with matter. Prereq: PHY 604. *McEllistrem.*

630 *Nuclear Physics.* (3)
A lecture and problem course concerned with the theories of the structure of atomic nuclei. Topics include nuclear shell structure, internuclear forces, nuclear binding energies, and theory of nuclear reactions. Prereq: PHY 714 or equivalent. *MacKellar.*

631 *Atomic Structure.* (3)
A lecture and problem course treating the theory of atomic structure. Topics include atomic and molecular spectra, multiplet structure, interatomic and intermolecular forces, and quantum mechanical treatment of the vector model. Prereq: PHY 714 or equivalent. *Knight.*

632 *Statistical Mechanics.* (3)
A lecture and problem course dealing with the thermal properties of matter from the standpoint of statistical mechanics. Topics include thermodynamic properties, perfect gases, and Fermi-Dirac statistics. Prereq: PHY 522 and 604. *Philhours.*

639, 640 *Theoretical Astrophysics.* (3 ea.)
A study of those branches of physics which have thus far proved most useful in astronomical applications and a thorough treatment of several major astronomical problems which have been elucidated by these methods. Prereq: PHY 504, 611, *DeMarcus.*

650 *Theory of Relativity.* (3)
A lecture and problem course dealing with the special and general theories of relativity. Topics include, relativistic kinematics, the Lorentz transformations, the principal of equivalence, Riemannian spaces, field equations and experimental tests of the special and general theories. Prereq: PHY 604. *Staff.*

651 *Physics of Elementary Particles.* (3)
A lecture and problem course treating the subjects of fundamental particle classification schemes, high energy accelerators and detectors, introduction to meson field theory, pion nucleon interactions, and strange particles. Prereq: PHY 555, 617. *Staff.*

652 *Theory of Elementary Particles.* (3)
A lecture and problem course dealing with the application of modern theoretical concepts to elementary particle systems. Prereq: PHY 714. *Staff.*

682 *Electronic Phenomena in Gases.* (3)
Considers basic phenomena of the motion and interaction of electrons in gases including ion formation, mobility, diffusion, recombination, ion lifetimes, atomic and molecular excitations and energetics. Prereq: PHY 417, 554 or 510; MA 431. *Hurst.*

706 *Methods of Mathematical Physics.* (3)
Solution of physical problems systematized according to the equations they satisfy. Variational methods, boundary conditions, eigenfunctions, Green's functions, integral representations, approximation procedures, with applications from electromagnetic theory, quantum mechanics, acoustics. Prereq: consent of instructor. *VanWinter.*

714 *Quantum Mechanics I.* (3)
A lecture course covering a brief review of the origin of quantum theories, mathematical techniques of quantum mechanics, the general aspects of wave mechanics and matrix mechanics, the uncertainty principle. Prereq: PHY 604 or equivalent. *Butler.*

715 *Quantum Mechanics II.* (3)
A continuation of 714 with extensions into special methods of solving problems in the theory, problems in more than one dimension, and the Pauli and Dirac theories of the electron. Prereq: PHY 714 or equivalent. *Butler.*

716 *Advanced Quantum Mechanics.* (3)
A continuation of PHY 715. Topics covered will include the relativistic wave equations, second quantization, quantum electrodynamics. Prereq: PHY 715. *Staff.*

755 *Topics in Chemical Physics.* (Subtitle required) (3)
An introduction to current research areas in chemical physics. Topics may include theory of atomic spectra, atomic and molecular processes, molecular theory, electrons and phonons in crystals, and optical properties of metals. Lectures, 2 or 3 hours. Prereq: Consent of instructor. May be repeated to a total of 12 credits. Same as CHE 755. *Ritchie.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar.* (1)
A weekly meeting of the staff and graduate students of the department for presentation and discussion of recent developments in physics and of work in progress in the department. May be repeated to a maximum of eight credits. *Senior Staff.*

781 *Independent Work in Physics.* (3)
May be repeated to a maximum of twelve credits. *Senior Staff.*

790 *Research in Physics.* (3)
May be repeated to a maximum of six credits. *Senior Staff.*

791 *Research in Physics.* (5)
May be repeated to a maximum of ten credits. *Senior Staff.*

ASTRONOMY

492 *Galactic Astronomy II.* (3)
Study of the content, organization and evolution of our own and other galaxies. Prereq: Consent of the department. PHY 292. *Krogdahl.*

495 *Elementary Astrophysics I.* (3)
Applications of the principles of elementary physics to the problems of stellar and planetary interiors. Prereq: PHY 231, 232. *Krogdahl.*

496 *Elementary Astrophysics II.* (3)
Applications of the principles of elementary physics to the problems of stellar atmospheres and interstellar matter. Prereq: AST 495. *Krogdahl.*

591 *Cosmology I.* (3)
Consideration of observational basis of cosmology, cosmological theories of general relativity, the steady state theory, and kinematic relativity. Prereq: MA 113, and 211. *Krogdahl.*

592 *Cosmology II.* (3)
A study of the universe as a complete physical unit. Consideration of the various relativistic models and theory evaluation in the light of current observations. Prereq: AST 591. *Krogdahl.*

593 *Advanced Celestial Mechanics.* (3)
The three—and n-body problems; special solutions; potential theory. Prereq: AST 391 or equivalent. *Krogdahl.*

POLITICAL SCIENCE

Graduates of accredited colleges may become candidates for a Master's degree in Political Science. The degree may be earned under two plans: Plan A requires 24 semester hours and a thesis; Plan B requires 30 semester hours and a written examination in four fields in lieu of a thesis.

At least two-thirds of the semester hours required for the Master's degree must be taken in Political Science. At least one-half of the work in Political Science must be in courses open only to graduate students.

Students who are deficient in Political Science background must take such additional courses as may be recommended by the Department.

Admission to candidacy for the Doctor's degree in Political Science is governed by the regulations of the Graduate School. These regulations require a qualifying examination taken by the candidate during or after his fourth semester of full-time graduate study or its equivalent in those fields considered relevant to his program, such determination of fields to be made by the candidate's program committee. Normally, twenty-four of the total semester hours presented by the candidate must be in strictly graduate courses. Candidates for either a Master's or a Doctor's degree in Political Science are expected to have a knowledge of the related social sciences as a background for work in political science.

Candidates for the Ph.D. in Political Science are required to pass written examinations in two (2) foreign languages or to demonstrate a reading knowledge of one modern foreign language and proficiency in an allied field contributing to research competency in political science, such proficiency to be determined by the Director of Graduate Study, or by successfully completing at least six (6) hours of course work in the allied area(s). The allied fields presently approved by the Department of Political Science are (1) Statistics, (2) Research Methods, and (3) Computer Sciences. At least six (6) graduate hours in any one or a combination of these areas may be substituted for one foreign language upon the recommendation of the student's Special Committee and approval of the Director of Graduate Study.

Upon completion of the above requirements, the candidate must take an oral examination covering primarily the dissertation and the field in which the dissertation falls.

Additional details concerning departmental requirements may be secured from the Chairman of the department.

I. COMPARATIVE GOVERNMENT

520 *Government and Politics of South Asia.* (3)
A study of the political processes of India, Pakistan, and Ceylon.

521 *Government and Politics of Southeast Asia.* (3) I
Study of the political processes, problems and behavior of the several states of Southeast Asia with emphasis on their chief determinants. The different patterns of political development will be examined. Lecture, three hours per week.

555 *Comparative Government-Parliamentary Democracies.* (3) I, S
A study of the governments of Great Britain and the Dominions, France, and Scandinavia.

556 *Government and Politics of the Soviet Union.* (3) II, S
Analysis of political development in the Soviet Union with emphasis on party-government relations, Communist ideology, and major approaches to the study of Soviet Politics.

557 *Government and Politics in SubSaharan Africa* (3) II
The course will focus on the relationship between ideologies, institutions, and individuals in African political systems. Implications of these factors for African political behavior (domestic and international) will be examined.

568 *The Governments and Politics of Eastern Asia.* (3)
A comparative analysis of the modern political experiences of China and Japan, exploring their responses to the West, the development of differing political elites in each country, and contemporary problems of the Chinese Communist and Japanese politics.

569 *Latin American Government and Politics.* (3)
A study of contemporary Latin American political institutions and of the dynamics of the Latin American political process.

757 *Seminar in Comparative Democratic Political Systems* (3)
An analysis of democratic political systems with emphasis upon the comparative approach as a method of political analysis. Prereq: PS 555 or consent of nistructor.

759 *Seminar in African Political Systems.* (3) I
The seminar will focus on dimensions of change in African political systems. Dimensions to be analyzed include ideology, economic development, socialization, authority, political recruitment and political party and interest group behavior.

776 *Political Development of Southeast Asia.* (3)
Study of the processes of political change in Southeast Asia; concepts, approaches and methodology; problems of political development; research problems in studying political development in Southeast Asia. Prereq: Permission of instructor.

II. INTERNATIONAL RELATIONS

501 *Latin American Relations.* (3) II, S
The relations between the United States and the Latin American countries, with emphasis on the Monroe Doctrine and Pan-Americanism.

530 *The Conduct of American Foreign Relations.* (3)
The formulation, conduct, and control of American foreign policy, basic principles, comparison with other countries. Prereq: PS 151.

541 *The Foreign Policy of the Soviet Union.* (3)
A factual survey of the Soviet record in foreign affairs and an introduction to the guiding concepts and the principle techniques of Soviet foreign policy; the role of Communist ideology. Prereq: PS 556, or consent of instructor.

551 *Comparative Foreign Policies.* (3) I
This course will emphasize comparative analysis and the development of propositions to explain why states behave as they do. Lecture, three hours. Prereq: PS 265 or consent of instructor.

566 *The United Nations.* (3) II, S

Background of the United Nations. Problems and issues at the San Francisco Conference; analysis of charter and comparison with League of National Covenant; nature, structure and functions.

674 *Proseminar in Theories of International Politics.* (3)

A survey of the major theoretical approaches to the study of international systems and processes.

758 *Seminar in Soviet Politics, Government, and Foreign Policy.* (3)

Emphasis on methodology of various approaches to the study of the USSR as well as substantive research. Subjects will alternate yearly between Soviet Politics and Soviet Foreign Policy. Prereq: PS 541, and 556, or permission of instructor.

777 *Research Problems in International Relations.* (3) II

This seminar focuses on research strategies that can be utilized in dealing with problems in International Relations. Prereq: PS 674 or consent of instructor. May be repeated once with consent of instructor.

778 *Seminar in Comparative Foreign Policies.* (3) I

Emphasis upon internal and external factors impinging upon decision-making in the area of foreign policy. May be repeated once with consent of instructor.

Related Courses in Other Departments

Economics 471 International Economics.

History 574 & 575 The Diplomacy and Foreign Policy of the United States.

History 556 & 557 The British Empire.

History 525 Europe Since 1919.

History 534 Russian Revolutions and the Soviet System I.

History 535 Russian Revolutions and the Soviet System II.

History 536 Intellectual History of Modern Russia, 1789-1917.

History 538 Political and Diplomatic History of East Central Europe from the French Revolution to the end of World War I.

History 539 Political and Diplomatic History of East Central Europe since World War I.

History 295 & 296 The Far East to 1850.

Law 905 Conflict of Laws.

III. THE POLITICAL PROCESS

570 *Political Parties.* (3) I, II

An analysis of pressure groups; organization, methods and functions of political parties in the United States.

573 *Public Opinion.* (3)

A study of the nature of public opinion and its influence on government, the role of the press, and other media, propaganda techniques, and voting behavior.

576 *Legislative Process.* (3) II

A study of Congress and the state legislatures, covering the legislative power structure, the selection of legislators and the roles they play, decision-making, and the relations of the legislative and executive branches.

779 *Voting Behavior.* (3) I

A study of recent research in the field of voting behavior, including analysis of survey research techniques. Prereq: An undergraduate course in parties or public opinion, or consent of instructor.

780 *Legislative Behavior.* (3) II

A study of recent research in the legislative process, emphasizing both the substantive and methodological aspects. Prereq: An upper-division course in the legislative process or consent of instructor.

Related Course in Other Department

Psychology 544 Social Psychology.

IV. PUBLIC ADMINISTRATION

577 *Introduction to Public Administration.* (3) I, S

A study of theories of administration and organization, problems of line management and control, the principal staff and auxiliary functions and agencies, and the problem of administrative responsibilities under democratic government.

578 *Public Personnel Administration.* (3) II

A study of the history of the merit system in public administration, recruitment, position classification, pay policies, employee relations and morale, tenure, promotion, transfer and training in the public service; the role of the personnel officer.

579 *Public Policy for Private Enterprise.* (3)

A study of the development and implementation of government regulatory policy with major emphasis in the fields of anti-trust and public utilities.

790 *Special Problems in Public Administration.* (3) I

A research course in selected problems of public administration. The problems will be selected in accordance with the needs and desires of students registered for the course.

791 *The Organization as a Political System.* (3)

This course involves an examination of theoretical concepts pertaining to the design of organizational structure and the prediction and control of administrative behavior, including detailed analysis of the models evolving from traditional, behavioral and decision-making approaches to the study of administrative organization. Major emphasis will be placed on such concepts as those relative to power and its allocations, leadership, representation and policy formation. Student work will include participation in field research projects as well as extensive reading in the field of organization theory. Prereq: PS 577 or equivalent.

Related Courses in Other Departments

Economics 476 Labor Economics.

Economics 479 Public Finance.

Economics 580 Theory of the Public Economy.

Economics 577 Labor Legislation.

Law 920 Administrative Law.

Social Work 500—Public Welfare Administration.

Social Work 530 Community Organization.

Social Work 551 Public Assistance.

V. PUBLIC LAW AND JUDICIAL BEHAVIOR

559 *Constitutional Politics I.* (3) I

A survey of the interpretation of the Constitution as embodied in leading Supreme Court decisions. Concentrates upon (1) the substantive nature of constitutional doctrine, and (2) its relationship to political, economic and social trends.

560. *Constitutional Politics II.* (3) II
A study of the philosophy and development of civil liberties in the U.S. Major concentration on the interpretation of constitutional guarantees by the Supreme Court.

563 *The American Judicial Process.* (3)
A study, from the standpoint of the social sciences, of the judicial process at the state and national levels, dealing with the organization of courts, the making of judicial decisions, and the exercising of judicial power.

761 *The Constitution and Civil Rights.* (3) I, S
The American conception of civil rights as expounded by the Constitutional Fathers and as interpreted by the courts. The social, economic and political aspects and implications of these rights.

762 *Seminar in Judicial Policy Making.* (3)
Formulation, development and implementation of Constitutional policy by the United States Supreme Court and other agencies. Primary focus on areas of contemporary importance (excluding Civil Rights). Cases and supporting materials. May be repeated once. Prereq: Permission of instructor.

763 *Seminar in Administrative Politics.* (3) II
The processes by which administrative agencies establish and enforce policy are analyzed in terms of both legal and political considerations and behavioral theory. Three class hours per week. Prereq: Consent of instructor.

764 *Seminar in Judicial Behavior.* (3)
A survey of published research in judicial behavior and a study of the methodological innovations in this field. Prereq: Permission of instructor.

VI. RESEARCH CONCEPTS AND METHODS

671 *Introduction to Methods and Methodology in Political Science I.* (3) I, II
Analysis of the application of scientific method to the study of political phenomena; problems of concept formation; law, cause, and explanation; theory construction; and the place of values in political inquiry.

772 *Research Methods in Political Science* (3) I, II
Consideration of various modes of conducting research in political science. Focus on research techniques, applications, and theory building. Prereq: PS 771 or consent of instructor.

VII. STATE AND LOCAL GOVERNMENT

540 *Rural Local Government.* (3)
Study of the organization and functioning of units of local government, with primary emphasis on government in Kentucky counties.

552 *Municipal Government.* (3) I, II
A course in the study of the structure and functions of modern city governments with considerable attention to other forms of local government.

553 *Urban Government and Politics.* (3) I, II
An analysis of the formulation of public policy in small towns, middle-sized cities, and metropolitan areas. A theoretical model appropriate to all three settings will be formulated. The principal methods of studying community decision-making will be evaluated.

574 *Kentucky Government and Constitution.* (3) II
An intensive study of government and administration in Kentucky. The course is intended primarily for teachers of civics in the secondary schools, and for teachers of government in colleges.

751 *Seminar in Metropolitics.* (3) I
Overview of research on metropolitan government and politics; power structures, voting behavior and elections in metropolitan areas; emphasis on student research in metropolitan problems. Prereq: PS 553 or consent of instructor.

752 *Problems in State and Local Government.* (3) II
An intensive study of the basic problems of state and local government. Special emphasis will be given to such current problems as are of fundamental importance. May be repeated once.

VIII. THEORY

571 *Early Political Theory.* (3) I
The history of political theory from classical Greece to the Seventeenth Century with emphasis on the relationships between political and cultural change and the development of Western political thought.

572 *Modern Political Theory.* (3)
Political Theory from the Seventeenth Century to the present with emphasis on the development of contemporary ideologies, the impact of industrialism and modern science, and the relationships between modern democracy and dictatorship.

575 *American Political Thought.* (3)
Analysis of the development of American political thought especially as it relates to the role of government in the society.

770 *Seminar in Contemporary Political Theory.* (3) I, S
An intensive study of contemporary political ideologies. May be repeated to a maximum of six credits.

773 *Asian Political Theory.* (3) I
An examination of the major political thought patterns of ancient and contemporary Asia, with emphasis on India and China. Prereq: Consent of instructor.

Miscellaneous Credits

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

795 *Special Problems in Political Science.* (3) I
May be repeated to a maximum of six credits. *Staff.*

PSYCHOLOGY

The major goal of the doctoral program in psychology is to prepare the student for a career in teaching and research in the fields of clinical or experimental psychology. A master's degree in general psychology is also available.

The program in clinical psychology provides academic courses, practica, and an internship which permit the student to combine his teaching and research activities with a clinical career within the mental health field. Current areas

of research interest include psychotherapy, behavior therapy, psychopathology, projective techniques, and experimental personality. Clinical experience is available at such facilities as the University of Kentucky Medical Center, the U.S. Veterans Administration Hospital, the National Institute of Mental Health Clinical Research Center, and various nearby state institutions.

The program in experimental psychology provides academic courses and research experience in any of the following areas of concentration: learning, motivation, perception, developmental psychology, cognitive processes, and social psychology. Current areas of research interest include verbal learning, psycholinguistics, instrumental learning, classical conditioning, visual perception, discrimination learning in children, mathematical psychology, and social learning. Laboratories for the study of human and animal behavior with supporting shop and computer facilities are available.

During the first year of the doctoral program, all students gain experience in the major content areas of psychology and in psychological statistics. Thereafter, the student and his adviser construct a program of study consistent with the academic interests and professional goals of the student. This program of study includes a minor in some field outside the Department of Psychology and a reading knowledge of one modern foreign language is required for Ph.D. candidates.

M.A. or M.S. degree is awarded under Plan A only.

The minimum departmental standards for admission to graduate work in psychology are similar to those of the Graduate School and include a B average, a satisfactory score on the verbal and quantitative aptitude tests of the Graduate Record Examination and three letters of recommendation. For additional information concerning the program in psychology and such matters as financial support, contact the Chairman, Department of Psychology.

501 *Personality.* (3) I, II

An examination of several prominent personality theories in terms of the contexts in which they were originated, their influence upon contemporary psychological thought, and their present applications. Prereq: PSY 104 and 106, or PSY 210, permission of instructor required for graduate students. Three class hours per week. *Worell.*

505 *Human Senses and Perception.* (4) I

A study of the stimulus, receptor and organism variables that underlie perceptual experience and perceptually based behavior with emphasis upon theory and experimental method. Prereq: PSY 104 and 106, or 210. *Engel.*

507 *Psychology of Learning.* (4) II

Fundamental principles and findings from laboratory investigations of classical, instrumental, and verbal learning. Prereq: PSY 104 and 106, or 210, and PSY 336 or equivalent. *Donahoe.*

509 *Animal Behavior.* (4) I

Experimental techniques used in investigations of animal behavior. Topics include: heredity and environment, activity, instinct, motivation, learning, sensory discrimination, and personality in subhuman species. Prereq: PSY 104 and 106, or 210. *Newbury.*

511 *Experimental Child Study.* (3) I

An advanced course in the psychology of the normal child. The scientific background of experimental and observation method. Opportunities are provided to work with children. Prereq: PSY 200. *Estes.*

520 *Mental Hygiene.* (3) II, S
A general orientation to the subject of mental hygiene, its historical development, its scope and relation to various sciences. The individual and cultural determinants of behavior will be discussed. Prereq: PSY 104 and 106, or 210.

521 *Abnormal Psychology.* (3) I, II, S
A study of the major mental disorders, especially the psychoneuroses and the psychoses, and the biological, psychological, and sociological factors which contribute to their causation. Prereq: PSY 104 and 106, or 210. *Pattie.*

522 *Counseling Psychology.* (3) I
The methods of dealing with problems in counseling psychology in college and high school, including the problems of selection, classification, grading, personal adjustment, motivation, academic, vocational and personal counseling. Prereq: PSY 520 or 521. *Staff.*

523 *Psychology of the Criminal.* (2) I
A study of psychological factors involved in criminality, with special emphasis on the emotional and personality patterns underlying the life of the criminal, and the problems brought about by incarceration. Prereq: PSY 104 and 106, or 210.

530 *Biology of Motivation.* (2) I
Fundamental activating and goal-seeking processes of living organisms, biologically considered, including experimental and theoretical studies on such topics as instincts, drives, motives, and the taste preferences. Prereq: PSY 104 and 106, or 210. *Newbury.*

531 *Genetic Psychology.* (3) II
Influence of hereditary factors in the development of human behavior. A critical survey of the evidence regarding psychological traits such as musical and other special abilities, intelligence, and interests. Prereq: PSY 104 and 106, or 210. *Newbury.*

535 *Psychological Testing.* (3) I
A general orientation to the field of psychological testing. Introduction to the principles and methods of psychological testing, and a survey of the various kinds of psychological tests. Prereq: PSY 104 and 106, or 210 and 201. *Herron.*

540 *Introduction to Industrial Psychology.* (3) I
Review of the functions and findings of psychology applicable to business and industry. Topics covered are: employment procedures, personnel testing, attitude analysis, motivation, and morale. Prereq: PSY 104 and 106, or 210.

541 *Psychology of Industrial Personnel Procedures.* (3) II
A practical course for those preparing for personnel administration and for psychology in industry and business. A study is made of the theory and methods of position classification, job analysis, job evaluation, merit rating, supervisor selection and training, and collective bargaining. Prereq: PSY 104 and 106, or 210.

544 *Social Psychology.* (3) I, S
Theoretical and empirical analysis of individual behavior in the social setting with particular emphasis on social learning, motivation, and the measurement, formation, and changing of social attitudes. Prereq: PSY 104 and 106, or 210. Same as SOC 544.

545 *Small Group Behavior.* (3) II
The course will systematically cover theoretical and empirical approaches to small groups. Attention will be given to certain group properties and how these properties have been manipulated experimentally. Three class hours per week. Prereq: PSY 104 and 106, or 210, and one introductory course in sociology. *Lott.*

570 *Verbal Behavior.* (3) II
A broad coverage of several basic areas of human verbal behavior with particular emphasis on rote learning, memory and retention, associative processes, and psycholinguistics. Three class hours per week. Prereq: PSY 330 or 507. *Staff.*

579 *Stuttering.* (3) II
The nature, causes and treatment of stuttering, with emphasis on therapeutic procedures. Prereq: EDU 550. Joint listing under EDU 579. *Sander.*

600 *Systems of Psychology and Their History.* (3) I
A survey of the history of psychology and an intensive study of current systems of psychology. *Pattie.*

601 *Theories of Learning.* (3) I
A systematic presentation and critical analysis of the major theories of learning. Prereq: PSY 505, 507, or equivalent, 600.

602 *Theories of Personality.* (3) II
An examination of current theories of personality. The relation of these theories to psychological research will be examined. Prereq: PSY 505, 507 or equivalent, and 600.

603 *Psychopathology.* (4) II
Problems of differentiation between the various neuroses and psychoses with emphasis upon the effective and conative factors. Prereq: PSY 521, 602.

610 *Psychometrics.* (3) I
Analysis and interpretation of human measurements. The course deals with the computation and interpretation of simple, partial, and multiple correlations, regression equations, and reliability of measures. Prereq: A course in statistics. *Calvin.*

611 *Psychological Research.* (3) II
A study of the application of experimental methods in the major areas of psychology, including sensation and perception, learning, motivation, emotion, and personality. The design of research studies will be emphasized. Prereq: PSY 610. *Donahoe.*

617 *Experimental Approaches to Personality.* (3) I
A critical evaluation of experimental studies in selected areas in personality. Each student is required to design and conduct an empirical investigation of a specific problem. Two hours lecture, three hours lab per week. Prereq: Completion of one year of graduate program in Psychology or permission of instructor. *Worell.*

618 *Experimental Approaches to Psychopathology.* (3) I
A critical evaluation of experimental studies in selected areas of psychopathology. Each student is required to design and conduct an empirical investigation of a specific problem. Two class hours, three lab hours. Prereq: Completion of one year of graduate program in Psychology, or permission of instructor. *Harris.*

620 *Proseminar in Systematic Psychology.* (2)
An examination of some works of important theorists in psychology of the last 40 years. Prereq: PSY 507 or equivalent. *Staff.*

621 *Proseminar in Learning.* (2)
An intensive treatment of concepts, methodology, and current developments in the field of learning. Two class hours per week. Prereq: PSY 507 or equivalent. *Staff.*

622 *Proseminar in Personality.* (2)
An intensive treatment of theories, methods of investigation and current developments in the area of personality. Two class hours per week. Prereq: PSY 501 or equivalent. *Staff.*

623 *Proseminar in Sensation and Perception.* (2)
An intensive examination of the facts, methods and concepts involved in the study of sensory and preceptual processes. Two class hours per week. Prereq: Consent of instructor. *Engel.*

624 *Proseminar in Social Psychology.* (2)
An intensive examination of the methods and data of social psychology with emphasis on social attitudes. Two class hours per week. Prereq: PSY 544 or equivalent. *Lott.*

625 *Proseminar in Developmental Psychology.* (2)
An intensive treatment of theoretical and experimental literature, both classical and contemporary, in development psychology. Two class hours per week. Prereq: PSY 200 or equivalent. *Estes.*

630 *Clinical Methodology I.* (2)
An intensive survey and evaluation of tests of intelligence and projective techniques, with emphasis on theoretical issues, relevant quantitative methods, including multivariate procedures, and research findings. Prereq: PSY 336, 501, 520, and 535, or equivalent, and enrollment in graduate program in Psychology.

631 *Practicum in Clinical Psychology I.* (1)
Clinical interviewing and practice in writing reports on behavioral observations, content of verbalization, and case history data. Practice in administration, scoring, and interpretation of mental age scales. Three hours lab per week. Prereq: PSY 501, 521, and 535, or the equivalent and enrollment in graduate program in Psychology. PSY 630 to be taken as co- or prerequisite.

632 *Clinical Methodology II.* (2)
Theoretical issues, relevant quantitative methods, and research findings, with special emphasis on objective methods of assessment of normal and abnormal personality. Prereq: PSY 630, and enrollment in graduate program in Psychology.

633 *Practicum in Clinical Psychology II.* (1)
Continuation of administration, scoring, and interpretation of intelligence tests. Practice in the administration and scoring of projective techniques. Three hours lab per week. Prereq: 630 and 631, and enrollment in graduate program in Psychology. PSY 632 to be taken as co- or prerequisite.

634 *Practicum in Clinical Psychology III.* (3)
Administration, scoring, and interpretation of projective techniques and personality inventories, individually administered. Nine hours lab per week. Prereq: PSY 632 and 633, and enrollment in graduate program in clinical psychology.

635 *Practicum in Clinical Psychology IV.* (3)
Administration, scoring, and interpretation of batteries of clinical tests, with emphasis on organization of all relevant behavioral and test data, and professional report writing. Students will be assigned to local clinical installations. Nine hours lab per week. Prereq: PSY 634, and enrollment in graduate program in clinical Psychology.

636 *Systems of Psychotherapy.* (3)
An intensive examination of the major theoretical and research approaches to therapeutic behavior change. Prereq: PSY 632 and 647, and enrollment in graduate program in clinical psychology. *Berzins.*

637 *Practicum in Psychotherapy.* (3)
Supervised experience in the techniques of psychotherapy with adults. Two class hours and 6 lab hours per week. Prereq: PSY 636 and enrollment in graduate program in clinical Psychology. *Berzins, Harris and Worell.*

638 *Clinical Child Psychology.* (3)
Theory and research relevant to behavior problems of children; supervised experience in the diagnosis and therapy of children. Two hours lecture, two hours lab per week. Prereq: PSY 636 and 637 and enrollment in graduate program in clinical Psychology.

640 *Practice in Testing: Intelligence Tests.* (4) II
This course provides theoretical material and advanced laboratory practice in the measurement of intelligence by individual techniques. Lecture, 3 hrs.; lab., 2 hrs. Prereq: PSY 535 or equivalent. *Estes.*

641 *Psychological Measuring Instruments.* (3)
A study is made of a wide variety of psychological tests including group intelligence tests, personality and interest inventories, area aptitude tests, and special aptitude tests. Prereq: PSY 201.

642 *Principles of Test Construction.* (3)
A survey of the principles involved in different types of standardized tests, followed by the construction and item analysis of an original test by the student. Prereq: PSY 610.

643 *Test Standardization.* (3)
A continuation of 642. The student will administer a revised form of his preliminary test to an adequate sampling of the appropriate population and will determine its reliability and validity. Prereq: PSY 642.

647 *Disorders of Language.* (3)
Emphasis on adult aphasia and developmental language disabilities, theories, research findings, assessment procedures, and therapy approaches. Three class hours per week. (Same as EDU 647.)

650 *Diagnosis and Counseling in Counseling Psychology.* (3)
An advanced course in diagnosis and application of theories, techniques and tools in counseling psychology. Prereq: A graduate major in psychology or education.

662 *Practicum in Child Psychology.* (3) I, II
Nine hours of supervised work each week. May be repeated to a maximum of twelve credits. *Estes.*

663 *Practicum in Industrial Psychology.* (3)
May be repeated to a maximum of twelve credits. Nine hours of supervised work each week.

665 *Practicum in Counseling Psychology.* (3) I, II, S
Supervised experience in application of diagnostic and interviewing techniques in a counseling service. May be repeated to a maximum of twelve credits. (Same as EDU 665). Prereq: PSY 522.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar in Psychology, I.* (0) I, II
One two-hour discussion each week of some current systematic concepts and of research under investigation by a graduate student or staff member. May be repeated indefinitely. *Staff.*

771 *Seminar in Psychology, II.* (0) I, II
One two-hour discussion each week of some current systematic concepts and of research under investigation by a graduate student of staff member. For Ph.D. candidates. May be repeated indefinitely. *Staff.*

772 *Seminar in Learning.* (3) I
The study of selected topics in the learning area with emphasis on the recent experimental and theoretical literature. May be repeated to a maximum of 6 credits. Prereq: PSY 507 and consent of instructor. *Donahoe.*

774 *Seminar in Verbal Behavior.* (3)
The study of selected topics in the area of verbal behavior with emphasis on recent research and theory. May be repeated to a maximum of 6 credits. Prereq: Consent of instructor.

775 *Advanced Seminar in Perception.* (3)
A study of the major theoretical approaches to perception and an examination of critical experiments and well established phenomena in the field of perception from the vantage-point of these theories. Three class hours per week. Prereq: PSY 623 or equivalent. *Engel.*

776 *Seminar in Animal Motivation.* (3)
A variety of topics in motivation and unlearned behavioral determinants in sub-human species will be treated intensively in comprehensive reports based on the research literature and related to such problems as instinct, drive theory, activation, stress, work decrement and neural components. Human implications may also be considered. Prereq: Consent of instructor. *Newbury.*

777 *Seminar in Mathematical Psychology.* (3)
Topics in psychology which are receiving detailed mathematical analysis. Examples are mathematical learning theory, decision and judgment processes, advanced application of probability and statistics in psychological theory. Prereq: PSY 610. *Calvin.*

778 *Seminar in Child Psychology.* (3)
Topics in psychological development of the individual, e.g., learning, sex typing, identification, emotional problems, mental retardation, theories of infant care, achievement motivation, etc. Prereq: PSY 200 or equivalent. *Estes.*

779 *Seminar in Social Psychology.* (3) II
Each semester some topic in the field of social psychology, such as attitudes and beliefs, structure and function of social groups, social determinants of behavior, leadership, and morale will be studied intensively. Same as SOC 779. May be repeated to a maximum of 6 credits. Prereq: PSY 544. *Lott.*

780 *Problems in Psychology.* (2) I, II, S
Shorter research problems are registered under this number. A minimum of six hours per week is required in consultation with the instructor. May be repeated to a maximum of twelve credits. *Staff.*

790 *Research in Psychology.* (3) I, II, S
Research or thesis work may be registered under this number. A minimum of nine hours a week is required on research conducted in consultation with the instructor. May be repeated to a maximum of twelve credits. *Staff.*

SLAVIC AND ORIENTAL LANGUAGES AND LITERATURES

At present no graduate majors are offered in these subjects.

RUSSIAN

461 *Advanced Readings in Russian Literature.* (3)
Based on the reading of 19th century and 20th century short stories and plays by Russian masters. Intended for students desiring to combine extensive reading with oral and written expression. Particular emphasis will be placed on advanced grammar and syntax. Prereq: SO 367, 368. *Dechtiarenko.*

462 *Advanced Readings in Russian Literature.* (3)
A continuation of SO 461. *Dechtiarenko.*

463 *Russian Drama* (in Russian). (3)
A survey of the growth and development of the Russian drama, with special emphasis on the outstanding dramatists of the 18th, 19th and the beginning of the 20th centuries. Three class hours per week. Prereq: SO 367 or permission of instructor. *Dechtiarenko.*

464 *Survey of Russian Literature to 1800* (in Russian). (3)
An introduction to the literature of Russia from earliest times to Pushkin. The emphasis will be on 18th century authors. Three class hours per week. Prereq: SO 367, 368, or consent of instructor. *Dechtiarenko.*

563 *Tolstoy and Dostoevky.* (in English) (open to non-majors) (3)
A study of the period, significant works, influence at home and abroad. Lectures, oral and written reports, class discussions. Required of majors in addition to 24 hours of courses in Russian. Three class hours per week. *Fayer.*

SEMITICS

576, 577 *Studies in Semitic Philology.* (3 ea.)
Courses to meet the needs of students in various areas of Semitic Philology, e.g., in literature, in civilization, linguistics, etc. Three class hours per week. Prereq: Consent of instructor. *Staff.*

SOCIAL WORK

Courses in Social Work listed below may be taken for graduate credit. Major programs of study in this field leading to advanced degrees are not offered at the present time.

500 *Public Welfare Administration.* (3) II
Philosophy, background, and methods of tax-supported social work. The inter-relationship of federal, state and local services; standards and supervision as influenced by federal welfare legislation. Prereq: SW 505, SW 513.

505 *Child Welfare Services.* (2 or 3) I, S
A study of community and national programs for child care and protection, including aid to dependent children and other social security services.

510 *Psychiatric Information for Social Workers.* (2) I
An analysis of personality development and behavior patterns with special reference to psychiatric interpretations and their implication for social case work. Prereq: SW 513, SW 540, or permission of instructor.

513 *Introduction to Social Case Work.* (2) II
An introductory course in the generic principles of social case work. Discussion based on selected readings and case records. Prereq: SW 505, SW 540.

516 *Social Work Research and Statistics.* (3) I
A consideration of statistical and other types of research in social work problems with illustrations drawn from current studies of government and private welfare agencies. Prereq: SW 505, 540. *Wetzel.*

530 *Community Organization for Social Welfare.* (3) I, S
Methods and techniques of social welfare planning. Analysis of needs and resources, coordination of agencies, financing and developing chest and council programs, and the interpretation of social work.

531 *Community Organization for Social Welfare.* (3) II
A continuation of SW 530 with special emphasis on the organization and function of social welfare agencies at the national and international level. Prereq: SW 530 or permission of instructor. *Wetzel.*

540 *Principles of Social Group Work.* (3) I, S
A critical study of the theories and practices of social group work with reference to the work of public and private agencies in this field.

541 *Administration and Supervision of Group Work Agency Programs.* (3) II
The group work process as applied to agency administration, supervision of staff and volunteers, statistical and process recording, evaluation of program, personnel and committee relationships. Prereq: SW 540 or permission of instructor.

551 *Public Assistance Programs.* (3) II

The current function of public assistance upon the federal, state and local levels with emphasis on the public assistance provisions of the Social Security Act, general relief, and work relief policies.

617 *Generic Social Case Work.* (2) II

An introductory course for graduate students with emphasis upon the application of case work principles in problems of increasing complexity. Prereq: SW 513, or special permission.

625 *Social Insurance.* (2) II

A study of social insurance in Europe and the United States. Emphasis will be given to the problems in administration, financing, and coverage.

SOCIOLOGY

Graduates from accredited colleges who meet the requirements of the Graduate Program in Sociology and the Graduate School may work toward the following advanced degrees with major work in sociology; Master of Arts, Master of Science in Agriculture, and Doctor of Philosophy. Students not planning to work for the doctorate and those on the accelerated doctoral program may qualify for the M.A. under Plan B. Only one modern foreign language is required for the Ph.D. degree in Sociology.

A special examination is given to all incoming graduate students near the end of their first year of study at the University of Kentucky. Beginning students who perform at a high level on this examination are invited to by-pass the master's thesis and proceed directly to doctoral work. When they successfully pass the doctoral examination and meet certain other requirements they are awarded a Master of Arts degere. This can substantially accelerate their degree program.

To aid in financing graduate education, a considerable number of assistantships, fellowships and other stipends are available to qualified students.

Sociologists at the University of Kentucky carry on a substantial variety of research projects, consultative activities, extension education programs and community services. Through affiliations with nearby institutions, specialized experience and training is available to graduate students. The Clinical Research Center and National Institute of Mental Health located near Lexington offer research assistantships for work on problems of addiction.

Research opportunities within the prisons and other correctional institutions of the state may be arranged. Experience in the rural sociological research of the Agricultural Experiment Station and applied sociology experience in the Cooperative Extension Service is available.

The Department participates in the University's Center for Developmental Change, which is devoted to interdisciplinary research and training in planned change. The Department of Behavioral Science, College of Medicine, includes sociologists on its staff and conducts research and other activities of a sociological nature. Sociology graduate students with appropriate interests and training are eligible for assistantships and other appointments in these fields.

Department standards for admission to graduate work in sociology are similar to those of the Graduate School, including satisfactory scores on the

verbal and quantitative tests of the Graduate Record Examination. Three letters of recommendation, a statement of educational and career goals, and a special departmental application are required. For additional information on departmental requirements and opportunities for financial assistance write to the Director of Graduate Study in Sociology.

501 *Population Analysis.* (3) I
Distribution and composition, fertility and mortality, migration, ecological relationships and growth of population. Prereq: SOC 151 or consent of instructor.

502 *Methods of Demographic Analysis.* (3) I
Application of statistical techniques employed in the analysis of census and vital statistics data, including methods of population standardization, life table construction, and preparation of population estimates. Prereq. or taken concurrently: SOC 501 and one of the following statistics courses: ECO 207, BSC 421 or AEC 530.

503 *Social Classes.* (3) I
A systematic treatment of the factors underlying social differentiation and stratification, with particular attention to class and caste; social mobility in American society. Prereq: SOC 151 or consent of instructor. *Wilkinson.*

509 *The Family.* (3) I, II, S
A study of the institutions of marriage and the family and an analysis of the various factors and forces at work in our time which are affecting the individual marital relationship. Prereq: SOC 151 or consent of instructor. *Gladden, Kenkel.*

510 *The Family.* (3) II, S
A study of the various social situations in which children grow to early adolescence with emphasis on the primary group relationships in home, neighborhood, play group, and school. Prereq: SOC 509 or permission of instructor. *Gladden, Mirande.*

518 *Social Change.* (3) I
A sociological analysis of the sources, processes and consequences of social change. Three class hours per week. Prereq: SOC 151. *Stephenson.*

519 *Sociology of Urban Life.* II (3)
This course is a study of the sociology of city life. The major emphasis is upon the ecological and social characteristics of urban life in contrast to rural community life. Prereq: SOC 151 or consent of instructor. *Sutton, Jordan.*

521 *Industrial Sociology.* (3)
A sociological analysis of the division of labor, the characteristics of occupational groupings; principal socio-economic movements, and group relationships in modern industry. Prereq: SOC 151 or consent of instructor. *Shepard.*

522 *Sociology of Complex Organizations.* (3)
An intensive study of intra- and interorganizational structures and processes. Special emphasis is given to emergence, maintenance, and change of bureaucratic and non-bureaucratic organizations and the impact of organizations on individuals. Three class hours per week. Prereq: Six hours of SOC or consent of instructor. *Barlow.*

523 *Social Determinants of Economic Behavior.* (3) II
A study of the sociology of consumption, the effect of social values upon business and employee behavior, and the socio-economic implications of welfare legislation. (Same as ECO 523.) *Staff.*

525 *Religion and Culture.* (3) I
An analysis of the structure, function, and process of religion, using the development of the Hebrew and Christian religions to show social origins of the two faiths and the effect of cultural change on their growth. Prereq: SOC 151 or consent of instructor. *Gladden.*

526 *Culture and Personality.* (3)
The cultural basis of personality. Personal character considered as the result of culturally fostered patterns. The ideal personality in several selected societies. (Same as ANT 526). *Essene.*

527 *Society and Health.* (3) II
The study of human behavior in illness and of medicine as a complex form of social organization in perspective of historical, cross-cultural and contemporary analysis. This course is designed primarily for students preparing for careers in an allied health science or profession. (Same as BSC 527). *Straus, Hall.*

529 *Political Sociology.* (3) I
A study of the sociological aspects of political systems, movements and ideologies. Special attention is given to comparative analysis of parties, pressure groups, voting patterns, elites, bureaucracy, political socialization, mass politics and the role of intellectuals. Prereq: 6 hours of sociology or consent of instructor. *Drysdale.*

531 *Sociological Analysis of American Society.* (3)
A study of the contemporary U.S.A. with emphasis upon the changing relations among various aspects of American society and culture. Prereq: SOC 151 or consent of instructor. *Brown.*

532 *Intergroup Relations.* (3) I, S
Analysis of relationships between groups which differ in religious, ethnic, or socio-cultural backgrounds; the development of educational and social techniques for reduction of tensions. (Same as EDU 532.) May be repeated to a maximum of six credits. *Coleman.*

533 *Social Anthropology.* (3) II
History and theory of social anthropology with special emphasis on the comparative approach to analysis of structure, function, and change in social and cultural systems. Prereq: Consent of instructor. (Same as ANT 533.) *Pearsall.*

536 *Sociology of Deviant Behavior.* (3) I
A systematic examination of the various types of social disorganization, with particular emphasis upon the sociological explanation of underlying factors. Prereq: SOC 151 or consent of instructor. *Voss, Burkett.*

537 *Criminology.* (3) I, II
A study of general conditions as to crime and delinquency, of measures of punishment and reform of offenders, of criminal procedure and its possible reform, and of measures for the prevention of crime. Prereq: SOC 151 or consent of instructor. *Voss, Barlow.*

538 *Juvenile Delinquency.* (3) I, II
Study of the extent, ecological distribution, and etiology of delinquency in contemporary American society, including a critical examination of trends and methods of treatment. Prereq: SOC 151 or consent of instructor. *Burkett.*

539 *Sociology of Corrections.* (3) II
A study of correctional practices, including the issues of punishment versus treatment of offenders, probation and parole as methods of treatment, the social structure of the institution and its impact on the offenders, and specific programs and experiments in institutional and community treatment. Prereq: SOC 151. Rec: SOC 537 or 538.

542 *Human Relations in Administration.* (3)
Analysis of the role of social structure, leadership, authority, power, and psychological stress in the administration of large-scale organization in the United States. *Youmans.*

544 *Social Psychology.* (3)
Theoretical and empirical analysis of individual behavior in the social setting with particular emphasis on social learning, motivation, and the measurement, formation, and changing of social attitudes. (Same as PSY 544.) Prereq: PSY 104 or 210. *Lott.*

546 *Social Factors in Mental Health.* (3) I

The significance of social and cultural factors in the recognition, course, and management of mental health problems; social organization of the mental hospital and cultural alternatives to hospitalization. Prereq: prior course work in sociology, anthropology, or psychology and permission of instructor. (Same as BSC 546.) *Gallagher.*

547 *The Sociology of Aging.* (3)

Analysis of demographic and institutional patterns, social roles, psychological and physiological changes, and rehabilitative and educational programs associated with aging. Prereq: SOC 151 or consent of instructor. *Youmans.*

548 *The Sociology of Public Opinion.* (3) II

Introduction to the study of public opinion, its role in the society and its functions for the individual. Propaganda and other mass persuasion techniques are examined as these relate to the formation, alternation or maintenance of public opinion. Prereq: SOC 151 or consent of instructor.

549 *Sociological Aspects of Mass Communication.* (3) I

The relationship between the organization of modern society and its communication media: Special emphasis is given to the way in which cultural processes and social change have an impact upon the mass media, and upon the way in which the mass media influence cultural processes and social change. The social-psychological bases of communication are studied within a context of theory and research. (Same as EDU 549.) Prereq: SOC 151 or consent of instructor. *Wilkinson.*

551 *Principles of Sociology.* (3) I, II, S

A survey of the basic elements of culture, collective behavior, communities, social institutions, and social change. Basic concepts required for the analysis of sociological data are systematically considered. Prereq: SOC 151 or consent of instructor. *Stephenson, Jordan.*

561 *Comparative Sociology.* (3) I

Two or more societies are analyzed and compared sociologically. The specific societies considered may vary from time to time; for example, Soviet and American society; the middle Eastern countries; Latin America societies, etc. Prereq: SOC 151 or consent of instructor. *Staff.*

571 *Contemporary Sociology.* (3) I

A survey of the current state and organization of sociology as indicated by consideration of the main fields of sociology and developments in each. Most of the staff participate as special lecturers in their specialty. Prereq: Major or minor in Sociology and nine hours in Sociology. *Coleman.*

581 *Techniques of Social Investigation.* (3) I, II

A study of the practical applications of sociology in organizing, conducting, and interpreting social surveys and other forms of sociological research. Prereq: SOC 151 and an introductory course in Statistics.

615 *Rural Urban Relations.* (3)

Interdependence of city and country; solidary and antagonistic relationship of city and country; the process of urbanization, and problems of rural adjustment to urban influences. *Brown.*

625 *Sociology of Religion.* (3)

Critical study of reciprocal relation of religion and culture, the function of religion in society, social sources of religious concepts, religious differentiation and institutionalization, the problem of church and state. *Gladden.*

632 *Minority Groups.* (3)

A sociological scheme of analysis is applied to the special problems of adjustment arising from ethnic group relations and culture contacts. *Coleman.*

651 *Systematic Sociology.* (3) I

An intensive study of certain selected sociological theorists such as Weber, Durkheim, Simmel, Pareto, and others.

661 *Educational Sociology.* (3) II, S
A course in the sociological foundations of education. (Same as Education 661.) *Staff.*

670 *Seminar on Role Theory.* (3) I
An exploration of differences and similarities in the utilization of the concept of role in Sociology, Anthropology and Psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Three class hours per week. Prereq: Consent of instructor. (Same as BSC 670.)

671 *Seminar in Contemporary Sociology.* (0) I
Each member of the Department of Sociology presents a summary of his past and present research and his current interests. The purpose is to acquaint the student with the wide range of interests, projects and personnel in his graduate department. *Staff.*

681 *Research Design and Analysis.* (3) I
Problem definition and delimitation, design appropriate to problem and data, and selection of appropriate analysis techniques; critical examination of representative research studies and students' designs. Prereq: Elementary Statistics and SOC 581 or equivalent. *Ford.*

685 *Integration of Theory and Research.* (3) I
Systematic analysis of problems related to the verification of sociological theory through empirical research. Prereq: SOC 681. *Staff.*

690 *Community Action Analysis.* (3) II
The structure and dynamics of complex, collective actions are analyzed in terms of their social and cultural characteristics and their temporal patterns. Lecture, three hours per week. *Sutton.*

702 *Seminar in Social Demography.* (3) II
A seminar designed to explore the relations between sociology and demography. Emphasis is given to the influence of social factors on demographic behavior and to the utilization of population data and demographic techniques in the investigation of sociological problems. Prereq: SOC 501 or equivalent. *Ford.*

720 *Seminar in Community Theories.* (3) I
An intensive examination of selected theories and writings relevant to an understanding of territorial communities. Includes a study of the writings of Durkheim, Park, Redfield, Warner, and others.

727 *Seminar on Socio-Cultural Change.* (3)
A seminar for advanced students. Emphasizes economic, religious, political, technological, psychological, etc., factors in change, and social and cultural patterns and processes of change. Prereq: ANT 527 or SOC 518, or permission of instructor. (Sam as ANT 727.) *Staff.*

731 *Seminar in Comparative Social Organization.* (2) II
A seminar for advanced students. Emphasizes principles in the comparative study of social systems; the role of kinship, age, sex, locality, and voluntary associations in determining relationships between individuals and between groups in non-literate and literate societies. (Same as ANT 731.) May be repeated once. *Staff.*

750 *Problems in Educational Sociology.* (3) S
An advanced course in the application of sociological findings to education, including consideration of Southern regional problems and potentialities. Prereq: 12 semester hours of graduate work including EDU 661 or equivalent. (Same as EDU 750.) *Staff.*

766 *Concepts in Medical Sociology.* (3) I
A systematic review of sociological concepts and methods which have been applied to the study of health and medicine; the contributions of medical sociology to general sociological theory; the roles of sociology in education for the health professions and in research on health related problems of society. Two class hours and four laboratory hours per week. Prereq: Predoctoral status in one of the Social or Behavioral Sciences with a concentration or minor in Medical Behavioral Science. (Same as BSC 766).

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 18 wks. residence)
May be repeated indefinitely. *Staff.*

770 *Seminar in Sociological Theory.* (3) II
An intensive survey of contemporary general theorists from Comte to the present. The principal sociological concepts of each are considered and their role in the development of contemporary sociology is assessed. *Drysdale.*

772 *Topical Seminar in Sociology.* (3) I, II, S
Advanced study of topics of current importance in sociology, such as structural strain and social change, game theory, decision processes, communication and power structures. Prereq: at least nine hours in the social sciences, preferably in sociology. May be repeated to a maximum of six credits. *Staff.*

775 *Seminar in the Family.* (2)
A seminar for advanced students interested in family research, family counseling, or dealing with family relations in some other professional capacity. *Gladden, Kenkel.*

779 *Seminar in Social Psychology.* (3) II
Each semester some topic in the field of social psychology, such as attitudes and beliefs, structure and function of social groups, social determinants of behavior, leadership, and morale will be studied intensively. (Same as PSY 779.) May be repeated to a maximum of six credits. *Staff.*

780 *Special Problems in Sociology.* (1-6) I, II, S
May be repeated to a maximum of ten credits. *Staff.*

792 *Research in Sociology.* (1-6) I, II, S
Individual research and reading in particular fields of sociology, under staff supervision. Open to advanced students who are prepared for intensive study beyond that offered in regular classes in each field. May be repeated to a maximum of ten credits. *Staff.*

For sociology courses of particular interest to students in agriculture, see agriculture.

DEPARTMENT OF SPANISH AND ITALIAN LANGUAGES AND LITERATURES

The Department of Spanish and Italian Languages and Literatures, as a prerequisite to candidacy for the master's degree, requires attainment in Spanish equivalent to that required for the undergraduate major in the field. The number of courses required for the M.A. degree varies, depending in part upon the advanced courses which the student may be asked or permitted to take in related departments. Usually, a minimum of 24 semester hours of Spanish and allied subjects may be offered, including always Spanish 501 or 601 and usually Spanish 553, unless proficiency in this last area—the teaching of foreign languages—can be otherwise demonstrated. All candidates for the M.A. will be required to demonstrate a reading knowledge of another foreign language before receiving the degree.

The Department offers the master's degree in Spanish according to both Plans A and B. At present there is no graduate program in Italian.

Applicants for the doctor's degree are required to complete at least two years of residence work beyond the M.A. The applicant's program should include always Spanish 621, 601-602, and usually 553, unless proficiency in this last area —the teaching of Spanish—can be otherwise demonstrated. A knowledge of two other foreign languages, one of which should generally be French, is required of all candidates. The second language will be chosen with the approval of the guidance committee in the light of the candidate's field of specialization. (See elsewhere in this bulletin.)

For information concerning the qualifying examinations, the final examination and the dissertation, see the discussion of these elsewhere in this bulletin, or consult the Department.

ITALIAN

543 *Survey of Italian Literature I.* (3)
A survey of Italian literature from its beginning to the 17th century. Three class hours per week. Prereq: SPI 292 or SPI 009.

544 *Survey of Italian Literature II.* (3)
A survey of Italian literature from the 17th century to the present. Three class hours per week. Prereq: SPI 292 or SPI 009.

561 *Old Italian.* (3)
An intensive study of the Old Italian language and its derivation, with mention of the development of the more important dialects along with the modern language. Examinations and study of medieval texts. Three class hours per week. Prereq: Adequate reading knowledge of modern Italian.

563 *Dante I.* (3)
Dante. The *Vita Nuova* and the *Divina Commedia, Inferno.* Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

564 *Dante II* (3)
Dante. The *Divina Commedia*: *Purgatrio and Paradiso.* Three class hours per week. Prereq: SPI 563.

565 *Petrarch and Boccaccio.* (3)
Study of the Iealian works of Petrarch and Boccaccio. Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

566 *Literature of the Italian Renaissance.* (3)
A study of the major literary trends and figures of the Italian Renaissance, from the literary and humanistic successors of Petrarch and Boccaccio to the writers of the Cinquecento. Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

571 *Modern Italian Novel.* (3)
A study of the origins and development of the modern Italian novel, with emphasis on major nineteenth-century trends as represented by the works of Foscolo, Manzoni, Verga, Fogazzaro and D'Annunzio, and on Pirandello and selected contemporary novelists. Three class hours per week. Prereq: SPI 292 or the consent of the instructor.

572 *Modern Italian Drama.* (3)
A study of the origins and development of modern Italian drama, from Goldoni and Alfieri in the eighteenth century, through Verga and D'Annunzio to Pirandello, Betti, Sem Benelli and other contemporary dramatists. Three class hours per week. Prereq: SPI 292 or consent of instructor.

573 *Modern Italian Poetry.* (3)
A study of the development of modern Italian poetry, with emphasis on major figures and trends, and close reading of texts. Three class hours per week. Prereq: SPI 292 or consent of instructor.

591 *Dante in Translation.* (3)
A study of the works of Dante from the literary viewpoint. Emphasis given to his sources, his enormous impact upon subsequent Italian and European literatures. The Divine Comedy would be the focal point of the course, but the poet's lesser works would also be studied. Three class hours per week. Not open to graduate students in Italian.

592 *Italian Renaissance Masterpieces in Translation.* (3)
A study of the great authors of the Italian Renaissance and their works in English translation: Petrarch, Boccaccio, Poggio, Piccolomini, Bruni, Pontano and others. Three class hours per week. Not open to graduate students in Italian.

593 *Modern Italian Literature in Translation.* (3)
A study of the major trends and figures of nineteenth and twentieth-century Italian literature. Three class hours per week.

SPANISH

501 *Survey of the Spanish Language.* (3) I, II, S
The development of the Spanish language from its Vulgar Latin stages to the modern period. Special emphasis on the Spanish of the 12th through the 14th centuries. Representative texts studied. Three class hours per week. Prereq: Senior standing in Spanish or above. *Sturm.*

502 *Spanish Phonetics and Pronunciation.* (3) I, II, S
An introduction to the phonetic peculiarities of Spanish as it is spoken in the major cultural areas of the Hispanic world. Three class hours per week. Prereq: SPI 202 or equivalent. *Staff.*

503 *Masterpieces of Medieval Spanish Literature.* (3) I, II, S
A close reading and analysis of representative masterpieces from the Old Spanish Period, including the *Poema* of the Cid, the works of Gonzalo de Berceo, the *Libro de Buen Amor* and the *Conde Lucanor*. Three class hours per week. Prereq: SPI 501. *Sturm.*

504 *Spanish Literature of the Seventeenth Century: Drama.* (3) I, II, S
A careful study of the important works of the great Spanish dramatists—Lope de Vega, Tirso, Calderon, Tirsode Molina and their contemporaries. Three class hours per week. Prereq: SPI 215, 216. *McCrary.*

505 *Spanish Literature of the Seventeenth Century: Non-Dramatic.* (3) I, II, S
Representative masterpieces of the novel, poetry and theoretical writings of the 16th and 17th centuries. Three class hours per week. Prereq: SPI 215, 216. *J. Jones.*

506 *Masterpieces of Modern Spanish Poetry.* (3) I, II, S
A study of the most significant movements from the 18th century to the present. Three class hours per week. Prereq: 215, 216. *Reedy.*

507 *Masterpieces of Modern Spanish Drama.* (3) I, II, S
A study of the most important plays of the Neoclassic, Romantic and Modern Theater. Three class hours per week. Prereq: 215, 216. *M. Jones.*

508 *Masterpieces of the Modern Novel.* (3) I, II, S
Representative novelists from the 18th century to the contemporary period, with special emphasis on the realistic novel through the post-civil war generation. Three class hours per week. Prereq: SPI 215, 216. *M. Jones.*

509 *Spanish American Prose Fiction.* (3) I, II, S
A study of the novel in Spanish America, with emphasis on the principal authors and works from Lizardi to the present. Three class hours per week. Prereq: SPI 215, 216. *Reedy, Saenz.*

510 *Spanish American Essay.* (3) I, II, S
A comprehensive study of the principal currents of thought in the Spanish American essay with special attention to the *Americanistas*. Three class hours per week. Prereq: SPI 215, 216. *Saenz.*

511 *Spanish American Drama.* (3) I, II, S
A study of dramatic production from the missionary theater to the present, accentuating the work of later authors beginning with Florencio Sanchez. Three class hours per week. Prereq: SPI 215, 216. *Reedy, Saenz.*

512 *Spanish American Poetry.* (3) I, II, S
A study of Spanish American poets, stressing the outstanding poets since Sor Juana. Three class hours per week. Prereq: SPI 215, 216. *Reedy, Saenz.*

513, 514 *Advanced Spanish Grammar and Composition.* (3 ea.) I, II, S
A study of the finer points of Spanish grammar. Three class hours per week. Prereq: SPI 315, 316. *Staff.*

545 *Spanish Literature of the XX Century.* (3)
A study of the works of the Generation of 1898 and representative works of recent writers. Three class hours per week. Prereq: SPI 215, 216, 315, 316.

551 *Tutorial Seminar for Majors in Spanish.* (1) I, II, S
A survey of Spanish literature. Required of all Majors in Spanish during the senior year. May be repeated once for a total of 2 credits. *Staff.*

553 *The Teaching of Modern Foreign Languages.* (3) S
A course for teachers and prospective teachers.

601 *Old Spanish: Phonology and Paleography.* (3) I, S
Intensive study of phonology of Spanish with emphasis on the various linguistic backgrounds that developed it. Examination and study of medieval texts with exercises in paleographical transcription of medieval manuscripts. Three class hours per week. *Keller.*

602 *Old Spanish: Morphology and Syntax.* (3) II, S
An intensive study of the morphology and syntax of Spanish, with emphasis on the Latin and Vulgar Latin grammatical systems. Further examination of medieval texts with exercises in paleographical transcription of medieval manuscripts. Three class hours per week. Prereq: SPI 601. *Keller.*

603 *Spanish Medieval Literature I.* (3)
A survey of Medieval Spanish Literature from the beginning to the end of the thirteenth centuries. Three class hours per week. *Keller.*

604 *Spanish Medieval Literature II.* (3)
A survey of Medieval Spanish Literature of the fourteenth and fifteenth centuries. Three class hours per week. *Keller.*

605 *The Spanish and Spanish American Ballad.* (3) I, II, S
Rise and development of the ballad in Spain and Spanish America to the present. Folkloristic and literary phases studied. Three class hours per week. Prereq: SPI 501 or 601 or equivalent. *Keller.*

606 *The Spanish Novel to Cervantes.* (3) I, II, S
A study of the various developments of the novel—picaresque, pastoral, chivalric, Moorish, etc. Three class hours per week. Prereq: SPI 501 or 601. *J. Jones.*

607 *Cervantes.* (3) I, II, S

The works of Cervantes, with emphasis on *Don Quixote,* but including the other works. Three class hours per week. Prereq: SPI 501 or 601. *J. Jones.*

608 *The Spanish Novel from Cervantes to Romanticism.* (3) I, II, S

A study of the major novels of the late 17th, 18th and early 19th centuries. Three class hours per week. *J. Jones.*

609 *Mystic and Ascetic Writers of the Sixteenth and Seventeenth Centuries.* (3) I, II

The works and philosophies of the great Spanish mystics—St. John of the Cross, St. Teresa, Juan de Avila, Fray Luis de Leon, etc. Three class hours per week. *McCrary.*

610 *Romance Philology.* (3)

A study of the historical development of the various Romance Languages with reading of texts chiefly from the medieval period. Special attention to historical phonology and morphology. May be repeated once. Prereq: FR 603 or SPI 641 or equivalent.

611 *Lope de Vega.* (3) I, II, S

The major dramatic and non-dramatic works of Lope de Vega. Three class hours per week. *McCrary.*

612 *The Theatre of Tirso de Molina.* (3) I, II, S

The major dramatic works of Tirso. Three class hours per week. *McCrary.*

613 *The Theatre of Calderon de la Barca.* (3) I, II, S

The major dramatic works of Calderon. Three class hours per week. *McCrary.*

614 *Minor Dramatists of the Golden Age.* (3) I, II, S

The dramatic works of such playwrights as Guillen de Castro, Alarcon, Mira de Amescua and other contemporaries of Lope de Vega and Calderon. Three class hours per week. *McCrary.*

615 *Spanish Drama from the Neoclassic Period to the Generation of 1898.* (3) I, II, S

Representative dramatic trends of the 18th and 19th centuries. Three class hours per week. *M. Jones.*

616 *Spanish Drama from the Generation of 1898 to the Present.* (3) I, II, S

Representative works of the major dramatists and dramatic trends from Benavente and his contemporaries through Garcia Lorca, Casona and Buero Vallejo. Three class hours per week. *M. Jones.*

617 *Prose Fiction from the Romantic Period to the Generation of 1898.* (3) I, II, S

A study of the major schools of fiction from the Romantic Period through the Generation of 1898. Three class hours per week. *M. Jones.*

618 *Prose Fiction from the Generation of 1898 to the Present.* (3) I, II, S

Studies in the most important novels and short stories of the late part of the modern period, produced from 1930 to the present. Three class hours per week. *M. Jones.*

619 *The Spanish Essay from the Eighteenth Century to the Present.* (3) I, II

Studies in the major essayists from Feijoo through Madariaga. Three class hours per week. *McCrary.*

620 *Spanish Poetry from the Eighteenth Century to the Present.* (3) I, II, S

A study of the major poetic schools from the 18th century through the Civil War. Three class hours per week. *Reedy.*

621 *Bibliography and Methods of Research.* (3) I, II, S

Investigation of Spanish bibliography and modern methods of research designed to provide guidance to the graduate student leading to an understanding of research methods and publication. Taught by various members of the staff, with each member dealing with his own specialty. Three class hours per week.

622 *Spanish Poetry of the 16th and 17 Centuries.* (3)

An examination of the several schools and forms of poetry, both lyric and narrative, in this period. Three class hours per week.

624 *Spanish American Novel: Mexico, Central America, the Caribbean.* (3) I, II, S

The works of the principal novelists of Mexico, Central America and Caribbean region with special emphasis on the novelist of the Mexican Revolution. Three class hours per week. *Saenz, Reedy.*

625 *Spanish American Novel: South America.* (3) I, II, S

Representative works of the principal novelists of South America, with special emphasis on Peru, Argentina, Chile, Colombia and Venezuela. Three class hours per week. *Reedy, Saenz.*

626 *Spanish American Poetry: Colonial Period to 1888.* (3)

Representative works of the principal poets from the Colonial Period through the Romantic Movement with emphasis on Sor Juana Ines de la Cruz and the Romantics. Three class hours per week. *Reedy, Saenz.*

627 *Spanish American Poetry: Modernism to the Present.* (3)

Representative works of the principal poets of the Modernist Period to the present. Three class hours per week. *Reedy, Saenz.*

630 *Early Brief Narrative—13th, 14th, 15th Century.* (Alternate years) (3)

The rise and development of the brief narrative in prose and rise of the oriental apologue, hagiographical tales and Greco-Roman fables. Prereq: SPI 601-602 or permission of instructor. Three class hours per week.

631 *Spanish Epic.* (Alternate years) (3)

Study of the Poem of the Cid and the important cycles of Spanish epicry with their sources, parallels in history and influences upon other genres. Prereq: SPI 601-602 or by permission of instructor. Three class hours per week.

632 *Spanish Poetry of the 13th, 14th, and 15th Centuries.* (Alternate years) (3)

Development of lyric poetry from the earliest beginnings to the 15th century. The *harchas,* Galician-Portuguese, lyric, sacred lyric and the poets of the *concioneros,* exclusive of the ballad. Prereq: SPI 601-602 or permission of instructor. Three class hours per week.

640 *Literary Currents in Contemporary Spanish American Fiction.* (Every other year) (3)

An examination of the outstanding works of Spanish American authors during the past ten years, with emphasis on literary innovations and new currents in the novel, short story, poetry and drama. Prereq: Graduate standing. Fluency in Spanish. Three class hours per week.

701 *Seminar in Historical Linguistics.* (3) I, II
Intensive study of a single problem in the medieval Spanish language, according to the needs of the students enrolled. Three class hours per week. Prereq: SPI 601. *Keller.*

702 *Seminar in Medieval Spanish Literature.* (3) I, II
Special and intensive study of a single problem in medieval Spanish literature, according to the needs of the students enrolled. Three class hours per week. Prereq: SPI 601. *Keller.*

703 *Seminar in Golden Age Non-Dramatic Literature.* (3) I, II
Special and intensive study of the work or works of a single Golden Age writer or of a movement in the olden Age's non-dramatic literature. Three class hours per week. Prereq: Two Spanish courses in 606 to 610 bracket (any two prerequisites). *McCrary, J. Jones.*

704 *Seminar in Golden Age Theater.* (3) I, II
Special and intensive study of the dramatic works of the Golden Age, depending upon the needs of the students enrolled. Particular works and movements investigated. Prereq: SPI 611-614 (any two courses). Three class hours per week. *McCrary.*

705 *Seminar in Modern Spanish Literature.* (3) I, II, S
Seminar in the recentt Premio Nadal novels and other post Civil War novelists. Three class hours per week. *Jones, Reedy, Saenz.*

706 *Seminar in Spanish American Literature.* (3) I, II, S
Special and intensive study of particular areas of Spanish American Literature. Three class hours per week. *Reedy, Saenz.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

772 *Seminar in Spanish Literature.* (3) I, II, S
May be repeated to a maximum of six credits. Prereq: 21 semester hours of College Spanish. *Staff.*

778 *Seminar—Main Currents of Romance and German Literature.* (3)
Studies of the principal works of the French, German and Spanish literature. Lecture, student reports. Required of all candidates for M.A. degree under Plan B.

782 *Special Studies in Spanish.* (3) I, II, S
Selected studies and investigations in the Spanish Language and Literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. May be repeated to a maximum of six credits. *Staff.*

STATISTICS

The University of Kentucky established a Department of Statistics on July 1, 1967, and has approved graduate programs in Statistics leading to degrees of Master of Science, Master of Science in Statistics, and Doctor of Philosophy. Minor and co-major programs will be developed for associated areas. An inter-departmental program in Operations Research is now under consideration.

In general, statistics applicants will be expected to have a minimum of one year of calculus and at least a B average in previous mathematics and statistics courses. Students with an undergraduate major in an applied field, as well as majors in Statistics or Mathematics, are urged to apply. Since at least one semester each of Advanced Calculus and Matrix Algebra are required for the basic statistical inference courses, prospective graduate students who have not taken these courses as undergraduates are urged to take them in the summer prior to entrance in the graduate program.

MASTER'S PROGRAMS

Master of Science with a Major in Statistics

1. Plan A as presented in the graduate Catalogue with at least 24 hours of course work, at least 12 hours being at the 600 or 700 level. A thesis and reading knowledge of one foreign language is required.
2. Plan B with at least 30 hours of course work, at least 15 hours being at the 600 or 700 level. No thesis is required, but a reading knowledge of one foreign language is required.

Master of Science in Statistics

Same as (2) above, but a reading knowledge of a foreign language is not required.

Each Master's student in Statistics will be expected to take at least two courses in other fields. Departmental assembled written examinations in basic statistical theory and analysis will be required of all Master's candidates.

DOCTORAL PROGRAMS

Major in Experimental Statistics

Requires statistical theory through STA 702; at least three courses in advanced statistical analysis.

Major in Mathematical Statistics

Requires at least two courses in advanced statistical theory beyond STA 702; at least one course in advanced statistical analysis.

Departmental qualifying examinations will consist of topics in advanced statistical theory and analysis in addition to the basic examination for Master's students.

A reading knowledge of one modern foreign language is required of candidates for the Ph.D. degree in Statistics.

STATISTICS COURSES

Courses numbered 400-499 do not carry graduate credit for students majoring in Statistics.

470 *Basic Statistical Methods.* (4)
Descriptive statistics; elementary probability; distributions; estimation and hypothesis testing; regression and correlation; analysis of variance. Three class hours, two lab hours per week. *(Approved for one year only.)*

481 *Basic Statistical Inference in the Engineering and Physical Sciences.* (3) I, II

Probability; population and sample distributions; sampling; methods of estimation; hypothesis testing; curvilinear analysis; analysis of variance. Three class hours per week. Prereq: MA 212.

521 *Introduction to Mathematical Statistics I.* (3) I

Discrete and continuous probability distributions, sampling theory, and point estimation. Prereq: MA 212 or 215.

522 *Introduction to Mathematical Statistics II.* (3) II

Theory of least squares; multiple regression; analysis of variance and covariance; experimental design models; factorial experiments; variance component models. Three class hours, one lab hour per week. Prereq: STA 521.

523 *Introductory Probability.* (3) I, II

Set theory; fundamental concepts of probability, including conditional and marginal probability; random variables and probability distributions (discrete and continuous); expected values and moments; moment generating and characteristic functions; random experiments; distributions of random variables and functions of random variables; limit theorems. Three class hours per week. (Same as MA 523.) Prereq: MA 212.

601 *Theory of Statistical Inference.* (5) I

Combinatorial analysis; concept of probability; conditional probability; random variables; density and distribution functions; mathematical expectation; moment generating functions; functions of random variables; limiting distributions and central limit theorem; point and interval estimation; hypothesis testing; multivariate normal distribution. Four class hours, two lab hours per week. Prereq: MA 470.

602 *Theory of the General Linear Model.* (3) II

Distribution of quadratic forms; linear estimable functions and their best estimates; principle of conditional error; testing linear hypotheses; multiple and polynomial regression; regression estimation using prior information; estimation of error variance; complete and incomplete block designs; factorial experiments; covariance; variance components; mixed models. Three class hours per week. Prereq: STA 601 and MA 462.

611 *Statistical Analysis I.* (4) I

Procedures for collecting and summarizing population data; index numbers; measures of central tendency and dispersion; random sampling; empirical frequency distributions; point and interval estimators; control charts; hypothesis testing; goodness-of-fit; contingency tables; equality of means and variances; simple analysis of variance; multiple comparisons; simple regression and correlation. Three class hours, two lab hours per week. Prereq: STA 521 or 601.

612 *Statistical Analysis II.* (3) II

Introduction to non-parametric and distribution-free methods; sequential analysis; decision theory and Bayesian inference. Three class hours per week. Prereq: STA 601 and 611.

614 *Design and Analysis of Experiments.* (4) II

Multiple regression; curvilinear regression; experimental designs; randomized blocks and n-way classifications; Latin squares; hierarchial classifications; incomplete blocks and cross-overs; factorial and fractional factorial experiments; variance component estimation. Three class hours, two lab hours per week. Prereq: STA 611; coreq: STA 602 or STA 522.

616 *Design and Analyses of Sample Surveys.* (2) II

Sampling from finite populations; estimation of sample size; stratification; ratio and regression estimators; systematic sampling; cluster sampling; multi-stage sampling (selection of sampling units with probability proportional to size); double sampling; response errors. Two class hours per week. Prereq: STA 611.

624 *Discrete Stochastic Processes.* (3) II

Random walk; recurrent events, branching processes; Markov chains and Markov processes; Poisson processes; birth and death processes; queueing theory; renewal theory. Three class hours per week. Prereq: STA 523 or 601.

641 *Design and Analysis for Variance Component Models.* (3) I

Expected values; variances and covariances; balanced and non-balanced designs; comparison of estimators; reduction of product variability; compositing; sequential designs; Bayesian estimation; confidence limits; negative estimates; finite populations. Three class hours per week. Prereq: STA 602, 611.

642 *Response Surface Techniques.* (3) II

Analysis in vicinity of stationary point; canonical analysis; steepest ascent for locating optima; first order designs for fitting response surfaces; orthogonal designs; second order designs; rotatability; central composite designs; conditions for orthogonal blocking; designs to minimize bias and mean square error; designs for sets of constrained variables. Three class hours per week. Prereq: STA 614.

643 *Advanced Experimental Design.* (3) I

Advanced topics in analyses of incomplete block designs; confounding and change-over designs; data collected at several places and times; principles of design construction. Three class hours per week. Prereq: STA 614.

652 *Advanced Mathematical Programming.* (3) II

A course for those desiring to study linear and non-linear programming from an advanced mathematical point of view. Theory of graphs; discrete linear programming; stochastic, non-linear and dynamic programming. Three class hours per week. Prereq: A course in linear programming.

661 *Multivariate Analysis I.* (3) I

Characterization and properties of the multivariate normal distribution, random samples from this distribution; multivariate analysis of variance, related distribution theory; factor analysis. Three class hours per week. Prereq: STA 602.

670 *Basic Experimental Statistics.* (4)

Introduction to methods of analyzing data from experiments and surveys; the role of Statistics in research; statistical concepts and models; probability and distribution functions; estimation; hypothesis testing; regression and correlation; analysis of classification models; factorial experiments; analysis of categorical data. Three class hours, two lab hours per week.

674 *Experimental Statistics in Biological Research.* (3)

Multiple comparisons; individual degress of freedom; multiple regression; covariance; methods of constructing designs for experimental investigations; concepts of blocking, randomization and replication; experimental unit technique; complete and incomplete block designs; response surface methodology. Three class hours per week. Prereq: STA 670.

676 *Experimental Statistics in Behavioral and Social Research.* (3)

Multiple regression; covariance; non-parametric methods; model construction; methods of constructing designs for survey investigation; simple random, stratified and multistage sampling designs; methods of estimation; questionnaire construction. Three class hours per week. Prereq: STA 670.

681 *Experimental Statistics in Engineering Research.* (3)

Random variables, distribution functions, introduction to stochastic processes and queues, estimation of functional relationship, hypothesis testing. Three class hours, one lab hour per week. Prereq: MA 431 or equivalent.

691 *Special Topics in the Planning and Analysis of Experiments.* (3) I, II

Place of statistics in experimentation; topics in experimental design; response surfaces; departures from usual assumptions in analysis of variance; other selected topics. Three class hours per week. Prereq: STA 522 or STA 602.

695 *Special Topics in Statistical Theory.* (3)

To be selected by staff. Three class hours per week. Prereq: STA 602.

701 *Advanced Probability and Statistical Inference.* (3) I

Measure and integration; random variables and expectations; conditional probability; conditional expectations; characteristic functions; probability inequalities; weak and strong laws of large numbers; central limit laws. Three class hours per week. Prereq: STA 601.

702 *Advanced Theory of Estimation and Hypothesis Testing.* (3) II

Advanced distribution theory; method of maximum likelihood; likelihood ratio tests; sufficient statistics; completeness; similar region tests; invariance. Three class hours per week. Prereq: STA 701.

721 *Non-Parametric Inference.* (3) I

Estimation and testing when the functional form of the population distribution is unknown; rank and sign tests; tests based on permutations of observations; power of non-parametric tests; optimum non-parametric tests and estimators. Three class hours per week. Prereq: STA 612.

762 *Multivariate Analysis II.* (3) II

A more rigorous study of distribution theory than in STA 661; random and mixed effects models; multivariate non-normal analysis. Assorted other topics. Three class hours per week. Prereq: STA 661.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

THEATRE ARTS

The Department of Theatre Arts requires for the Master's Degree a minimum of 30 semester hours of Theatre Arts and English dramatic literature courses including English 600 *Bibliographical Studies*. A maximum of 6 of these 30 semester hours may be taken in other allied subjects provided these courses have the approval of the Chairman of the Department of Theatre Arts. All candidates for the Master's Degree in Theatre Arts will be required to attain a reading knowledge of one modern foreign language (ordinarily French or German) before receiving the degree.

It is assumed that a student who seeks a Master's Degree in the Department of Theatre Arts will have had courses approximating those required for an A.B. degree with a major in Theatre Arts. If not, he must remove the deficiency by taking (without graduate credit) courses in addition to those normally specified for the Master's Degree.

The Department offers the Master's Degree according to Plan B only at the present time (see page 21).

590 *History of the Theatre I.* (3)

A study of the theatre from primitive times through the Elizabethan period. Theatre and stage architecture, scene design, costuming and acting styles are discussed and their relation to dramatic literature analyzed. *Dickens.*

591 *History of the Theatre II.* (3)

A continuation of TA 590, a study of the theatre from the Jacobean period to the present. *Dickens.*

592 *Scene Design I.* (3)
Study of theory, principles and techniques of scene and lighting design for the contemporary theatre. Comprehensive analysis of a play and the development of a design through the media of floor plans, lighting plot, and perspective line drawings. *Smith.*

593 *Scene Design II.* (3)
Intensified and expanded application of TA 592. Advanced theory and practice in scene and lighting design for the theatre. Prereq: TA 592 or consent of instructor. *Smith.*

594 *Acting I.* (3)
Study of acting styles from antiquity to the present, with emphasis on important acting periods. Lecture and weekly demonstrations for the development of skill in the use of body and for projection of voice and total characterization. Two hours of lecture and two hours of laboratory weekly. *Briggs.*

595 *Acting II.* (3)
Study and acting of scenes from classical and modern dramatic literature. Intensive application of techniques studied in TA 594. Two hours of lecture and two hours of laboratory weekly. *Briggs.*

596 *Playwriting.* (3)
A course designed for students interested in creative drama. The completion of at least one play is required. May be repeated once for a total of six credits. *Dickens.*

597 Teaching of Theatre Arts. (3)
A course designed to introduce teachers and community theatre workers to the problems of staging under circumscribed conditions; minimum essentials of play production and the means of supplying these needs. *Briggs.*

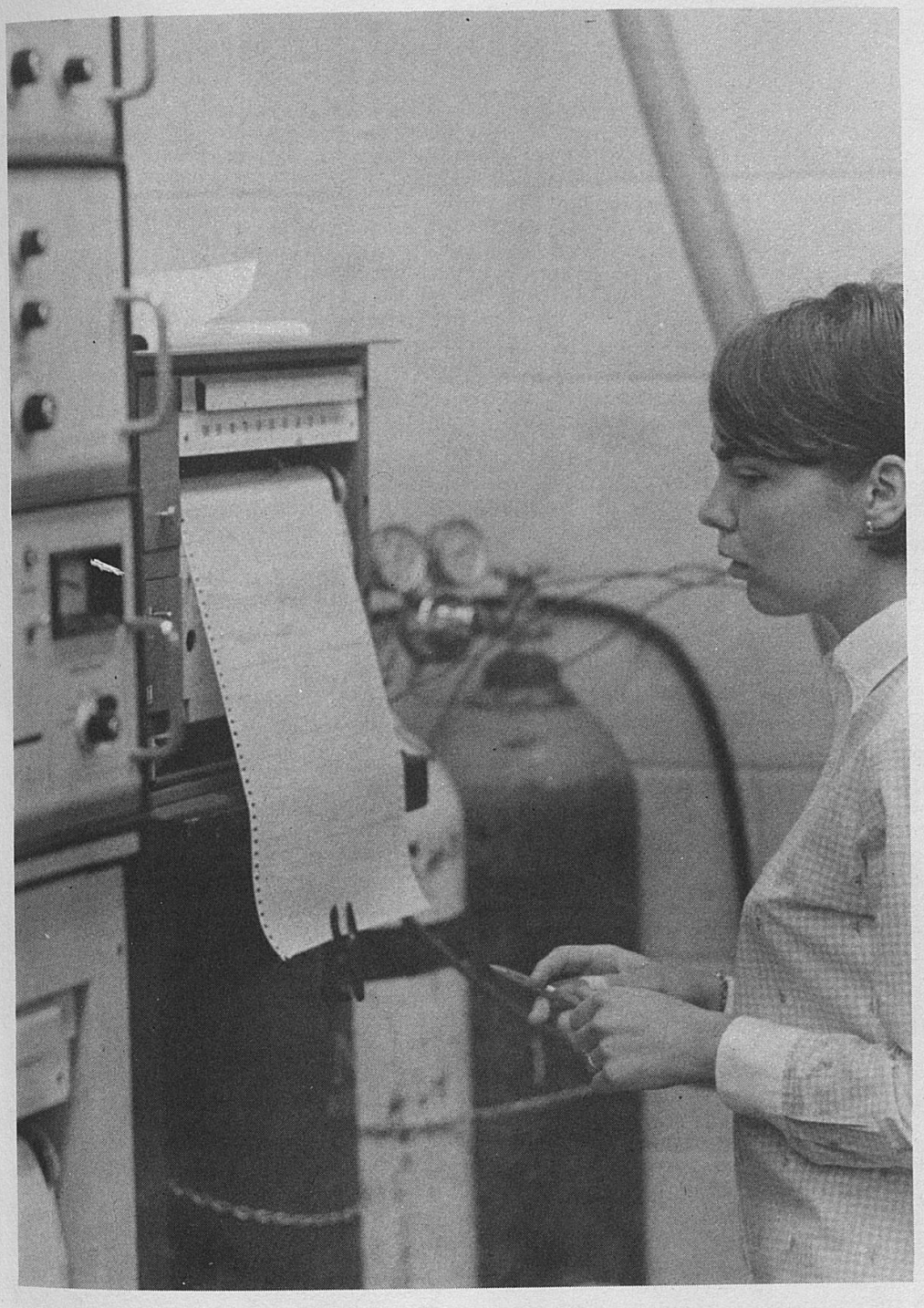
598 Theatre Directing I. (3)
Study of movement, interpretation of lines, creation of atmosphere, use of stage areas, use of levels, methods of achieving a climax, handling of groups, planning of mob scenes. *Dickens and Staff.*

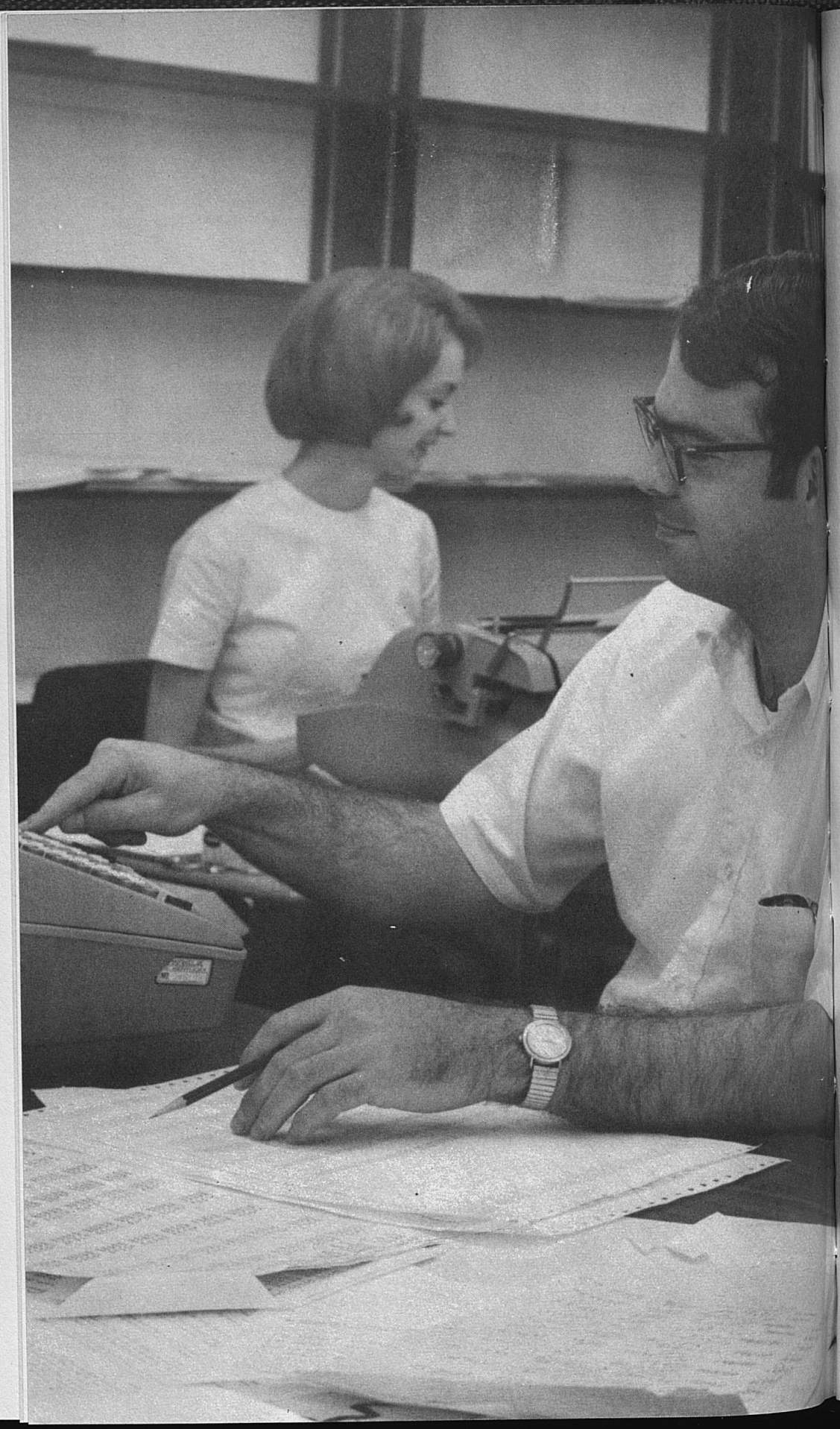
599 *Theatre Directing II.* (3)
Analyses and direction of the characteristics of tragedy, comedy, melodrama, farce and their variants. Intensive application of techniques studied in TA 598. Prereq: TA 598 or consent of instructor. *Dickens and Staff.*

690 *Studies in Technical Theatre: Production* (3)
Problems in advanced sceno-graphic techniques including drafting for the theatre, period composition and design, translation of the design into actuality, planning and laying out the technical schedule. Prereq: permission of instructor.

691 *Studies in Technical Theatre: Lighting.* (3)
Investigation and critical evaluation of lighting practice and artistry in the contemporary theatre. Prereq: permission of instructor.

794 *Special Topics in Theatre Arts.* (3)
Study and research on specific topics and problems according to the interests and needs of individual students. Normally offered as an independent work course. (May be repeated once for a total of six credits.) *Staff.*





III. BUSINESS AND ECONOMICS

THE DEGREE OF MASTER OF SCIENCE IN ACCOUNTING

Objectives

The principal objectives of the Master of Science Program in Accounting are to develop the ability to perform, and report upon, significant research and to further the understanding of the relationship between accounting and other disciplines. Since the specific needs of individuals for advanced study differ, the program has been structured to provide for maximum flexibility.

Requirements

1. Admission to the Master of Science Program in Accounting is open to students who hold a bachelors degree from any accredited college or university and who have maintained an undergraduate grade point standing of at least 2.5 on a basis of 4.
2. Graduate study in accounting presumes a minimum preparation of 21 hours in business and economics, including the completion of the following basic courses (in certain cases, these areas may be satisfied within the degree program):

   Principles of Economics
   Principles of Accounting
   Business Law
   Statistical Method
   Management
   Finance
   Marketing
3. The Admission Test for Graduate Study in Business must be taken prior to being admitted to full graduate standing.
4. A minimum of 30 semester hours must be presented in courses carrying graduate credit. At least 18 semester hours must be in courses reserved exclusively for graduate students and at least 12 of these must be in accounting.
5. The course requirements are:
   a. One course in each of the following fields:
      Advanced Managerial Accounting
      Income Taxation
      Attest Function
      Accounting Theory
   b. At least 6 semester hours of graduate credit outside the Department of Accounting, three of which must be in Economics.
   c. A course in Computer Science or Data Processing.
6. The candidate must submit evidence of competence in statistics (successful completion of six semester hours of course work at the upper division level).
7. Minimal average of Grade B in all courses attempted for graduate credit.
8. Successful completion of a comprehensive examination.

THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION

1. Admission to the degree program is open to students who hold a bachelor's degree from any accredited college or university and who have maintained a 2.5 standing (on basis of 4) or better in their undergraduate courses.
2. The Admission Test for Graduate Study in Business must be taken prior to being admitted to full graduate standing.
3. Graduate study in business presumes a minimal preparation in economics and business, including the following areas (undergraduate credit can be applied). In certain cases, these areas may be satisfied within the MBA program upon approval of the Director of Graduate Studies:

   Principles of Economics
   Principles of Accounting
   Statistical Method
   Business Law
   Business Finance
   Marketing
   Management

Core Requirements in the Degree Program:

BA 635—Managerial Economics	3 hours
BA 636—Research and Report Writing	3 hours
ACC 628—Accounting for Control and Planning	3 hours
BA 637—Administrative Behavior	3 hours
BA 645—Corporate Financial Policy	3 hours
BA 630—Advanced Marketing Management	3 hours
BA 639—Advanced Business Management	3 hours
One of the following:	
BA 652—Production Management	3 hours
BA 650—Quantitative Methods in Business Decisions	3 hours
Electives: Six hours of courses giving graduate credit	6 hours
TOTAL	30 hours

Master of Business Administration with Area Specialization: Six-hour sequences of courses may be approved for specialization beyond the core in the following fields: Marketing, Finance, Management Science, Managerial Accounting, Managerial Economics, and International Business.

Additional requirements are:

(a) Residence for at least two semesters at the University of Kentucky as a full-time student, or its equivalent as a part-time student.

(b) Minimal average of Grade B in all courses attempted for graduate credit.

(c) Successful completion of a comprehensive final examination.

THE DEGREE OF DOCTOR OF BUSINESS ADMINISTRATION

The basic purpose of the program leading to the Doctor of Business Administration degree is to enable persons who are seeking careers in collegiate

business teaching, business research, or busines consultation in acquiring a comprehensive, professional education appropriate to their goals.

Objectives:

The Doctor of Business Administration degree is designed for persons who are seeking careers in collegiate teaching, business research, or business consultation. A basic purpose of the program is to develop a broad understanding of business administration, economic analysis, and related behavioral and quantitative disciplines. An appreciation of the administrator's point of view in decision making within an organzational setting, and the development of scientific methods and techniques in research investigations will be emphasized.

Requirements:

1. Background Training in Business and Business Related Areas.

   The D.B.A. is designed to provide specialization beyond the master's level. The educational background of each candidate will be reviewed by an admissions committee which will identify any deficiencies. In most cases, an M.B.A. from an accredited institution (A.A.C.S.B. accreditation) provides the background. The Admission Test for Graduate Study in Business is required for admission to the D.B.A. program.

2. Core Requirements (24 credit hours)

   a. Six hours of coursework in Administrative Science and Management Science
      BA 735, Administrative Science I
      BA 736, Administrative Science II (Management Science)

   b. Six hours of coursework in Research
      BA 762, Research Methodology
      A graduate course in research techniques appropriate to major interest

   c. Six hours of coursework selected from:
      ECO 660, Advanced Microeconomic Theory
      ECO 661, Advanced Macroeconomic Theory
      A graduate course directly supporting major research interest

   d. Six hours of coursework in Quantitative Analysis
      BA 650, Quantitative Methods in Business Decisions
      BA 750, Statistics in Business Decisions

3. Major and Minor Field Requirements

   The major field will consist of at least 9 hours of graduate credit coursework from the following fields:

   Accounting*
   Management and Organizational Behavior*
   Managerial Economics*
   Finance
   Human Resource Development
   International Business
   Marketing*

   * Fields available, September 1969.

The minor field will consist of at least 6 hours of graduate credit coursework from the above fields or from an outside department closely related to the major field, e.g., statistics, computer science. This coursework must be approved by the Graduate Coordinator of the Department of Business Administration.

4. Written comprehensive examinations are required in the major and minor fields.
5. The dissertation will be based on original research on a significant topic. The dissertation will be defended in an oral examination.

THE DEGREE OF MASTER OF SCIENCE IN ECONOMICS

The M.S. in Economics is primarily for students who wish to have flexibility in a program of advanced study in economics. The M.S. in Economics provides adequate preparation for initial employment as a teacher in colleges and as a researcher for government, business, and other organizations. The program can be structured to prepare a student for further graduate work in Economics and related fields.

Requirements for the M.S. in Economics are:

1. A minimum of 30 hours of graduate credit courses.
   a. Fifteen hours must be in courses in the Department of Economics, and 12 of these hours must be in courses reserved exclusively for graduate students.
   b. At least 15 hours of the total of 30 must be in courses reserved exclusively for graduate students.
   c. The 30 hours must include Economics 660 and 661—Economic Theory, and Economics 662—Research.
2. Successful examination in one modern foreign language or competence in mathematical sciences evidenced by 9 hours of approved course work.
3. Success in final examination.
4. Minimal average of Grade B in all courses attempted for graduate credit.

THE DEGREE OF MASTER OF ARTS IN ECONOMICS

The M.A. in Economics is the first stage of the Ph.D. program. As a terminal degree, the M.A. in Economics provides adequate preparation for initial employment as a teacher in colleges and as a researcher for government, business, and other organizations. The program is therefore designed to provide advanced study in:

1. Economic Theory
2. Quantitative techniques, particularly statistics and mathematics
3. A specialization within economics, normally to consist of at least two courses
4. Research and writing skills

Requirements for the M.A. in Economics are:

1. A minimum of 30 hours of graduate credit courses.
   a. At least 24 of the 30 hours must be in courses reserved exclusively for graduate students.
   b. Economics 590—Mathematical Economics (or its equivalent), Economics 660 and 661—Economic Theory.
   c. Economics 665—History of Economic Thought, or Economics 667—Economic History.
   d. One of the basic courses (600 level) in each of two of the elective fields from the Ph.D. program.
   e. Economics 662—Research.
2. Successful examination in one modern foreign language *or* competence in mathematical sciences, evidenced by 9 hours of approved course work, 6 hours of which must be in statistics courses numbered 400 or higher.
3. Success in a final examination.
4. Minimal average of Grade B in all courses attempted for graduate credit.

THE DEGREE OF PH.D. IN ECONOMICS

Work for the degree of Doctor of Philosophy in Economics must conform to the general requirements of the Graduate School appearing on pages 22-27 in the *Graduate Bulletin*.

Objectives:

The Ph.D. in economics program is designed to give students both broad and intensive training in economics, research and communicative skills, and knowledge of the broad social, political, and economic environment.

Requirements:

Although there is no specific course work required in the Ph.D., the student must develop a depth of understanding in the following areas and the equivalent of the material in the following courses:

1. Economic Theory
   Economics 590
   Economics 660
   Economics 661
   Economics 760
   Economics 761
2. History of Economic Thought—Economic History
   a. History of Economic Thought—Economics 665 and 666
   b. Economic History—Economics 667 or 668
3. The Elective Requirement
   All Ph.D. students must complete two fields in economics in addition to 1 and 2 above. A sequence of two courses cover the minimum material necessary for each field.

a. International Economics (Economics 671 and 771)
b. Economic Development (Economics 673 and 773)
c. Labor Economics (Economics 676 and 776)
d. Public Finance (Economics 679 and 779)
e. Regional Economics (Economics 682 and 683)
f. Monetary Economics (Economics 686 and 786)
g. Mathematical Economics (Economics 688 and 788)
h. Econometrics (Economics 692 and 792)

4. Supporting Work—At least six hours of supporting course-work must be selected. These courses of study must be approved by the student's Special Committee.
5. Competence in mathematical sciences, evidenced by 9 hours of approved course work, 6 hours of which must be in statistics courses numbered 400 or higher.
6. Successful examination in one modern foreign language.
7. Qualifying Examinations
   a. Written examinations: Written examinations must be taken in each of four fields (Economic Theory, Economic History and History of Economic Thought, two electives [from above eight], as part of the requirement for candidacy for the Ph.D. These examinations usually are given in the spring and fall.
   b. Oral examination for candidacy: After passing the above written examinations, the student will prepare a proposal for his dissertation. An oral examination will be held in which the prospective candidate must defend his proposal and demonstrate competence in his fields.
8. The Dissertation—The dissertation will be based on original research on a significant topic. The dissertation will be defended in an oral examination.

ACCOUNTING

408 *Cost Accounting.* (3)
Concepts of costs in developing information for management use in the determination of income, the selections of activities (or projects) and the measurement of performance.

410 *Accounting for Institutions and Regulated Industries.* (3)
The requirements of adequate accounting systems for various governmental units, including the recording of usual transactions and the form and content of reports. Prereq: ACC 202.

416 *Accounting for Business Combinations.* (3)
Accounting records for consolidations and mergers, preparation of consolidated statements. Insolvency and receivership records and statements. Accounting for estates and trusts. Prereq: ACC 302 and senior standing.

418 *Controllership.* (3)
The organizational position of the Comptroller, his functions and objectives, his methods and procedures.

419 *Internship in Accounting.* (3)
Students are placed with cooperating firms for on-the-job training in accounting. Written reports to be submitted by the firm and the student to the instructor. Prereq: ACC 302 and consent of instructor.

422 *Functions of Accounting.* (3)
Introduction to the basic concepts and uses of accounting data. Three class hours per week. Prereq: Consent of instructor. Not open to students who have ACC 202 or its equivalent.

501 *Accounting Theory.* (3)
An investigation into earlier attempts to develop a coordinated statement of accounting theory; a critical examination of selected current accounting practices; and discussion of recent developments in accounting research. Prereq: ACC 302.

503 *Auditing.* (3)
The attest function of accounting with both internal and independent application. Emphasis is placed on the ethics, standards, and objectives of auditing and management's responsibilities in implementing internal control. Prereq: ACC 302 and senior standing.

507 *Income Taxation.* (3)
A comprehensive study of the federal income tax structure with emphasis on its application to individuals. Prereq: ACC 302 and senior standing.

514 *Data Processing in Accounting Systems.* (3)
Fundamentals of data processing for business organizations, including manual and automated applications, with emphasis on unit records, flow charts, and control procedures, in relation to both financial and nonfinancial data. Prereq: ACC 202.

515 *C.P.A. Problems.* (3)
The application of generally accepted principles to representative problems from C.P.A. examinations. Prereq: ACC 302 and senior standing.

601 *Advanced Accounting Theory.* (3)
Critical examination of accounting concepts and standards. Study of current problems and contemporary development reflected in accounting literature and reports. Prereq: ACC 301 or consent of instructor.

603 *Attest Function.* (3)
A critical examination of contemporary professional attestation theory and practice including a comprehensive review of AICPA audit case studies, statements on audit procedure, and their application in simulated business situations. Prereq: ACC 503 or consent of instructor.

607 *Tax Accounting Problems.* (3)
A comprehensive study of corporation, partnership and fiduciary income tax problems. Consideration given to gift and estate taxes. Prereq: ACC 507 or consent of instructor.

608 *Advanced Managerial Accounting.* (3)
Accounting procedures for the evaluation of performance in business, including the analysis of revenues and costs by projects and responsibilities and the use of budget cost studies and rates of return. Three class hours per week. Prereq: ACC 408.

615 *Advanced Professional Problems.* (3)
The application of generally accepted principles to advanced problems of a professional level, including an analysis and study in depth of problems from professional examinations. Prereq: Consent of instructor.

619 *Independent Study in Accounting.* (1-3)
Designed for students undertaking special studies to be conducted in regular consultation with the instructor. Prereq: Consent of instructor.

628 *Accounting for Control and Planning.* (3)
A study of the application of accounting information and services in the recognition or solution of management problems in business. Prereq: ACC 202 or equivalent.

BUSINESS ADMINISTRATION

MARKETING

430 *Marketing Distribution Systems.* (3)
The design and management of complex marketing organizations and systems, including home-office marketing organizations, field sales forces, channel structures, and the logistics of microdistribution systems. Three class hours per week. Prereq: BA 330.

431 *Contemporary Marketing Problems.* (3)
A capstone course with emphasis on the contemporary problems in the field of marketing. Consideration will also be given to the development of marketing programs including the integration of product planning, marketing communications, and marketing systems. Prereq: BA 330 plus 2 other marketing courses.

434 *Market Research.* (3)
Training in the application of scientific method to research in the fields of marketing. A major marketing investigation will be conducted by the class. Prereq: ECO 391 or equivalent.

630 *Advanced Marketing Management.* (3)
A critical study of significant trends, controversial issues and advanced techniques in the fields of marketing. Prereq: A course in marketing or consent of instructor.

656 *International Marketing.* (3)
A comparative approach to marketing systems with emphasis on the adaptability of U. S. marketing policies in overseas areas. The nature of the foreign markets, their growth, distribution systems and government policies. The U. S. firm and its overseas activities, organization structure, management, finance, product policies, physical distribution, promotion and research. Three class hours per week. Prereq: Consent of the instructor.

730 *Seminar in Marketing Theory.* (3)
A survey, analysis and evaluation of the current research in marketing theory. Detailed attention is given to problems of determining the meaning and boundaries of marketing theory. Emphasis is placed on introducing the student to the substantive content of marketing theories and their methodologies. Three class hours per week. Prereq: BA 630 or consent of instructor.

MANAGEMENT

435 *Analysis of Organizational Behavior.* (3)
The behavior of business organizations and their participants is analyzed in the contemporary language of social psychology, systems, and models. Various theories of the firm are reviewed and evaluated. The interdependence of economic, social and behavioral factors is stressed. Three class hours per week. Prereq: BA 335 or consent of the instructor.

439 *Business Policy.* (3)
Analysis of management problems, formulation of alternative courses of action, determination of policy decisions. Prereq: Senior standing, BA 435 or BA 450 or consent of the instructor.

535 *Industrial Relations.* (3)
Historical development of industrial relations; the economic implications of job analysis, recruitment, selection and training for industry; wages, hours, promotion and health policies; employee representation, collective bargaining; union-management cooperation. Prereq: One course in statistics.

536 *Personnel Problems.* (2)
A case course in the problems of supervision of employees, and the personnel policies which promote productive efficiency. Prereq: Senior standing.

635 *Managerial Economics.* (3)
Analysis of applications of economic theory to management decision-making. Such problems as demand and cost determination, pricing, and capital budgeting are treated.

636 *Research and Report Writing.* (3)
An introduction to business research and formal report writing. Emphasis is placed on methodology, research design, techniques of analysis, and data sources. The actual writing of research reports is stressed.

637 *Administrative Behavior.* (3)
A critical examination of the principles, methods, policies and procedures related to the effective utilization of human resources in business concerns, consideration being given to mutual relationships.

638 *Comparative International Management.* (3)
A comparison of management concepts and practices in different countries and the role of management in economic development; an interdisciplinary approach emphasizing the impact of sociological-cultural factors, legal-political factors and education on management development. Three class hours per week. Prereq: BA 335 or consent of instructor.

639 *Advanced Business Management.* (3)
A functional study of business management. Control devices and procedures for carrying out and testing policies.

735 *Administrative Science I.* (3)
Primary emphasis upon the identification and investigation of the schools of thought concerning the field of administration. Analysis of various theory bases for purposes of integration and generalization will also make up a major portion of the course.

736 *Administrative Science II.* (3)
Examination and empirical research on organizational behavior, structure and dynamics. Integration of research and theory and development of modified theoretical approaches. Design of research to test some of the theory. Prereq: BA 735.

761 *Seminar in Managerial Economics.* (3)
Each semester some topic in managerial economics such as cost analysis, capital budgeting, production management, demand analysis, forecasting will be studied intensively Prereq: BA 635.

762 *Research Methodology.* (3)
This course will deal with the philosophy of science, problems of scientific logic, induction and deduction and the role of theory construction in the behavioral and social sciences. It will emphasize the nature of scientific method and problems in research design.

763 *Research, Design and Analysis.* (3)
This course deals with the design and analysis of business research. Emphasizes the practical application of analysis of variance and correlational techniques to problems in business research. Focus will be on design, implementation and interpretation of research. Prereq: BA 762.

LEGAL ENVIRONMENT

441 *Business Law II.* (3)
A survey of the principles of contracts, sales, bills and notes, that portion of the law of torts applicable to business practices. Prereq: BA 341 or consent of instructor.

FINANCE

446 *Investments.* (3)
Analysis of corporation statements for investment purposes; the security market; market influences on security prices; effect of interest changes on security prices; and the development of investment programs. Prereq: ACC 202.

447 *Life Insurance.* (3)
Economics of life insurance; organization and control; special forms of life insurance; and fundamental principles of rate-making. Prereq: ECO 261.

448 *Property and Casualty Insurance.* (3)
Public control; nature of contracts; analysis of reserve functions and rate-making processes. **Prereq: ECO 261.**

585 *Bank Management.* (3)
A study of principles and cases in commercial banking practice. Bank management practices are studied within the economic, monetary, fiscal and legal framework of the American economy. **Prereq: ECO 485 or consent of instructor.**

645 *Corporate Financial Policy.* (3)
A study of financial management from the viewpoint of the corporate financial officer. Problems of planning the capital structure, issuing securities, the management of working capital and policies with reference to reserves, surplus and dividends. Prereq: A course in business finance or consent of instructor.

646 *Investment Management.* (3)
Evaluation of sources of information and advice concerning securities, methods of analysis and policies of individuals and institutions in the management of investment funds. Prereq: Appropriate undergraduate courses in accounting and finance.

QUANTITATIVE BUSINESS ANALYSIS AND PRODUCTION

450 *Quantitative Analysis in Management.* (3)
An introduction to quantitative techniques in management decisions. Includes basic linear programming, Monte Carlo, and waiting line theory. **Prereq: BA 335 or consent of the instructor.**

573 *Automatic Data Processing.* (3)
Examination of the role of high speed data processing equipment in the solution of business and economic problems. The study of computer fundamentals; input, arithmetic and logical units, control storage, and output. Includes digital computer programming. **Prereq: Junior standing.**

650 *Quantitative Methods in Business Decisions.* (3)
Application of mathematical analysis in business decision-making. Includes linear programming, total value analysis, incremental analysis, and other phases of operations research. **Prereq: MA 211 and ECO 291.**

652 *Production Management.* (3)
A study of procedures and techniques employed in manufacturing plants. An analysis of actual cases in production planning and control, time and motion study, quality control, plant layout, and budgetary control. Visits to industrial plants.

750 *Statistics in Business Decisions.* (3)
Statistical analysis as applied to business decisions. Includes waiting line theory, Monte Carlo method, and sampling as applied to inventory control, quality control, and similar business problems. **Prereq: ECO 291.**

INTERNATIONAL BUSINESS

456 *World Business.* (3)
Examines the impact of international business upon society from a political, cultural, and economic point of view. Particular stress will be given to U.S. business in international operations; its past involvement, present position, and future direction. Prereq: ECO 260, 261.

556 *International Commercial Policy.* (3)
America's position in the world economy and its international accounts; United States tariff policies, war debts, financial cooperation and investment policy. **Prereq: ECO 471.**
(Crosslisted with ECO 571.)

ADDITIONAL COURSES IN BUSINESS ADMINISTRATION

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

771 *Seminar in Business Administration.* (3)

Each semester some topic currently discussed in scholarly journals in business administration will be studied intensively. Three class hours per week. May be repeated to a maximum of 9 credits. Prereq: Consent of instructor.

781 *Independent Work in Business Administration.* (1 to 6)

Designed for advanced students who undertake research problems to be conducted in regular consultation with the instructor. May be repeated to a total of 6 credits. Prereq: Consent of instructor.

ECONOMICS

ECONOMIC THEORY

460 *Analysis of Business Conditions.* (3)

A study of economic factors causing fluctuations in aggregate economic activity and the methods of forecasting business activity. Prereq: ECO 360, 361, and 391 or equivalent.

660 *Advanced Microeconomic Theory.* (3)

An intensive course covering microeconomic theory and its various methodological and analytical techniques. Prereq: ECO 361; or consent of instructor.

661 *Advanced Macroeconomic Theory.* (3)

National income and employment theory, theories of inflation, and problems of economic growth. Prereq: ECO 360; or consent of instructor.

662 *Research Methods and Procedures in Economics.* (3)

The basic procedures and methods of research in economics are considered from the standpoint of their applicability to problem solving and discovery of new scientific facts and generalizations in economics. Definition of the problem, statement of hypothesis, research design, data collection methods and data analysis constitute the major topics. Attention is given to proper style and preparation of research reports in economics. Prereq: Second semester standing as graduate student in economics.

760 *Seminar in Microeconomic Theory.* (3)

Recent developments and major issues in contemporary microeconomic theory. Prereq: ECO 660 or consent of instructor.

761 *Seminar in Macroeconomic Theory.* (3)

Recent developments and major issues in contemporary macroeconomic theory. Prereq: ECO 661 or consent of instructor.

ECONOMIC HISTORY AND HISTORY OF ECONOMIC THOUGHT

467 *The Economic Evolution of the North Atlantic Community.* (3)

The related development of the European and American economies will be examined within the general framework of economic theory. Major emphasis will be given to the long-run process of economic growth with the period of analysis being from the 16th to the beginning of the 19th century. Prereq: ECO 260 and 261.

665 *History of Economic Thought I.* (3)
The background and development of English political economy up to 1848.

666 *History of Economic Thought II.* (3)
Main lines of controversy, reconstruction and development in economics since 1848 with emphasis on the bibliography.

667 *Seminar in Historical Studies in Economic Change.* (3)
Growth and development hypotheses will be tested on a wide range of historical materials drawn from the experience of Western Europe and America as bases for comparative studies in the newer developing regions.

668 *American Economic Change in Historical Perspective.* (3)
A wide range of statistical and historical studies will be used as bases to test various hypotheses concerning economic growth and development in the United States since the Revolution. Prereq: ECO 360, 361, or consent of instructor.

INTERNATIONAL ECONOMICS

471 *International Economics.* (3)
An analysis of the determinants of the pattern of international trade and the behavior of the international financial system, with careful attention to the problems of government policy in both the highly developed and the less developed countries.

570 *International Finance and Investment.* (3)
An intensive study of the international financial system, with special attention to its relationship to the balance of payments and economic development. Prereq: ECO 471.

571 *International Commercial Policy.* (3)
America's position in the world economy and its international accounts; United States tariff policies; war debts, financial cooperation and investment policy. Three class hours per week. Prereq: ECO 471. (Crosslisted with BA 556.)

671 *International Economics Seminar I.* (3)
History and analysis of theories of international trade; theories of international equilibrium and mechanisms of equilibrium adjustments; theory of economic integration. Prereq: ECO 471.

672 *International Conflict and Conflict Resolution.* (3)
A study of the interrelationships of commerce and violence in the world economy; static and dynamic theories of conflict; the institutional analysis of war; war and trade as policy alternatives. Three class hours per week. Prereq: ECO 360 and ECO 361 or consent of instructor.

771 *International Economics Seminar II.* (3)
Trade and economic development; determination of international payments equilibrium; econometric studies in world trade; computation of terms of trade; new developments in trade theory. Prereq: ECO 471.

ECONOMIC DEVELOPMENT

475 *Economic Development.* (3)
A comparative study of economic progress in selected countries; growth patterns, theories of development and capital formation; interaction of social and economic change. Prereq: ECO 261.

595 *Economic Planning.* (3)
Creation of development plans for the underdeveloped economics. Topics included the internal content, administrative structures and procedures for implementation, and economic policies. Prereq: ECO 360 or equivalent.

673 *Seminar in Economic Development I.* (3)
An intensive study of growth models, with special attention to problems associated with capital accumulation, balanced growth, and low-level equilibrium. Prereq: ECO 475 or equivalent.

674 *Agriculture and Economic Development.* (3)
Analytical consideration of role of agriculture in economic development in relation to over-all development strategy at various stages of growth. Theoretical and policy issues of particular relevance to the agricultural development in underdeveloped agrarian economies with various resource, social, political and economic systems. Prereq: ECO 475 or consent of instructor. (Same as AEC 626.)

773 *Seminar in Economic Development II.* (3)
Comprehensive survey of the literature on specific aspects of economic development, including industrialization, foreign trade policy, foreign aid, foreign investment, demographic problems, and stimulation and mobilization of savings. Prereq: ECO 475.

LABOR ECONOMICS

476 *Labor Economics.* (3)
Insecurity, wages and income, substandard workers, industrial conflict, wage theories, the economics of collective bargaining, unionism in its structural and functional aspects; recent developments. Prereq: ECO 261.

576 *Manpower Economics.* (3)
The impact of technology, the level of economic activity, and market imperfections on the labor market; evaluates manpower and other economic policies to provide jobs, improve labor market information and provide better preparation of people for jobs. Prereq: ECO 260 and 261.

577 *Labor Legislation.* (3)
The status of labor law, mediation, conciliation, arbitration, the minimum wage, the eight-hour day, unemployment relief, safety and health legislation, and social insurance. Prereq: ECO 261.

578 *Collective Bargaining.* (3)
The principles and procedures of bargaining and dispute settlement studied in detail. Includes a review of the content of labor contracts and provisions for administration. Union and management techniques considered. Prereq: ECO 476 or consent of instructor.

676 *Labor Markets and Wage Determination.* (3)
Economic and social forces determining labor supply and demand, labor force, unemployment, labor mobility; economic and institutional forces determining wages, wage theories and impact of collective bargaining. Prereq: ECO 360 and 361 or consent of instructor.

776 *Economics of Trade Unionism and Labor Law.* (3)
Origin and growth of labor organizations; trade union philosophy, organization and administration. Foreign labor movements. A detailed analysis of industrial relations and economic security legislation. Prereq: ECO 676 or consent of instructor.

PUBLIC FINANCE

479 *Public Finance.* (3)
A study of public receipts; public expenditures; the principles of taxation with special reference to their application to the tax systems, federal and state. Prereq: ECO 261.

580 *Theory of the Public Economy.* (3)
Application of economic and public finance theories to the income distribution, resource allocation, and economic stabilization problems associated with public sector use of resources. Prereq: ECO 360 and 361.

679 *Seminar in Public Finance I.* (3)
Reading and discussion of current and standard literature on public finance problems and the theory of the public economy. Individual research reports. Prereq: ECO 580, 479, or consent of instructor.

779 *Seminar in Public Finance II.* (3)
Essentially a continuation of ECO 679. Individual research reports. Prereq: ECO 580, 479, or consent of instructor.

REGIONAL ECONOMICS

482 *Regional Economics.* (3)
A survey of the major tools, measurements, and theories utilized in studying the regional economy. The topics covered include the basic elements of location theory, regional growth theory, and such economic models as economic base, input-output, and shift-share. Prereq: ECO 360 and 361.

682 *The Economics of Spatial Relations.* (3)
A study of the spatial aspects of the economy with emphasis on location theory in a static equilibrium and dynamic framework. Empirical evidence and public policy considerations are also included. **Prereq: ECO 361 or equivalent.**

683 *Economics of Growth and Development in Regions and Urban Areas.* (3)
A macroeconomic study of regional-urban growth and development with primary emphasis on the construction of income determination and growth models for an open economy. Prereq: ECO 360 or equivalent.

783 *Seminar in Regional Economics.* (3)
A critical study of recent extensions in regional economic analysis and regional policy programs. Individual research paper is required. Prereq: ECO 682 and 683.

MONETARY ANALYSIS

485 *Money and Banking.* (3)
Nature and functions of money; the importance of credit; relation of money and credit to prices; bank deposits, and loans; complete study of our national banking system. Prereq: ECO 261.

686 *Advanced Money and Banking.* (3)
A theoretical study of contemporary money and banking institutions with emphasis on **central bank functions. Prereq: ECO 485 or equivalent.**

687 *History and Theory of Money and Prices.* (3)
The evolution of money, the rise of banking processes and the causes of fluctuations in the **general price level. Prereq: ECO 485.**

786 *Seminar in Monetary Theory and Policy.* (3)
A comprehensive and critical analysis of contemporary monetary theory and policy. Prereq: ECO 686.

MATHEMATICAL ECONOMICS

590 *Introduction to Mathematical Economics.* (3)
A review of mathematical approaches to economic theory. Models applicable to production, marketing and pricing problems. **Prereq: MA 211 and ECO 361 or equivalent. (Same as AEC 590.)**

688 *Mathematical Economics—Micro Theory.* (3)
Consumer behavior and demand, theory of the firm, market equilibrium, optimality criteria and welfare maximization. Selected topics in dynamics. **Prereq: ECO 361, MA 113 or equivalent.**

788 *Mathematical Economics—Macro Theory.* (3)
Selected aggregative models treated mathematically. Emphasis on maximization problems for linear systems. Leontief input-output models. **Prereq: ECO 360, MA 113 or equivalent. (Same as AEC 690.)**

ECONOMETRICS

591 *Survey Sampling Design.* (3)
Sampling theory applied to research design and data collection in economics. Covers simple random, stratified random, systematic, and cluster sampling. **Prereq: ECO 391 or consent of instructor.**

592 *Advanced Business and Economic Statistics.* (3)
Advanced time series analysis, multiple and partial correlation, elementary analysis of variance and experimental design. **Prereq: ECO 391 or consent of instructor.**

692 *Econometrics I.* (3)
Foundations of econometrics. Analysis of linear regression models, including inferences involving linear transformations of random variables, individual degrees of freedom and the analysis of covariance. Statistical forecasting of economic magnitudes. **Prereq: ECO 391 and ECO 592 or equivalent.**

791 *Problems in Econometrics.* (3)
Empirical estimation of multi-equation models. Bayesian estimation theory and techniques. Non-linear estimation techniques. Supervised empirical work requiring a major research paper. **Prereq: ECO 792.**

792 *Econometrics II.* (3)
The application of statistical methods to problems of economic analysis. Building and measuring relationships among economic variables. Econometric models of the economy as a whole and of individual sectors. **Prereq: ECO 692 or equivalent. (Same as AEC 691.)**

793 *Seminar in Econometrics.* (3)
Comprehensive consideration of current empirical literature. Individual dissertation progress reports and discussion. **Prereq: ECO 791 or consent of instructor.**

ADDITIONAL COURSES IN ECONOMICS

495 *Comparative Economic Systems.* (3)
A study of capitalism, socialism, fascism, communism and cooperation, with attention to current experiments in economic planning. **Prereq: ECO 261.**

523 *Social Determinants of Economic Behavior.* (3)
A study of the sociology of consumption, the effect of social values upon business and employee behavior, and the socioeconomic implications of welfare legislation. **(Same as SOC 523.)**

560 *Business Combinations and Public Policy.* (2)
Forms of combinations; the problem of monopoly and the regulations of competition; federal and state anti-trust legislation and court decisions.

594 *Transportation.* (3)
Railways, waterways, highways, airways. Rates, service, management, regulation. **Prereq: ECO 261.**

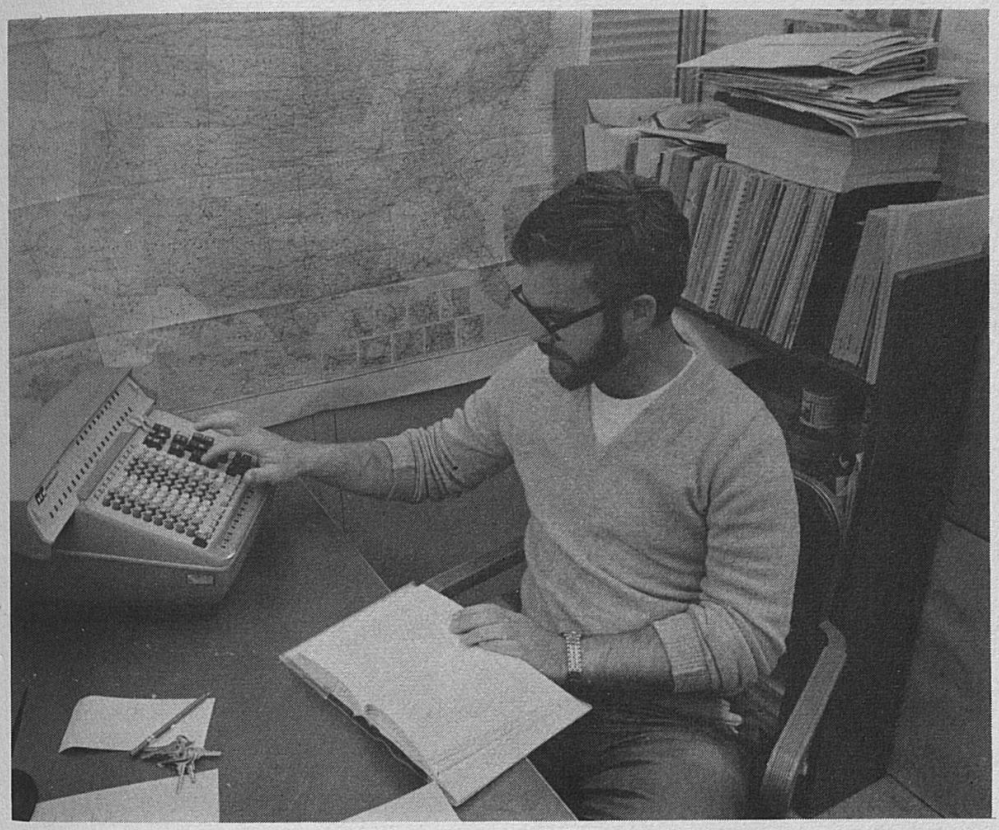
596 *Soviet Area Economics.* (3)
The course is designed to provide an intensive study of the economic principles, institutions, and policies which provide direction and coordination for the economic processes in the Soviet Union and Eastern European countries. Prereq: ECO 261 or consent of instructor.

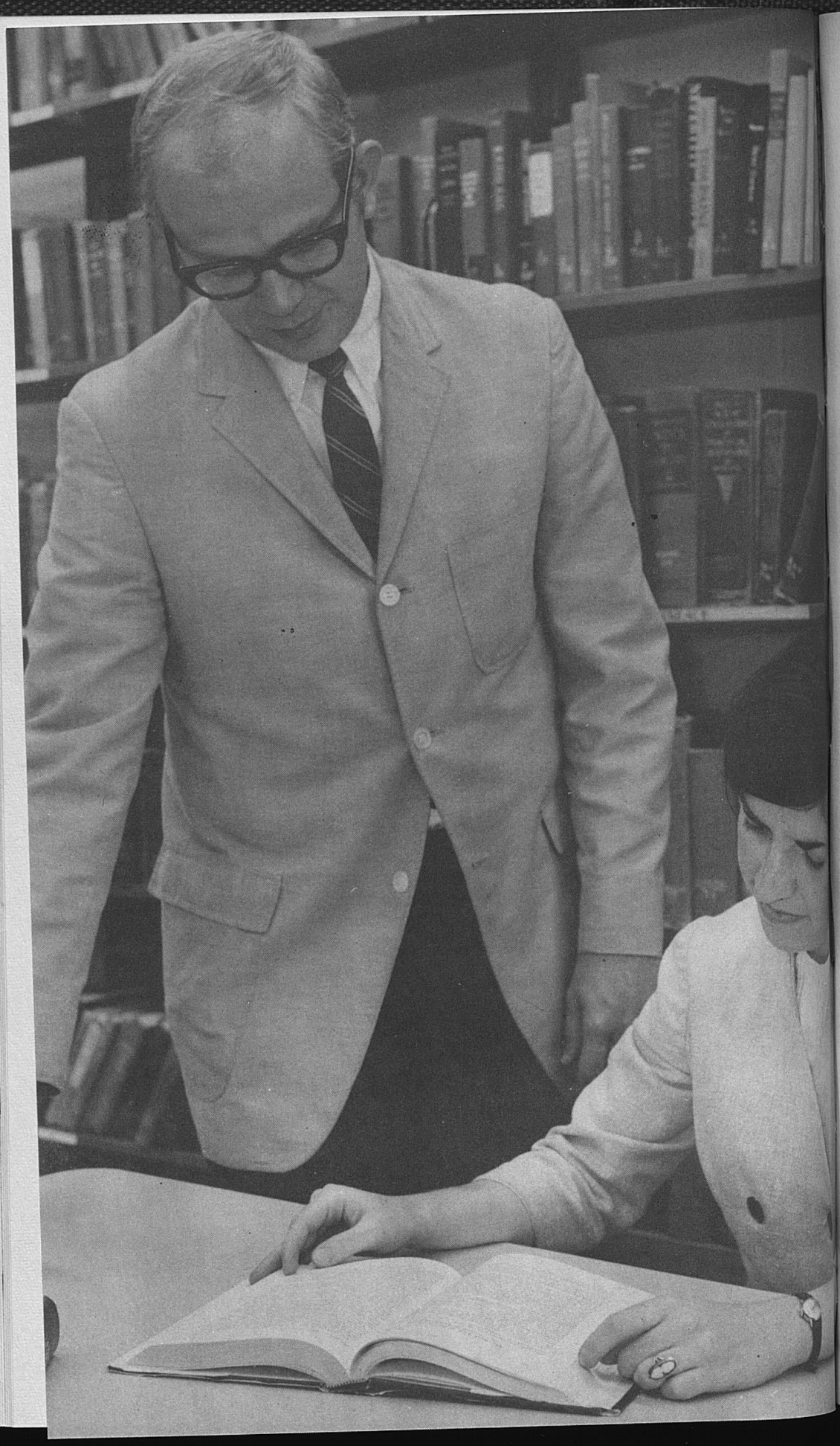
768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

796 *Seminar.* (1-6)
An extended original investigation of some specific topic with a view to giving training in methods of research and studying intensively a particular subject in the field of economics. May be repeated to a maximum of six credits.

797 *Research Problems in Economics.* (1-6)
Students confer individually with the instructor. May be repeated to a maximum of six credits.





IV. EDUCATION

General Statement of Regulations Governing Graduate Work in the College of Education

The College offers the following degrees in Education: Master of Arts, Master of Science, Specialist, Doctor of Education and the Doctor of Philosophy. In addition to the general requirements for graduate degrees (pages 17-27) certain other requirements must be met.

Graduate work is also provided for persons seeking rank I or II certification. (For rank II requirements without a degree, see page 186. Rank I consists of a 30 semester hour planned program above the Master's degree.)

1. Candidates must complete a minimum of 30 semester hours in education (undergraduate work in education may be counted to meet this requirement.)

2. Candidates must qualify for a Kentucky Teaching Certificate. (In special cases candidates whose preparation is not for work in schools may upon petition have this requirement waived.)

3. Candidates for doctoral degrees must have completed three years of teaching or other professional school experience.

The two plans which lead to the degree of Master of Arts or Master of Science in Education are outlined below.

PLAN A

1. A minimum of 24 semester hours of graduate work must be completed and a thesis must be presented.
2. At least 12 semester hours of graduate work must be in education.
3. At least 12 semester hours of graduate work must be in courses numbered 600 or higher.
4. At least 12 semester hours must be outside the field of education, except for majors in Educational Administration, Counseling and Guidance, and Vocational Education, other than Home Economics Education. It is expected that students in Educational Administration, Counseling and Guidance, and Vocational Education will have six hours outside education.
5. No student may satisfy more than one-half of the residence requirements for advanced degrees by part-time work. This limitation does not apply to intensive courses.
6. The total number of credits presented in education, undergraduate and graduate, must be at least 30 semester hours.
7. A standing of 3.0 (an average of B) or better must be made on all graduate work.
8. Six semester hours (if approved by the graduate adviser) may be completed in off-campus study (that is, extension work). In such case, however, a minimum of 30 weeks of *resident on-campus* work is required for the master's degree.

9. The Graduate Record Examination is required of all candidates for graduate degrees. It is to be taken the first semester the student is enrolled as a full-time student in the Graduate School. The National Teachers Examination will be required of all candidates for the degree of Master of Arts in Education or Master of Science in Education. The student should consult with his adviser to determine the proper time to take this Examination. In exceptional cases an additional examination, either written or oral, may be required. These examinations are to be taken just prior to or during the session in which the degree is to be conferred.
10. All graduate students must meet the requirements for a teaching certificate in Kentucky as established by the State Department of Education of Kentucky. These requirements are outlined in the General Catalogue of the University. If deficiencies are found, they should be overcome before proceeding with graduate work. The work required to overcome these deficiencies is in addition to the minimum graduate requirements for the degree.

PLAN B

1. A minimum of 30 semester hours of graduate work must be completed.
2. At least 12 semester hours of graduate work must be in education.
3. At least 15 semester hours must be in courses numbered 600 or higher.
4. At least 12 semester hours must be outside the field of education, except for majors in Educational Administration, Counseling and Guidance, and Vocational Education, other than Home Economics Education. It is expected that students in Educational Administration, Counseling and Guidance, and Vocational Education will have six hours outside education.
5. No student may satisfy more than one-half of the residence requirements for advanced degrees by part-time work. This limitation does not apply to intensive courses.
6. The total number of credits presented in education, undergraduate and graduate, must be at least 30 semester hours.
7. A standing of 3.0 (an average of B) or better must be made on all graduate work.
8. Six semester hours may be done in extension classes, off-campus study, or independent work courses with the permission of the student's adviser and the dean of the Graduate School.
9. The Graduate Record Examination is required of all candidates for graduate degrees. It is to be taken the first semester the student is enrolled as a full time student in the Graduate School. The National Teachers Examination will be required of all candidates for the degree of Master of Arts in Education or Master of Science in Education. The student should consult with his adviser to determine the proper time to take this Examination. In exceptional cases an additional examination, either written or oral, may be required. These examinations are to be taken just prior to or during the session in which the degree is to be conferred.

10. All graduate students must meet the requirements for a teaching certificate in Kentucky as established by the State Department of Education of Kentucky. These requirements are outlined in the General Catalogue of the University. If deficiencies are found, they should be overcome before proceeding with graduate work, and in addition to the minimum 30 graduate credits required for the degree.

Each student's graduate curriculum must be a well-rounded program of courses related to the student's major interest and approved by his committee. In cases of deficient preparation the committee, with the approval of the Dean, determines prerequisite undergraduate courses to be taken. Each department has designated one or more faculty members to direct graduate studies in their department. Specific questions regarding programs may be referred to these people.

DEPARTMENT	DIRECTORS
Administration & Supervision	James Kincheloe Robert Ogletree
Curriculum & Instruction	Harry Barnard, Secondary Education James Moore, Elementary Education Earl Rankin, Reading
Educational Psychology & Counseling	Louis Karmel
Health, Physical Education & Recreation	Joseph Gruber
Higher & Adult Education	Collins Burnett
Social & Philosophical Studies in Education	John Rich
Special Education	William Tisdall
Vocational Education	Harold Binkley Vernon Musselman, Business Education Ann Gorman, Home Economics Education

Education 99—This is a non-credit seminar required of all graduate students in education the first semester or summer session they are registered for full time graduate study.

Master of Arts Degree in Elementary Education

For a Master of Arts degree in Elementary Education, a minimum of 12 semester hours of graduate work shall be selected from at least three of the following areas of professional education in accordance with the needs of the individual teacher. This program qualifies the teacher for a Standard Certificate

if he has completed the four-year undergraduate curriculum. The specific courses listed below under each area shall be used to meet the requirements:

Area 1—*A General Study of Curriculum Development*

EDU 712—The Elementary School
EDU 732—Principles of Curriculum Construction

Area 2—*Research Methodology*

EDU 522—Educational Tests and Measurements
EDU 656—Methods of Educational Research
EDU 657—Educational Statistics

Area 3—*Advanced Study in Human Growth and Development*

EDU 739—A Survey of Research in Human Development and Education
EDU 755—Human Development and Behavior
EDU 759—Identifying and Providing for Individual Student Needs

Area 4—*Advanced Study in Reading* (Required unless waived on basis of previous advanced study in reading)

EDU 540—The Analysis and Correction of Reading Disabilities
EDU 641—A Study of Research and Theory in Teaching Reading in the Elementary School
EDU 642—A Study of Research and Theory in Teaching Language Arts in the Elementary School

Area 5—*The Psychology of Learning*

EDU 548—Educational Psychology
EDU 658—Problems in Educational Psychology

Area 6—*A Seminar in Instruction Devoted to the Method of Teaching*

Any general course in methods or any specific course in methods in subject matter areas may be taken to meet this requirement.

Area 7—*Foundations in Education*

EDU 548—Educational Psychology
EDU 640—Philosophy of Education
EDU 645—Foundations in Education
EDU 650—General History of Education
EDU 651—History of Education in the United States
EDU 658—Problems in Educational Psychology
EDU 661—Educational Sociology

Master of Arts Degree in Secondary Education

For a Master of Arts degree in Secondary Education, a minimum of 12 semester hours of graduate work shall be selected from at least three of the following areas of professional education in accordance with the needs of the individual teacher. This program qualifies the teacher for a Standard Certificate if he has completed the four-year undergraduate curriculum. The specific courses listed below under each area shall be used to meet the requirements:

Area 1—*A General Study of Curriculum Development*

EDU 714—The Secondary School (for secondary school teachers only)
EDU 717—The Junior High School (for junior high school teachers only)
EDU 732—Principles of Curriculum Construction
EDU 735—The Core Program in the Secondary Schools

Area 2—*Research Methodology*

EDU 522–Educational Tests and Measurements
EDU 656–Methods of Educational Research
EDU 657–Educational Statistics

Area 3—*Advanced Study in Human Growth and Development*

EDU 520–The Secondary School Pupil
EDU 755–Human Development and Behavior
EDU 759–Identifying and Providing for Individual Student Needs

Area 4—*The Psychology of Learning*

EDU 548–Educational Psychology
EDU 658–Problems in Educational Psychology

Area 5—*A Seminar in Instruction Devoted to the Method of Teaching*

Any general course in methods or any specific course in methods in subject matter areas may be taken to meet this requirement.

Master of Arts Degree in Vocational Education

For a Master of Arts degree in Vocational Education (Agricultural Education, Business Education, Home Economics Education) a minimum of 12 semester hours of graduate work must be taken in professional education. One course shall be taken from each of three areas listed below. This program qualifies the teacher for a Standard Certificate if he has completed the four-year undergraduate curriculum.

AGRICULTURAL EDUCATION

Area 1—*Curriculum Development*

672–Determining Content in Vocational Agriculture
678–Selecting Teaching Materials
732–Principles of Curriculum Development

Area 2—*Research*

656–Methodology of Educational Research
657–Educational Statistics (consumer research)
695–Special Problems in Vocational Education
794–Research in Vocational Education
795–Research Problems in Agricultural Education

Area 3—*Advanced Study in Human Development*

755–Human Development and Behavior
759–Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

548–Educational Psychology
658–Problems in Educational Psychology

Area 5—*Seminar in Instruction Devoted to Method in Teaching*

585–Farm Practice Supervision
670–Advanced Method in Teaching Vocational Education
671–Teaching Prevocational Agriculture
675–Modern Problems in Agricultural Education
677–Advanced Problems in Agricultural Education
679–Adult-Farmer Schools
680–Directing Farm Practice

681–Teaching Farm Shop
682–Young-Farmer School
687–Supervision in Vocational Education
776–Seminar in Vocational Education

Area 6—*Foundations in Education*

640–Philosophy of Education
645–Foundations of Education

BUSINESS EDUCATION

Area 1—*A General Study of Curriculum Development*

615–Problems in Business Education
621–The Business Curriculum
622–Business Education in Colleges and Universities
626–Classification and Possible Use of Community Resources in Business Education
714–The Secondary School
732–Principles of Curriculum Development

Area 2—*Research Methodology*

656–Methodology of Educational Research
657–Educational Statistics
786–Independent Work in Business Education
794–Research in Vocational Education

Area 3—*Advanced Study in Human Development*

755–Human Development and Behavior
759–Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

548–Educational Psychology
658–Problems in Educational Psychology

Area 5—*A Seminar in Instruction Devoted to the Method of Teaching*

511–Teaching Secretarial Subjects
512–Teaching Bookkeeping and Accounting
513–Teaching Office Practice, Clerical Practice, and Office Appliances
514–Teaching General Business Subjects in the Secondary Schools
605–Teaching Consumer Courses in the High School
615–Problems in Business Education
618–The Social Business Subjects in High School
622–Business Education in Colleges and Universities
687–Supervision in Vocational Education
774–Seminar in Business Education
776–Seminar in Vocational Education

Area 6—*Foundations in Education*

640–Philosophy of Education
645–Foundations of Education
651–History of Education in the U.S.
650–General History of Education
661–Educational Sociology

HOME ECONOMICS EDUCATION

Area 1—*Curriculum Development*

714–The Secondary School
732–Principles of Curriculum Construction

Area 2—*Research*

656–Methodology of Educational Research
657–Educational Statistics
787–Independent Work in Home Economics Education
794–Research in Vocational Education

Area 3—*Advanced Study in Human Development*

739–Survey of Research in Human Development and Education
755–Human Development and Behavior
759–Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

548–Educational Psychology
658–Problems in Educational Psychology

Area 5—*Seminar in Instruction Devoted to Methods of Teaching*

683–Current Problems in Home Economics Education
684–Modern Trends in Home Economics Education
685–Home Economics Curriculum Construction
686–Evaluation in Home Economics Education
687–Supervision in Vocational Education
775–Seminar in Home Economics Education

Area 6—*Foundations in Education*

640–Philosophy of Education
650–General History of Education
652–History of Educational Thought
661–Educational Sociology

MASTER'S DEGREE PROGRAM COUNSELING AND GUIDANCE

The Master of Arts degree in Education which follows the curriculum in Counseling and Guidance is valid for the Provisional Certificate only, unless all other requirements for the Master of Arts degree in Elementary or Secondary Education have been met.

Curriculum for master's degree (30 *semester hours required*)		Sem. Hrs.
Required:		
EDU 755	Human Development and Behavior	3
EDU 756	Fundamentals of Guidance	3
EDU 522	Educational Tests and Measurements	
or		3
PSY 535	Psychological Testing	
EDU 758	Group Guidance Problems and Practices	3
EDU 760	Counseling Theory and Practice	3
EDU 761	Supervised Practice in Counseling (May be repeated to a maximum of 9 hours)	3
EDU 661	Education Sociology	
or		3
EDU 640	Philosophy of Education	

Electives: 9 hours from Psychology, Sociology, Anthropology, or Social Work as recommended by the advisor.

As a part of the Master's degree program in Counseling and Guidance, students may specialize in Rehabilitation Counseling by meeting the following requirements:

		Sem. Hrs.
ANA 206	Elementary Anatomy	4
EDU 521	Introduction to Vocational Rehabilitation	3
EDU 522	Educational Tests and Measurements	
or		3
PSY 535	Psychological Testing	
EDU 527	Survey of Physical Defects	3
EDU 657	Educational Statistics	3
EDU 664	Studies in Vocational Rehabilitation	3
EDU 760	Counseling Theory and Practice	3
°EDU 761-2	Supervised Practice in Counseling	3
EDU 764	Using Occupational and Educational Information in Counseling and Guidance	3
°EDU 777-2	Seminar in Counseling and Guidance	3

° Courses designated by the suffix-2 are specifically adapted to the Rehabilitation Counseling program.

681—Teaching Farm Shop
682—Young-Farmer School
687—Supervision in Vocational Education
776—Seminar in Vocational Education

Area 6—*Foundations in Education*

640—Philosophy of Education
645—Foundations of Education

BUSINESS EDUCATION

Area 1—*A General Study of Curriculum Development*

615—Problems in Business Education
621—The Business Curriculum
622—Business Education in Colleges and Universities
626—Classification and Possible Use of Community Resources in Business Education
714—The Secondary School
732—Principles of Curriculum Development

Area 2—*Research Methodology*

656—Methodology of Educational Research
657—Educational Statistics
786—Independent Work in Business Education
794—Research in Vocational Education

Area 3—*Advanced Study in Human Development*

755—Human Development and Behavior
759—Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

548—Educational Psychology
658—Problems in Educational Psychology

Area 5—*A Seminar in Instruction Devoted to the Method of Teaching*

511—Teaching Secretarial Subjects
512—Teaching Bookkeeping and Accounting
513—Teaching Office Practice, Clerical Practice, and Office Appliances
514—Teaching General Business Subjects in the Secondary Schools
605—Teaching Consumer Courses in the High School
615—Problems in Business Education
618—The Social Business Subjects in High School
622—Business Education in Colleges and Universities
687—Supervision in Vocational Education
774—Seminar in Business Education
776—Seminar in Vocational Education

Area 6—*Foundations in Education*

640—Philosophy of Education
645—Foundations of Education
651—History of Education in the U.S.
650—General History of Education
661—Educational Sociology

HOME ECONOMICS EDUCATION

Area 1—*Curriculum Development*

714—The Secondary School
732—Principles of Curriculum Construction

Area 2—*Research*

656—Methodology of Educational Research
657—Educational Statistics
787—Independent Work in Home Economics Education
794—Research in Vocational Education

Area 3—*Advanced Study in Human Development*

739–Survey of Research in Human Development and Education
755–Human Development and Behavior
759–Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

548–Educational Psychology
658–Problems in Educational Psychology

Area 5—*Seminar in Instruction Devoted to Methods of Teaching*

683–Current Problems in Home Economics Education
684–Modern Trends in Home Economics Education
685–Home Economics Curriculum Construction
686–Evaluation in Home Economics Education
687–Supervision in Vocational Education
775–Seminar in Home Economics Education

Area 6—*Foundations in Education*

640–Philosophy of Education
650–General History of Education
652–History of Educational Thought
661–Educational Sociology

MASTER'S DEGREE PROGRAM COUNSELING AND GUIDANCE

The Master of Arts degree in Education which follows the curriculum in Counseling and Guidance is valid for the Provisional Certificate only, unless all other requirements for the Master of Arts degree in Elementary or Secondary Education have been met.

Curriculum for master's degree (30 *semester hours required*)		Sem. Hrs.
Required:		
EDU 755	Human Development and Behavior	3
EDU 756	Fundamentals of Guidance	3
EDU 522	Educational Tests and Measurements	
or		3
PSY 535	Psychological Testing	
EDU 758	Group Guidance Problems and Practices	3
EDU 760	Counseling Theory and Practice	3
EDU 761	Supervised Practice in Counseling (May be repeated to a maximum of 9 hours)	3
EDU 661	Education Sociology	
or		3
EDU 640	Philosophy of Education	

Electives: 9 hours from Psychology, Sociology, Anthropology, or Social Work as recommended by the advisor.

As a part of the Master's degree program in Counseling and Guidance, students may specialize in Rehabilitation Counseling by meeting the following requirements:

		Sem. Hrs.
ANA 206	Elementary Anatomy	4
EDU 521	Introduction to Vocational Rehabilitation	3
EDU 522	Educational Tests and Measurements	
or		3
PSY 535	Psychological Testing	
EDU 527	Survey of Physical Defects	3
EDU 657	Educational Statistics	3
EDU 664	Studies in Vocational Rehabilitation	3
EDU 760	Counseling Theory and Practice	3
*EDU 761-2	Supervised Practice in Counseling	3
EDU 764	Using Occupational and Educational Information in Counseling and Guidance	3
*EDU 777-2	Seminar in Counseling and Guidance	3

* Courses designated by the suffix-2 are specifically adapted to the Rehabilitation Counseling program.

PSY 521	Abnormal Psychology	3
PSY 544	Social Psychology	3
PSY 640	Practice in Testing; Intelligence Tests	3
SW 530	Community Organizations for Social Work	3

Electives:

Three hours from Education, Psychology, Rural Sociology, Social Work or Sociology as recommended by the advisor.

SIXTH-YEAR DEGREE PROGRAM COUNSELING AND GUIDANCE

Curriculum for the Ed.S. degree (30 *semester hours required*) Sem. Hrs.

Required: 15-21 hours from the following, in addition to the courses required for the master's degree in Guidance and Counseling:

EDU 657	Educational Statistics	3
EDU 761	Supervised Practice in Counseling (May be repeated to a maximum of 9 hours)	3
EDU 762	Organization and Administration of Guidance Services	3
EDU 763	Research and Evaluation in Guidance	3
EDU 764	Using Occupational and Educational Information in Guidance and Counseling	3
EDU 777	Seminar in Guidance and Counseling (May be repeated to a maximum of 6 hours)	3
PSY 640	Practice in Testing: Intelligence Tests	3

Electives: 6-9 hours outside of Education (to be approved by adviser)

Research: 3-6 hours in independent research as approved by adviser

MASTER'S DEGREE PROGRAM—SPECIAL EDUCATION

The Master of Arts degree in Education which follows the curriculum in Special Education is valid for the Provisional Certificate only, unless all other requirements for the Master of Arts degree in Elementary or Secondary Education have been met.

All undergraduate requirements for a provisional teaching certificate must be met before this program can be completed for teacher certification in the Special Education Area.

Curriculum for Master's Degree (36 hours required)

Foundations of Education (6 hours required)

EDU 661—Educational Sociology (3)
EDU 640—Philosophy of Education (3)
EDU 657—Educational Statistics (3)
EDU 658—Problems in Educational Psychology (3)
(EDU 755—Human Development and Behavior may be substituted for EDU 658)

Counseling and Guidance (6 hours required)

EDU 764—Using Occupational and Educational Information in Counseling and Guidance (3)
EDU 521—Introduction to Vocational Rehabilitation (3)
or
EDU 756—Fundamentals of Guidance (3)
EDU 770—Seminar in Education of Exceptional Children (3)
EDU 526—Methods and Materials of Teaching the Mentally Retarded (3)
EDU 530—The Nature and Needs of Retarded Children
EDU 525—Methods and Materials in Teaching the Orthopedically Handicapped Including the Cerebral Palsied (3)
EDU 527—Survey of Physical Defects (3)
EDU 528—Modern Educational Problems: Education of Handicapped Children (3)
*Methods and and Materials for the Trainable Mentally Retarded (3)
*Administration and Supervision in Special Education (3)

* Two additional courses are being proposed. If approved, they will become a part of the Special Education program.

Psychology and Sociology (12 hours required)

**PSY 535	Psychological Testing	3
PSY 550	Speech Pathology: A Survey	3
PSY 560	Introduction to Clinical Audiology	3
PSY 561	Audiometry	3
PSY 640	Practice in Testing: Intelligence Tests	3
PSY 641	Psychological Measuring Instruments	3
PSY 631	Psychology of Language	3
SOC 509	The Family	3
SOC 536	Sociology of Deviant Behavior	3
SOC 538	Juvenile Delinquency	3
SOC 632	Minority Groups	3

In the event of potential duplication of course work as a result of courses previously completed on the undergraduate level, additional electives may be selected from the areas of foundations, special education, psychology, or sociology.

PLANNED FIFTH YEAR PROGRAM

By action of the Council on Public Higher Education and the State Board of Education, all provisional teaching certificates issued *after* 1967 on the basis of a four-year program and a Bachelor's degree are valid for an initial period of ten years and shall be renewed either upon completion of a Master's degree or a planned Fifth Year Program of college work. Conditions of the "Planned Fifth Year Program" are outlined below.

Candidates for admission must be graduates of accredited four-year institutions and hold a valid teaching certificate.

The program must be completed within ten years. Grades of "C" or better are required in all work applied to the program.

Thirty-two semester hours must be completed under the supervision of an adviser.

At least 18 semester hours must be earned at the University of Kentucky.

At least 12 hours must be in courses numbered 600 or above.

At least 12 semester hours must be in professional education.

At least 12 hours must be in disciplines other than education.

CERTIFICATION IN ADMINISTRATION AND SUPERVISION

Beginning with the graduates of 1970, those persons seeking certification in Administration and Supervision must complete a Master's degree before admission to the program. (This requirement applies to all candidates who began graduate work at the University of Kentucky after June 1, 1967.)

Upon completion of a Master's degree in Elementary or Secondary Education encompassing certain components, a program of 15 semester hours is provided for certification for the supervisor, the secondary and the elementary principalship. A 30-semester-hour program is provided for the certification of the superintendency. (For specific program and admission requirements consult the Director of Graduate Studies in Administration and Supervision.)

** Prerequisite: EDU 522 or EDU 573.

GRADUATE COURSES IN EDUCATION

DEPARTMENT OF ADMINISTRATION AND SUPERVISION

502 *The Administration of Pupil Personnel.* (3) S

Administrative problems relating to child accounting, including school census, attendance records and reports, social and economic factors affecting school attendance, and duties and responsibilities of school and non-school personnel and agencies. *Staff.*

602 *Local School Administration.* (3) I, II, S

The organization, management, and control of a local school system, including such problems as federal, state, and local relationships, board of education, pupil personnel, employed personnel, public relations, finance and business management, and school services. *Staff.*

603 *Constitutional and Legal Basis of Public School Administration.* (3) II, S

A study of court decisions to discover the legal principles involved in practical problems of school administration. Prereq: EDU 602, 636 or 630. *Staff.*

604 *School Buildings and Equipment.* (3)

Measurement and evaluation of existing school building facilities, planning new buildings, determining suitable equipment, and financing the building program. Prereq: EDU 636 or its equivalent. *Staff.*

608 *Internship in Educational Administration.* (3) I, II, S

Field experiences are provided for prospective administrators under the cooperative supervision of University personnel and principals, supervisors, and superintendents in Kentucky public school systems. May be repeated to a maximum of six credits. *Staff.*

628 *Field Problems in Curriculum and Supervision.* (3) I, II

A course designed to provide direct experience in dealing with educational problems in field situations. Observations, readings, and research also required. Registration only with consent of instructor. May be repeated to a maximum of six credits. *Ogletree.*

629 *The Elementary Principal.* (3) I, S

Problems involved in the organization and administration of a modern elementary school. *Staff.*

630 *High School Administration.* (3) I, II, S

This course deals with organization, administration, and problems of the modern secondary schools, including such specific problems as school staff, program of studies, records and reports, school-community relationships, school plant, finance, and scheduling. *Staff.*

633 *Leadership Problems in Today's Education.* (3)

The common and persistent problems of public education are analyzed. Insights, procedures, and skills for solutions to these problems are developed. *Staff.*

634 *Effective Educational Leadership.* (3)

The leadership roles, responsibilities, understandings and behavior patterns of effective school principals, supervisors and superintendents. *Staff.*

635 *Business Administration and Finance of Public Education.* (3) II, S

A course for prospective superintendents. Emphasizes school support, including state, local, and federal revenues; budgetary policy; procedures for purchasing, accounting, and reporting costs; management of funds, property, equipment, and supplies; payroll procedures, records, and reports. *Staff.*

636 *State School Administration.* (3) S

Organization, administration, and control of education at the state level, including state-federal and state-local school relationships, state support, control of the material environment, training and certification of teachers, teachers' contracts, tenure, retirement. *Staff.*

639 *Supervision of Instruction.* (3) II, S

Development, purposes, and organization of supervisory programs. Special emphasis on the nature of educational leadership. Consideration of various approaches to supervision with special attention to current in-service educational programs. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

771 *Seminar in Administration.* (3) II, S

A critical study of selected problems in school administration. The course is designed primarily for students who have had some administrative experience. Prereq: EDU 602 and 639. May be repeated to a maximum of six credits. *Staff.*

772 *Seminar in Education.* (1) I, II

A course planned for graduate students majoring in education, given under the direction of the faculty of the College of Education. May be repeated to a maximum of two credits. *Staff.*

785 *Independent Work in School Administration.* (3) I, II

Research on a practical problem in school administration. Open only to students with at least one semester of graduate work in education. Approval of instructor necessary before registration. May be repeated to a maximum of six credits. *Staff.*

792 *Research Problems in Educational Administration.* (3) I, II, S

An independent research course for the study of special problems in educational administration. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Staff.*

793 *Research Problems in Curriculum and Supervision.* (3) I, II

An independent research course. Students confer individually with the instructor. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Ogletree.*

DEPARTMENT OF CURRICULUM AND INSTRUCTION

538 *Advanced Arts and Crafts in the Elementary School.* (3)

Planned to give the elementary teacher an understanding of teaching methods involved in, and construction of, art activities which would enrich the classroom program.

539 *The Elementary Curriculum.* (3)

The philosophy and techniques of curriculum construction and some practical work in construction.

540 *The Analysis and Correction of Reading Disabilities.* (3)

A study of current methods and materials useful in analyzing the problems of disabled readers and giving corrective help. Students will use what is learned in working with children who have less severe reading problems. Special sections will be organized for students in special education. Prereq: EDU 329 or 541, a course in testing, and work in linguistics.

541 *Teaching Reading and Related Language Arts in the Secondary School.* (3)
A study of current methods and materials useful in: (1) teaching reading and related language arts in secondary schools, and (2) improving reading ability in the content areas. Prereq: nine hours of English.

542 *Children's Literature.* (3)
Planned to acquaint students with literature for children, kindergarten through grade 8. Review of interests at different ages. Discussion of types of literature—folklore, modern fairy tales, myths and legends, realistic stories, biography and poetry.

543 *Teaching in the Kindergarten.* (3)
The nature, development and education of the child of kindergarten age. Organization, equipment, curriculum, and procedures used with children of this age. Regular periods are scheduled for observing and participating in the kindergarten.

544 *Utilization of Educational Media.* (3)
Surveys the broad area of educational media with an emphasis on utilization and the advantages and disadvantages of the various media. Provides experience in relating educational technology to productive learning activity. (Same as LS 586.)

545 *Preparation of Instructional Materials.* (3)
Develops a basic pattern for the preparation of a wide variety of instructional materials. Laboratory practice is provided for the production of materials for projected and non-projected use. Source of free and inexpensive materials will be identified and evaluated. Lecture, 2 hours; lab, two hours.

546 *Introduction to Early Childhood Education.* (3)
Survey of early childhood educational programs with emphasis on principles, purposes, values and contemporary problems. A study of current literature and research related to these aspects for developing programs for young children. Lecture, three hours. Prereq: Permission of instructor.

549 *Sociological Aspects of Mass Communication.* (3)
The relationship between the organization of modern society and its communication media: Special emphasis is given to the way in which cultural processes and social change have an impact upon the mass media, and upon the way in which the mass media influence cultural processes and social change. The social-psychological bases of communication are studied within a context of theory and research. (Same as SOC 549). Prereq: 6 hours of sociology.

552-557 *Modern Educational Problems.* (3)
A brief survey of some of the problems in modern education.

560-576 *Modern Educational Problems.* (3 ea.)
A brief survey of some of the problems in modern education.

596 *Science in the Elementary School.* (3)
A background of elementary science usable with children in the first six grades. Includes planning units of work, organizing and using materials, and references, making bibliographies for teachers and children, illustrated materials, and excursions.

606 *Instructional Television in the Classroom.* (3)
Emphasizes the classroom utilization of instructional television. Includes the psychology of listening; problems of evaluation; the writing, producing, and scheduling of school telecasts; and the sources of telecasting for school use. Research studies in the area will be investigated. Three class hours per week.

607 *Programmed Instruction in the Classroom.* (3)
Investigates aspects of programmed instruction in its various levels of complexity. Studies programmed books, "teaching machines," computerized instruction, and the systems approach to instruction. Emphasis is placed upon research in the area. Three class hours per week.

641 *A Study of Research and Theory in Teaching Reading in the Elementary School.* (3)

A systematic study of the research and theory and their application to the teaching of reading in the elementary school. Attention will be given to new developments in the field. Not available for credit to students who have had EDU 372. Prereq: EDU 329 and work in linguistics.

642 *A Study of Research and Theory in Teaching Language Arts in the Elementary School.* (3)

A systematic study of the research and theory and their application to the teaching of listening, oral and written communication, spelling, and handwriting in the elementary school. Attention will be given to new developments in the field. Not available for credit to students who have had EDU 566. Prereq: EDU 329 and work in linguistics.

643 *A Study of Research and Theory in Teaching Reading in Secondary Schools.* (3)

A systematic study of the research and theory and their application to the teaching of reading in the secondary schools. Attention will be given to new developments in the field. Not available for credit to students who have had EDU 568. Prereq: EDU 541 and work in linguistics.

712 *The Elementary School.* (3)

Recent research and modern trends in teaching the skills and content subjects in the elementary school. Planned for supervisors, superintendents, principals, and teachers for better understanding of a modern elementary school.

714 *The Secondary School.* (3)

A course designed to acquaint the secondary teacher, counselor and the administrator with the nature and function of the secondary school.

717 *The Junior High School.* (3)

A study of the unique functions of the junior high school. Scope and sequence of the curriculum, school organization and guidance as related to the young adolescent will be considered. A course for principals, supervisors, teachers.

724 *Organization and Supervision of Student Teaching.* (3)

A course designed for teachers preparing to become supervising teachers. The basic principles apply to both elementary and secondary education. Includes a presentation of the experiences deemed important in developing students into effective teachers.

730 *Problems of the School Curriculum.* (3)

Problems in the field of the school curriculum and in the preparation of instructional materials. Students enrolling in this course are required to leave on file with the College of Education a complete report of each problem studied. May be repeated to a maximum of six credits.

732 *Principles of Curriculum Construction.* (3)

Study of basic principles of curriculum development. Relationship of social and psychological factors to curriculum change. Survey of current approaches to curriculum organization. Consideration of means of curriculum development in school systems.

735 *The Core Program in the Secondary Schools.* (3)

Deals with the philosophical and psychological bases of the core program and gives major emphasis to problems of teaching in the core class. A course designed for teachers, principals, supervisors.

740 *Practicum in Teaching Reading and Related Language Arts.* (3)

Supervised practicum in analyzing problems in reading and related language arts and providing corrective work. Requires six hours per week in practicum with individual children or groups, plus two hours per week in seminar. A high level of knowledge in teaching reading is assumed. May be repeated once to a maximum of 6 credits.

742 *Administration and Supervision of Public School Music.* (3)
A study of current trends in school music, curricula, testing programs, and other supervisory procedures. (Same as MUS 742.)

743 *Advanced Methods and Materials in Music Education.* (2)
Survey and evaluation of new public school music methods and materials.

744 *History and Philosophy of Music Education.* (3)
A historical survey of thought concerning the place and significance of music in the education of the individual and the group. (Same as MUS 744.)

745 *Administration of Educational Media Programs.* (3)
Stresses the operation of educational media programs considering budgeting, training of personnel, duties of staff, sources of materials, and the purchase of equipment. Previews are made of many educational media and attention is given to the special needs of the Instructional Materials Center.

746 *Motion Pictures in Education.* (3)
The history of the educational motion picture. technique in the use of films, educational scenario writing, grading and scoring films, and motion picture appreciation.

749 *Extracurricular Activities.* (3)
The underlying principles and common practices of the co-curricular activities programs as developed in public schools. Home room activities. assembly programs, and clubs are the three major sections of the course; other activities included when necessary.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

780 *Independent Work in Elementary Education.* (2)
An independent work course for students who have done a minimum of 12 semester hours of graduate work including EDU 712 or 629. May be repeated to a maximum of four credits.

781 *Independent Work in Secondary Education.* (3)
An independent work course for students who have done a minimum of twelve semester hours of graduate work including EDU 714 or 630. May be repeated to a maximum of six credits.

790 *Research Problems in Secondary Education.* (3)
An independent research course. Students confer individually with the instructor. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Cierley.*

791 *Research Problems in Elementary Education.* (3)
An independent research course. Students confer individually with the instructor. Prereq: one year of graduate work. May be repeated to a maximum of six credits.

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY AND COUNSELING

519 *The Elementary School Pupil.* (2) I, S
The psychology of the child in the primary and intermediate grades. Prereq: one course in psychology.

520 *The Secondary School Pupil.* (3) II, S
The psychology of the pupil in junior and senior high school. Prereq: one course in psychology.

521 *Introduction to Vocational Rehabilitation.* (3)
Survey of vocational rehabilitation: historical, legal, and administrative aspects of rehabilitation services; survey of rehabilitation services; and the role of the counselor in rehabilitation process.

522 *Educational Tests and Measurements.* (3) I, S
The problems of measurement in the school program, with special emphasis on standardized tests. The construction and use of new-type tests, use and limitations of traditional examinations, marking systems, etc., are also considered.

548 *Educational Psychology.* (3) I, II, S
Application of psychology to the problems of learning and teaching.

550 *The Role of the Teacher and the Principal in Guidance.* (3) I, II, S
A first course for non-specialists; basic principles and practical approaches to guidance for prospective teachers and principals in service. *Staff.*

656 *Methodology of Education Research.* (3) II
A course intended to acquaint the student with the various techniques of research and to aid him in methods of attack on his own particular research problems. Prereq: 12 semester hours in education.

657 *Educational Statistics.* (3) I
A non-mathematical study of the applications of statistical and graphical methods to educational data.

658 *Problems in Educational Psychology.* (3) II, S
A critical survey of the psychological theories and research applicable to educational practices. Prereq: one year of psychology.

659 *Advanced Educational Measurement.* (3) II, S
Theory and application in educational measurement with emphasis on the appropriate selection, administration, and intepretation of standardized tests used in educational assessment. Three class hours per week. Prereq: EDU 522 or equivalent.

660 *Research Design and Analysis in Education.* (3)
A study of the research methodologies applicable in the several aspects of education. Emphasis is on the design of research and analysis of accumulated data. Three class hours per week. Prereq: EDU 657.

664 *Problems in Vocational Rehabilitation.* (3) I, II
A study of actual cases of vocational rehabilitation clients emphasizing the various kinds of disabilities, the functional implication of disability, and the contribution of professional personnel in medical, social, psychological, and vocational areas. Lecture, 2 hours; lab, 2 hours per week. Prereq: EDU 521.

665 *Practicum in Counseling Psychology.* (3) I, II, S
Supervised experience in application of diagnostic and interviewing techniques in a counseling service. May be repeated for a maximum of 12 credits. (Same as PSY 665).

707 *Multivariate Analysis in Educational Research.* (3)
A study of several techniques for the analysis of educational outcomes utilizing multiple variables. Three class hours per week. Prereq: EDU 660 or equivalent.

739 *A Survey of Research in Human Development and Education.* (3) II
A study of the research and principles of education and allied fields which are appropriate to a consideration of education as a development process. Prereq: Master's degree or by permission. *Staff.*

755 *Human Development and Behavior.* (3) I, S

The physiological, sociological, and psychological bases of human behavior with emphasis upon the normal school child in his environment. Findings of research in the behavioral sciences and their implications for the guidance of young persons.

756 *Fundamentals of Guidance.* (3) I, II, S

A survey of the educational, sociological, and psychological foundations of guidance in schools and colleges. Study of the basic philosophy and nature of guidance services, organization and administration of guidance programs, the role of the guidance counselor, and the relationship of guidance services in the total curriculum.

758 *Group Guidance Problems and Practices.* (3) II, S

Providing for the common needs of groups of students in making more effective educational, occupational, social, and personal adjustments. Special emphasis is given to the selection, organization, and effective use of group guidance materials and techniques.

759 *Identifying and Providing for Individual Student Needs.* (3)

Research studies and reports on individual differences in the physical, intellectual, social, and emotional development of students, and of ways that have proved effective in meeting individual needs, especially in secondary schools. *Staff.*

760 *Counseling Theory and Practice.* (3) II, S

A study of the basic theories, principles, and techniques of counseling and their applications to counseling in schools and colleges. Practice in the techniques of interviewing, and the use of psychological tests, observation, records, case studies, and other procedures in the counseling process. Prereq: EDU 755, 756.

761 *Supervised Practice in Counseling.* (3) I, II, S

Supervised practice in counseling in the educational setting in which the student plans to work. Requires 8 hours a week in actual counseling plus a minimum of 2 hours weekly in seminar. Prereq: EDU 755, 756, 760, and at least 6 graduate hours in Psychology. *Staff.* May be repeated to a maximum of nine credits.

762 *Organization and Administration of Guidance Services.* (3)

A study of the problems of supervision, staffing, finances, effective inter-personal relationships, community participation, in-service education and evaluation of the guidance program. Includes supervised experience in the planning and administration of guidance services. Prereq: Master's degree in counseling and guidance.

763 *Research and Evaluation in Guidance.* (3)

Research methodology applied to the evaluation and interpretation of guidance services. May include analysis and interpretation of test data from schools and school systems, emphasizing the application of test data to local school problems and the organization of reports.

764 *Using Occupational and Educational Information in Counseling and Guidance.* (3)

Collection, evaluation, organization, filing and use in counseling of current data. Supply and demand, working conditions, trends, entrance requirements, job families, and career fields. Schools, colleges and other agencies that prepare for advancement in productive careers.

765 *Independent Work in Counseling and Guidance.* (2)

An independent work course for advanced graduate students who desire to investigate special problems in counseling and guidance. Prereq: one year of graduate work in Counseling and Guidance, including EDU 755 (or PSY 610), and approval of instructor. May be repeated to a maximum of four credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

777 *Seminar in Counseling and Guidance.* (3)

A seminar for advanced graduate students. Designed to develop deeper understandings and clearer insights in guidance and counseling, through critical examination and discussion of pertinent theories, research reports, case records and counseling experiences. Prereq: 36 hours in Counseling and Guidance, including Practicum (EDU 761 or PSY 665), approval of adviser and staff.

782 *Independent Work in Educational Psychology.* (3) I, II, S

An independent work course for students who have done a minimum of 12 semester hours of graduate work including Education 522, 520, or 658. May be repeated to a maximum of six credits.

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

The Department of Health, Physical Education, and Recreation offers graduate work toward the Master of Arts or the Master of Science with a major in Physical Education. Candidates may select, subject to the approval of the Department, either of two plans in pursuing their graduate program. Students must submit evidence of good undergraduate preparation in the area. In general, twenty-four hours credit will suffice.

For Plan A, see the general information at the front of this publication.

The modified Plan B has the same minimum requirements as Plan A except that six or more semester hours of course work may be substituted for a thesis and a reading knowledge of a modern foreign language is not required of candidates in the Department. Of the thirty hours of graduate credit indicated above in the modified Plan B, eight hours must be in a subject-matter area other than Physical Education and Education. At least 15 hours must be in courses numbered 600 or above in Physical Education. The candidate under this plan must also present a major paper approved by his major professor and the director of graduate study as partial fulfillment of his requirements. This major paper may be developed as a part of a particular course requirement, or it may be done as an independent project. A student may follow this plan only with approval of the Department.

Candidates who are not graduates of the University of Kentucky are required to teach under supervision at least one activity class during their residence. The purpose of this regulation is to provide staff members an opportunity to evaluate their teaching and leadership ability.

In order to meet the needs and interests of graduate students, the Department offers specialization in the following areas:

1. Administration of Physical Education
2. Athletics in Education
3. Physical and Health Education
4. Dance in Education

Each area of emphasis is organized around a central core which contains fundamental and basic knowledge generic and essential to all areas. The following core curriculum is, therefore, recommended for graduate students:

741—Current Studies and Trends ..... 3 hrs.

650—Curriculum and Program Development ..... 3 hrs.

770—Seminar ..... 2 hrs.

RECREATION: Students interested in Recreation may choose one of the following options: Outdoor Recreation, Recreation in Rehabilitation and Mental Retardation programs, Commercial Recreation and general agency administration.

Each area of emphasis is organized around a central core which contains fundamental and basic knowledge generic and essential to all areas, including these courses:

583—Interpretation of Leisure and Recreation

685—Administrative Practices

741—Current Studies and Trends

780—Problems in Recreation

For details on the graduate programs of the various areas of specialization, write the Department of Health, Physical Education, and Recreation, Graduate Division.

COURSES FOR MEN AND WOMEN OPEN TO UPPER DIVISION AND GRADUATE STUDENTS

471 *Outdoor Education Through Camping.* (2)
The theory and practice of the use of camping as an adjunct to the classroom in achieving educational objectives. Prereq: PE 281 or consent of instructor.

482 *Administration of Intramural Activities.* (2)
To teach the conduct of sports related programs such as intramurals, extramurals, sports clubs and comparable activities; lecture, recitation, and practice in methods of organizing and administering intramurals and other activities. Lecture, one hour; lab, 2 hours per week.

491 *Dance in Education.* (3) II
An introduction to the creative approach to dance for elementary, secondary, and college levels. The principle of kinesthetics and rhythmical forms applied to the practice of fundamental movement techniques. Two hours lecture and four hours laboratory. Prereq: PGY 206, PE 572, and a beginning course in dance, or consent of instructor. *McCall.*

507 *Driver and Traffic Safety Education.* (3) II, S
Analysis of traffic accidents, attitude factors, essential knowledge of automobile operation and traffic laws and regulations. Laboratory experience is devoted to improvement of the students' driving skill and an understanding of how to structure laboratory lessons in the dual control automobile. *Gardner.*

520 *Physiology of Exercise.* (3) I, II
A comprehensive survey of the physiological and clinical aspects of exercise. Lectures, demonstrations, three hours. Prereq: ANA 206, and PGY 206, 207, or equivalent; and consent of instructor. *Jokl, Teraslinna.*

540 *Organization and Administration of Physical Education.* (3) I, S (odd years)

Policies and procedures of administration on the secondary school and collegiate levels. Special emphasis on construction and care of facilities, equipment, and supervision of personnel. Three hours per week. ***Clay, Carr.***

541 *Coaching Advanced Basketball.* (2) I, S

Lecture and recitation on the theory and practice of team play in basketball. Special emphasis is placed upon systems of offense and defense. Two hours per week. Prereq: PE 141, or consent of instructor. ***Staff.***

542 *Coaching Advanced Football.* (2) II, S

Lecture and recitation on the theory of football. Special emphasis is placed upon generalship, signal systems, scouting, and conditioning of players. Two hours per week. Prereq: PE 142, or consent of instructor. ***Staff.***

545 *Introduction to Tests and Measurements.* (3) II

The construction and grading of essay and objective tests, construction and analysis of achievement tests, and testing and measuring in health and physical education. Two hours lecture and two hours laboratory per week. ***Gruber, Kirkendall, Reece.***

572 *Kinesology and Its Application.* (3) I

A study of basic principles of bodily movement and their application to sports, rhythmical activities and the correction of functional defects. Three hours lecture and two hours laboratory. Prereq: ANA 206 and PGY 206, 207. ***Reece.***

573 *Administration and Organization of Recreation.* (3) II, S

This course is designed to equip students and community leaders with workable procedures for developing and operating recreation programs in communities of various sizes and with varying political and social structures. ***Verhoven.***

575 *Interpretation of Leisure and Recreation.* (3) I, S

Designed to provide students interested in recreation as a profession, as an adjunct to other work, or as informed citizens with a basic understanding of the significance of leisure and the objectives of recreation. ***Kauffman, Verhoven.***

592 *Choreography for Groups.* (2)

The building of dances for groups in Ballet, Modern, and Theater dance forms. Lecture, one hour; lab, two hours per week. Prereq: PE 491. ***McCall.***

595 *Folk Dance Leadership for School and Community.* (2) S

Philosophy, background and methods of folk dance for schools and communities. Leadership, participation and program planning with special emphasis upon field work with community groups.

COURSES OPEN TO GRADUATE STUDENTS ONLY

644 *Research and Its Application.* (3) I, S

The theory and practice of tests and measurements in the field of health and physical education. Two hours lecture and two hours laboratory. ***Gruber.***

650 *Curriculum and Program Development.* (3) I, S (even years)

A study of fundamental principles basic to the development of the over-all curriculum in physical education with special emphasis upon the proper selection and organization of physical education activities to meet the education and recreational needs of all students. Three hours per week. Prereq: PE 540, 343, 344. ***Reece.***

651 *Facilities, Construction, and Equipment.* (2) S

Principles and standards for maintaining facilities, and planning construction; purchase and care of equipment. Prereq: PE 540. ***Seaton.***

685 *Administrative Practices in Recreation.* (3) I, S

A study of administrative practices concerned with policy determination, public relations, personnel practices, and routine details that constitute the functions of the chief recreation officer and his staff associates. Three hours per week. Prereq: PE 580, or consent of instructor. *Verhoven.*

690 *Organization and Administration of Dance in Education.* (3) II, S (odd years)

Special emphasis is placed upon the organization and administration of the program in dance to meet the needs of students from elementary through college levels. Some attention is given to dance production, festivals and social dance functions in schools. Three hours per week. Prereq: PE 491, 592, 595. *McCall.*

720 *Sports Medicine.* (3) II, S (even years)

A study of the basic areas covered in sports medicine with readings and discussions of current international trends in the research and practice in this field. Three hours per week. Prereq: Twelve semester hours' credit in the field of biological science and consent of instructor. *Jokl.*

741 *Current Studies and Trends in Health and Physical Education.* (3) I, S (even years)

A study of modern trends in health and physical education and standards of evaluation in relation to the history of the various systems including a review of the principles and objectives. *Seaton, Kirkendall.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

770 *Seminar.* (2) I, II, S

A review of current literature in the field. Two hours per week. May be repeated to a maximum of four credits. *Teraslinna.*

780 *Problems in Recreation.* (2) II, S

Current problems in recreation are identified and analyzed by the application of appropriate recreation techniques. Designed for recreationists, school people, and community workers. *Verhoven.*

782 *Problems in Physical Education.* (3) I, S

For school administrators and directors of physical education. Students work on individual problems applicable to their situation and interests, as well as upon general school problems. *Graduate Faculty.*

783 *Problems in the Administration of Athletics.* (2) II, S

For athletic directors, supervisors, and athletic coaches. A study of representative athletic administration procedures for colleges and public school systems. Business management is also stressed. Two hours per week. *Clay.*

DEPARTMENT OF HIGHER AND ADULT EDUCATION

Special Note: The faculty in the Department of Higher and Adult Education is planning a graduate program through the post doctoral level which hopefully will be approved by fall, 1969. The doctoral program will be available to those qualified students who plan careers (major or minor areas) in college administration and teaching. Each major will be encouraged to develop a strong outside minor in his discipline, e.g., history, sociology, psychology, speech.

Basically, the doctoral program will center around four comprehensive seminars, a supervised internship, and selected courses from other departments. There will be limited Master's degree programs in adult education, student personnel, and teaching in the junior college.

New special purpose courses such as The Junior College and Adult Education will be developed to serve those who want to schedule one or two courses. Present courses listed in the Department will be revised. Clinic workshops and post doctoral seminars will be available for the summer session.

99 *Orientation Seminar for Graduate Students.* (0)
An orientation course for students who are entering the Graduate School for the first time.

559 *Modern Educational Problems: Community Organization in Adult Education.* (3)
Problems of community organizations as they affect the adult life of the citizens of the community served.

718 *Trends in Higher Education.* (3)
A survey of modern tendencies in higher education; scope and development, objectives, organization, administration, curricula, finance, faculty and student personnel. Designed primarily for prospective college administrators, teachers, and registrars. *Staff.*

719 *Teaching at the College Level.* (3)
A study of all phases of instruction at the college level. The course will include methods and principles of teaching, utilization and materials in teaching, a consideration of the teaching-learning process as it relates to the individual student, and the evaluation of student progress. A comprehensive course for prospective college teachers.

733 *Technique and Professional Work of the Registrar.* (3) I, II, S
A comprehensive study of the work of the registrar in institutions of higher education, including the history, literature, and present-day tendencies; rules of the University, recommendations of the American Association of College Registrars. May be repeated to a maximum of six credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

799 *Research Problems in Higher Education.* (3) I, II, S
An independent research course for the study of special problems in higher education. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Staff.*

DEPARTMENT OF SOCIAL AND PHILOSOPHICAL STUDIES IN EDUCATION

532 *Intergroup Relations.* (3) S
Analysis of relationships between groups which differ in religious, ethnic, or socio-cultural backgrounds; the development of educational and social techniques for reduction of tensions. (Same as SOC 532). May be repeated to a maximum of six credits. *Staff.*

551 *The Teaching of Higher Level Study Skills.* (3) I, S
A course designed to demonstrate the teaching of study skills (including remedial work) in secondary schools. One approach to teaching these skills will include the study problems of college students. *Staff.*

640 *Philosophy of Education.* (3) I, II
An advanced course dealing with the philosophy of democratic education and applications to some of the larger educational problems of today. Prereq: 12 semester hours in education. May be repeated to a maximum of six credits.

645 *Foundations in Education.* (3) I, S
An intensive study in various foundational fields which contribute to the development of educational theory and practice. May be repeated to a maximum of six credits.

649 *Review of Current Educational Literature.* (3) II, S
An extensive study of current educational literature as found in educational periodicals. Prereq: 12 semester hours in education.

650 *General History of Education.* (3)
A survey of the history of education from the Greek period to the present.

651 *History of Education in the United States.* (3)
A history of the growth and development of education in the United States from earliest Colonial times to the present, including recent movements and trends. *Hartford.*

652 *History of Educational Thought.* (3) I, S
A study of the lives and writings of the world's educators to acquaint the student with their major contributions to society and education.

655 *Comparative Education.* (3) II, S
Comparisons of modern national systems of education.

661 *Educational Sociology.* (3) II, S
A course in sociological foundations of education. (Same as SOC 661).

725 *Advanced Problems in Philosophy of Education.* (3)
A critical study of philosophical problems which relate to present day education. Prereq: teaching experience and 6 semester hours in philosophy of education.

750 *Problems in Educational Sociology.* (3) S
An advanced course in the application of sociological findings to education including consideration of Southern regional problems and potentialities. Prereq: 12 semester hours of graduate work including EDU 661 or equivalent. (Same as SOC 750.)

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

773 *Seminar in Foundations of Education.* (3) S
A critical study of selected problems in the foundations of education areas.

778 *Seminar in History of Education in Kentucky.* (3) II, S
A seminar for graduate students in education who are interested in developing a background and perspective upon educational problems by study of the history and development of education in Kentucky.

783 *Independent Work in the Philosophy of Education.* (3) I, II, S

An independent work course for students who have done a minimum of 12 semester hours of graduate work, including EDU 640, 652, and 661. May be repeated to a maximum of six credits.

784 *Independent Work in History of Education.* (3) I, II, S

Independent work problems and topics for advanced students in history of education. May be repeated to a maximum of six credits.

DEPARTMENT OF SPECIAL EDUCATION

500 *Speech Analysis and Perception.* (3) I

Physics of sound; acoustic and structural properties of speech and their relationship to speech perception; analysis of speech intensity, fundamental frequency, wave composition, and time (rate, duration, and transitional change).

501 *Speech and Language Development.* (3) II

The normative aspects of speech and language acquisition; application of linguistic and learning theory concepts; communication in lower animals; language and cognition.

505 *Education of the Trainable Mentally Retarded.* (3) II, S

A study of modern classroom techniques for working with the trainable, or severely mentally retarded. Private and public day and residential school programs are considered. Attention is given to educational significance of multiple disabilities of retarded children.

525 *Education of the Orthopedically and Neurologically Handicapped.* (3)

A study of educational techniques, materials, and equipment used in teaching crippled, brain-injured and chronically ill children. Curriculum for both classroom and individual clinical teaching is included.

526 *Education of the Educable Mentally Retarded.* (3)

A study of modern classroom techniques for working with the educable, or mildly mentally retarded. Major emphasis is on curriculum development and teaching techniques.

527 *Survey of Physical and Neurological Defects.* (3)

A survey of causes, treatment, and educational implications of physical and neurological disabilities in school age children. Attention given to rehabilitation and life adjustment problems of individuals with single and multiple handicaps.

530 *The Nature and Needs of Retarded Children.* (3) I, II, S

A critical examination of pertinent research in reference to the educational, physical, and psychological nature and needs of the educable and trainable mentally retarded child, including interpretation of psychological tests. Evaluation of the physical, social, emotional and mental characteristics of the retarded, to assist the classroom teacher to recognize the social potential of each child to the degree that the child with retarded mental development may become less of a burden to himself and society.

558 *Modern Educational Problems: Education of Handicapped Children.* (3)

Procedures to be used in the education of children who are handicapped physically, mentally, or emotionally. Attention is given to work with individual children as well as with groups.

577 *Speech Pathology: A Survey.* (3) I, S

An introduction to the nature, causes, and treatment of the major disorders of speech: articulation, voice, cleft palate, hearing, cerebal palsy and aphasia. Prereq: PSY 104 and 106, or 210.

578 *Speech Pathology: An Introduction to Therapy.* (3) II, S
Observation and discussion of and limited supervised experience with therapeutic techniques and procedures of speech therapy. Prereq: PSY 577.

579 *Stuttering.* (3) II
The nature, causes, and treatment of stuttering, with emphasis on therapeutic procedures. Prereq: PSY 550. (Same as PSY 579).

583 *Speech Mechanisms.* (3) I
A detailed investigation of the speech musculature: respiration, phonation, resonation, and articulation. Voice disorders and cleft palate will be given special emphasis. Prereq: PSY 550.

584 *Introduction to Clinical Audiology.* (3) I
Topics covered are the auditory stimulus, air and bone conduction thresholds, masking, speech audiometry and auditory rehabilitation. Prereq: PSY 550.

587 *Audiometry.* (3) II, S
Methods and techniques for evaluating the hearing of large samples (school children, industry). Study of test instruments, calibration and variables in testing procedures. Essentials of hearing conservation. Prereq: PSY 577 or consent of instructor.

591 *Advanced Clinical Methods for the Aurally Handicapped.* (3) II, S
Principles and methods of speech and hearing therapy including speech reading, auditory training, speech conservation and hearing aid counseling for children and adults. Prereq: PSY 562 or equivalent.

592 *Introduction to Hearing Disorders.* (3) I
Types of hearing loss. Classification of organic hearing disorders. Nonorganic hearing disorders. Psychological effects of impaired hearing. Differential diagnosis. Prereq: ED 584.

610 *Educational Evaluation of Exceptional Children.* (3) I
An intensive study of, and laboratory experience in, the assessment of educational problems of exceptional children. Special emphasis is given to the relationship of physical, intellectual, emotional and social handicaps to performance in the individual or group setting. Class hours per week, 2; lab hours per week, 2. Prereq: EDU 522 and consent of instructor.

611 *Educational Remediation of Learning Disabilities of Exceptional Children.* (3) II
The study of, and laboratory experience in, the remediation of educational problems of exceptional children. Attention is given to the amelioration of learning disabilities in individual cases. Class hours per week, 2; lab hours per week, 2. Prereq: EDU 610 or consent of instructor.

613 *Articulation and Articulation Disorders.* (3) II
Research and clinical findings on articulation and articulation disorders. Topics include articulation testing and prediction, variables related to articulation performance and articulation programming (therapy). Three class hours per week.

614 *Voice and Voice Disorders.* (3) I
Research on voice and voice disorders. Topics include a review of voice physiology and organic and functional voice disorders. Three class hours per week.

617 *Cleft Palate and Cerebral Palsy.* (3) I
Description, assessment and interdisciplinary management of organic speech disorders, particularly those associated with orofacial anomalies and dysarthria. Review of relevant research. Three class hours per week.

627 *Practicum in Speech Therapy.* (3) I, II, S
Practical case work in speech therapy in speech clinic, hospitals, and public schools. Training in diagnostic examination, case history methods, and group therapy. Prereq: PSY 550 and 551. May be repeated for a maximum of 6 credits.

647 *Disorders of Language.* (3) II
Emphasis on adult aphasia and developmental language disabilities, theories, research findings, assessment procedures, and therapy approaches. Three class hours per week. (Same as PSY 647.)

702 *Seminar in Speech Pathology.* (3)
Advanced coverage of the clinical and research literature on the etiology, description, assessment, and management of specific speech and language disabilities. The semester topic will be rotated. Topics will include stuttering, developmental language disabilities, cleft palate, cerebral palsy, etc. May be repeated twice for a maximum of 9 hours.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar in Education of Exceptional Children.* (3) I, II, S
Study of philosophy, principles, trends, and research in education of exceptional children. Students will carry on an extensive study of a problem dealing with education of the exceptional child.

DEPARTMENT OF VOCATIONAL EDUCATION

AGRICULTURAL EDUCATION

580 *Teaching Vocational Agriculture.* (15) I, II
Preparation for teaching of agriculture. About one-half of the course is practice. ***Binkley, Bruce, Bayer, and supervising teachers.***

581 *Adult-Farmer Schools and Young-Farmer Courses in Agriculture.* (3) I, II
A general introduction to adult-farmer schools and young-farmer courses with some observation of work in both of these fields. ***Binkley, Cox, and supervising teachers.***

582 *Problems in Agricultural Education.* (3) I, II, S
Class work on current problems in agricultural education common to special groups of students (not individual-problems work). (May be repeated once to a maximum of 6 credits.) ***Binkley and Staff.***

585 *Farm Practice Supervision.* (1) I, II, S
Practice and directed study in supervising farming programs in vocational agriculture. ***Binkley.***

670 *Method of Teaching Vocational Education.* (3) S
The principles of method applied to teaching in the field of vocational education. Prereq: experience in teaching vocational education. ***Binkley.***

671 *Teaching Prevocational Agriculture.* (3)
Aims, purposes, and methods of teaching prevocational agriculture. Each student works out the content of a course, including selecting the teaching materials. ***Staff.***

672 *Determining Content in Vocational Agriculture.* (3) S
Interpretation of local data as a basis for course building. Each student works out the content of a four-year course in vocational agriculture. ***Bruce and Luster.***

675 *Modern Problems in Agricultural Education.* (3) I, II, S
Class work (not individual-problem work) on modern problems in agricultural education. May be repeated to a maximum of nine credits. *Binkley.*

677 *Advanced Problems in Agricultural Education.* (3) I, II, S
Specific problems selected according to the needs of the individuals. *Staff.*

678 *Selecting Teaching Materials.* (3) S
Selection of specific references and other teaching materials to be used in the teaching of vocational agriculture. *Luster and Bruce.*

679 *Adult-Farmer Schools.* (3) S
Preparation for teaching adult farmers; organization of adult-farmer schools, curriculum content, method of teaching, and follow-up work. *Bruce and Cox.*

680 *Directing Farm Practice.* (3) S
Supervised farming as a method of teaching; standards, planning, supervision, and records. *Binkley.*

681 *Teaching Farm Shop.* (3) S
A study of necessary content for shop, plans for securing and equipping the shop, and methods of teaching farm shop. *Cox.*

682 *Young-Farmer Schools.* (3) S
Content and method of teaching young-farmer courses in vocational agriculture. *Cox.*

795 *Research Problems in Agricultural Education.* (3) I, II, S
A continuation of EDU 794. May be repeated twice to a maximum of nine credits. *Staff.*

BUSINESS EDUCATION

511 *Teaching Secretarial Subjects.* (3) II, S
Special techniques and devices for teaching shorthand, typewriting and secretarial office practice. Required of business education majors. *Dickinson.*

512 *Teaching Bookkeeping and Accounting.* (3) I, S
Methods materials, and techniques used in the teaching of bookkeeping and accounting. Required of business education majors. *Musselman.*

513 *Teaching Office Practice, Clerical Practice, and Office Appliances.* (3) I, II, S
Methods and materials in teaching office practice and procedures, clerical practice and the various machines commonly used in business offices. *Dickinson.*

514 *Teaching General Business Subjects in the Secondary Schools.* (3) S
The aims and purposes of the general business course are studied. Analysis is made of the objectives of the general subjects, and methods and materials used in teaching them are emphasized. *Musselman.*

605 *Teaching Consumer Courses in the High School.* (3) I, S
Methods, materials and techniques of teaching high school pupils the various aspects of consumer education. Emphasis is placed on procedures and the student should have a background of training in economics before taking the course. *Musselman.*

615 *Problems in Business Education.* (3) I, II, S
A study of advanced problems of interest to business teachers such as testing in business subjects, guidance, job studies, placement and follow-up, equipment, and supervision. May be repeated three times to a maximum of 12 credits. *Musselman, and Dickinson.*

618 *The Social Business Subjects in High School.* (3) I
An examination of the various social business subjects to determine their contribution to the objectives of business education. *Musselman.*

621 *The Business Curriculum.* (3) II, S
A study of business subjects offered in the high school to determine their content and the place each should occupy in high school curricula. A course of study is developed for each subject. *Musselman.*

622 *Business Education in Colleges and Universities.* (3) S
Consideration of the problems pertaining to the teaching of business subjects at the college level. Consideration is also given to the development of curricula to meet teacher certification requirements in various states. *Musselman and Dickinson.*

623 *Administration and Supervision of Business Education.* (3) II, S
Duties and responsibilities of city and state supervisors, department heads, and others engaged in directing business education. *Musselman and Dickinson.*

626 *Classification and Possible Use of Community Resources in Business Education.* (3) I
Course provides for community analysis, and the development of possible ways and means to supplement the business education course in the secondary school with a study of vital community resources. *Musselman.*

774 *Seminar in Business Education.* (1) I, II, S
A study of current literature in business education with special reference to trends in this field. May be repeated once to a maximum of two credits. *Musselman and Dickinson.*

786 *Independent Work in Business Education.* (3) I, II, S
An independent work course for students who have done a minimum of 12 semester hours of graduate work, one-half of which must have been in business education. May be repeated once to a maximum of six credits. *Musselman and Dickinson.*

BUSINESS AND OFFICE EDUCATION

445 *Office Administration and Services.* (3)
A study of the theory, principles, and techniques of modern office administration and services with emphasis on data processing systems and information handling.

519 *Records Management and Control.* (3)
Underlying principles and procedures of records management; information storage and retrieval systems; integration and control of records systems and programs, with case study applications on the computer. Lecture, three class hours per week. Prereq: BOE 219, or consent of instructor.

556 *Business Research Reports.* (3)
Current problems in selected interest areas investigated by various research procedures with major emphasis placed upon sources of data, compilation and arrangement of data, documentation, bibliography, and effective presentation. Prereq: BOE 117 or its equivalent.

DISTRIBUTIVE EDUCATION

515 *Problems in Distributive Education.* (2) I, II, S
Problems in teaching vocational distributive education in day, part-time, and evening schools. The problems are selected in accordance with the needs and desires of the students. May be repeated to a maximum of six credits.

516 *Problems of the Coordinator in Industrial and Distributive Education.* (2) I, II, S

A course for coordinators of Industrial and Distributive Education, including planning of local programs, use of advisory committees, selection and arrangement of teaching materials and over-all planning and operation of the program. May be repeated once to a maximum of four credits.

517 *Determining Teaching Content in Distributive Education.* (2) I, II, S

Course construction in the field of distributive education. This course is planned to meet the needs of persons engaged as instructors in the field of distributive education. May be repeated to a maximum of six credits.

528 *Technique of Teaching Distributive Education.* (2) I, II, S

A study of the methods of teaching as applied to distributive education. The purpose of the course is to train prospective teachers to teach in the field of distributive education. May be repeated to a maximum of six credits.

HOME ECONOMICS EDUCATION

586 *Technique of Teaching Home Economics.* (3) I, II

A study of methods of teaching as applied to home economics. Prereq: HE 227, 261; EDU 520.

588 *Adult Education in Home Economics.* (3) I, II, S

Problems in teaching vocational homemaking in day, part-time, and evening schools. Prereq: EDU 586; Concur: EDU 362.

590 *Problems in Home Economics Education.* (3) S

Problems in teaching home economics for high school students and adults. The course may include such subjects as teaching in, and supervision of, the school community cannery and the teaching of housing. May be repeated twice to a maximum of nine credits.

683 *Current Problems in Home Economics Education.* (3) II, S

Recent developments in home economics education. Prereq: EDU 586 and 362; teaching experience.

684 *Modern Trends in Home Economics Education.* (3) I, S

A basic course for students in home economics education. The course includes the development of home economics education and modern trends in curriculum, methods of teaching, and evaluation.

685 *Home Economics Curriculum Construction.* (3) S

A study of the underlying principles of curriculum building for junior and senior high school and adult education in home economics. Prereq: EDU 586 and 362.

686 *Evaluation in Home Economics Education.* (3) I, S

A course to acquaint teachers of home economics with techniques used in measuring attainment in home economics in the junior and senior high school and college. Prereq: teaching experience.

687 *Home Economics Supervision.* (3) I, S

A course planned primarily to help prepare teacher-trainers and supervisors of home economics education. Prereq: EDU 586 and 362; experience in teaching; approval of instructor.

775 *Seminar in Home Economics Education.* (3) I, II, S

Individual investigations and reports on special problems in home economics education. May be repeated twice to a maximum of nine credits.

787 *Independent Work in Home Economics Education.* (3) I, II, S
An independent work course for students who have done at least 12 semester hours of graduate work, one course of which must have been in home economics education. May be repeated once to a maximum of six credits.

INDUSTRIAL EDUCATION

422 *Organization and Operation of Business and Industrial Education Programs.* (3) I, II, S
Training in the organization and operation of business and industrial education training programs, including theory and practice.

423 *Supervised Work Experience in Industry or Business.* (3) I, II, S
For students planning for careers as vocational industrial educational training directors. Includes education and training practices under the supervision of college and plant personnel. May be repeated three times to a maximum of 12 credits.

518 *Methods in Industrial Education.* (2) I, II, S
The most approved methods in instructional management, including lesson planning, in the field of vocational industrial education. May be repeated once to a maximum of four credits.

524 *Modern Industrial Analysis.* (2) I, II, S
Modern industrial organizations; trends in industrial educational policies; the proper approach to and analysis of these problems as they affect the industrial vocational teacher.

529 *Evaluation in Industrial and Distributive Education.* (2) I, II, S
The theory and practice of standardized, classroom, and performance testing as a means of measuring student achievement. Opportunity to practice will be provided in keeping with each teacher's work assignment. Prereq: Must be employed as teacher in Trade or Distributive Education.

534 *Organization and Operation of Part-Time and Evening Classes.* (2) I, II, S
A course for administrators, coordinators, and teachers in part-time and evening industrial education. Covers the duties of a coordinator in cooperative training programs.

535 *Principles and Philosophy of Industrial Education.* (2) I, II, S
A course planned primarily for the advanced student in industrial education. It covers the general philosophy of vocational education as it relates to the problems and principles of industrial education. May be repeated once to a maximum of four credits.

536 *Surveys in Industrial Education.* (2) I, II, S
This course deals with the basic methods and techniques used in making a survey to determine the needs for trade and industrial education. Emphasis is placed on gathering, evaluating, and interpreting the data.

537 *Special Problems in Industrial Education.* (2) I, II, S
The supervised study of approved problems in industrial education on a research basis.

VOCATIONAL EDUCATION

523 *Vocational Guidance.* (2-3) I, II, S
A study of the philosophy of guidance, aims and purposes of vocational guidance, individual student inventory (as revealed by tests, surveys, records, case studies, interviews, and observations), and counseling techniques. Emphasis is given to securing and using occupational information, student guidance, placement, evaluation of occupational performance, and organizing and administering vocational guidance programs.

693 *Supervision in Vocation Education.* (3) I, II

A course for supervisors of programs in vocational education. The course includes principles, practice, and projects in supervision. Prereq: Two years of teaching experience in vocational education and EDU 687.

694 *The Administration of Vocational Education.* (3)

A course designed for superintendents, high-school principals, and other administrators. Its purpose is to train for administering and supervising vocational education in schools.

695 *Special Problems in Vocational Education.* (3) I, II, S

An independent work course for students interested in vocational education. Students make individual investigations and report on special problems. ***Binkley and Staff.***

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)

May be repeated indefinitely.

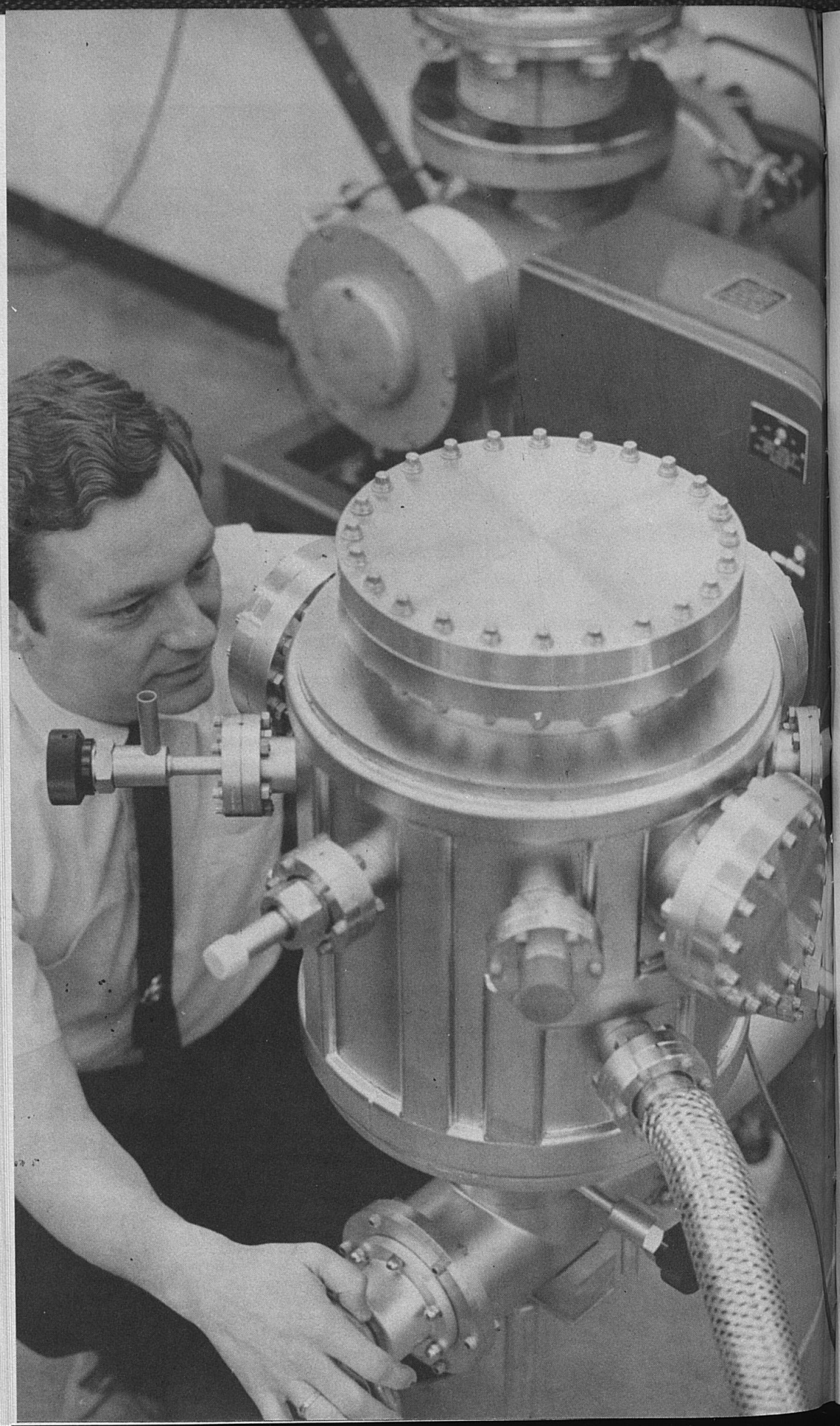
776 *Seminar in Vocational Education.* (2) I, II, S

A critical study of selected problems in vocational education. The course is open only to students with experience in the field. May be repeated once to a maximum of 4 credits.

794 *Research in Vocational Education.* (3) I, II, S

Individual problems of importance to vocational education.


C. DICKEY HALL



V. ENGINEERING

Requirements for Advanced Degrees in Engineering

(See also pages 13-17)

THE MASTERS' DEGREES IN ENGINEERING. The masters' degrees in engineering may be obtained by satisfying the following requirements:

1. Twenty-four semester hours in graduate courses with an average standing of 3.0 or better.
2. An acceptable thesis.
   (With departmental approval, a student may substitute six credits of graduate level course work for the thesis.)
3. Two-thirds of the work must be in the major subject.
4. There is no language requirement for these degrees.

The candidate must hold the corresponding Bachelor of Science degree in engineering or the equivalent from this institution or from another engineering school of recognized standing. A thorough working knowledge of chemistry, physics, and mathematics is necessary. The degrees offered are Master of Science in Agricultural Engineering, Master of Science in Chemical Engineering, Master of Science in Civil Engineering, Master of Science in Electrical Engineering, Master of Science in Engineering Mechanics, Master of Science (major in Engineering Mechanics), Master of Science in Mechanical Engineering, Master of Science in Metallurgical Engineering, Master of Science in Nuclear Engineering.

REQUIREMENTS FOR THE PH.D. DEGREE

Doctoral work is offered in Agricultural Engineering, Civil Engineering, Electrical Engineering, Engineering Mechanics, Mechanical Engineering, and Metallurgical Engineering. See the general requirements for the degree of Doctor of Philosophy as listed on page 22 of this bulletin.

One modern foreign language is required for the Ph.D. degree in Engineering.

AGRICULTURAL ENGINEERING

COURSES FOR AGRICULTURAL STUDENTS

400 *Farmstead Planning and Mechanization.* (3) I

Analysis of systems for handling of feed, water, and waste products in agriculture. The processing and storage of farm products. Farmstead layout and design. Structural and environmental design. Lecture, two hours; laboratory, two hours. Prereq: Junior standing or consent of instructor. *Walker, White.*

410 *Farm Power and Machinery.* (3) S

A study of farm tractors and implements. Operating principles of valves, carburetion, ignition, and lubrication of the engine. Use and care of selected tractor-mounted implements. Emphasis on maintenance. Class and laboratory work on tractors and implements. Lecture, two hours; laboratory, two hours. *Young.*

430 *Farm Water Management.* (3) I
Elementary surveying, mapping, and determination of areas of farm land; consideration of precipitation, runoff, and soil erosion relationships; planning terraces, waterways, drainage systems, and farm reservoirs. Lecture, two hours; lab, three hours. ***Brooks.***

440 *Dairy Equipment.* (2) II
Engineering principles involved in the construction, operation, and management of machinery and equipment used in processing dairy products. Lecture, two hours. ***Parker.***

442 *Farm Electrification.* (3) II
Study of the various aspects of farmstead electrification including the fundamentals of farmstead wiring and the selection, operation and economics of farm electrical equipment. Special attention given to materials handling and crop processing equipment. Lecture, two hours; lab, two hours. Prereq: Junior standing or consent of instructor. ***White.***

450 *Special Problems.* (1-3) I, II, S
An intensive study of some phases of Agricultural Engineering in which the student is particularly interested. Approval of the instructor is required. May be repeated to a maximum of six credits. ***Staff.***

506 *Greenhouse Design, Management, and Environmental Control.* (3)
Functional requirements of a greenhouse and the physical laws influencing these requirements. The influence of structural, physical, and biological factors on the environmental conditions will be emphasized. (Same as HOR 506). Lecture, two hours; lab, two hours. Prereq: HOR 512 and consent of instructor. ***Walker.***

COURSES FOR ENGINEERING STUDENTS

405 *Properties of Soils and Biological Materials as Related to Engineering.* (3) I
A study of the properties of soil and biological materials which are needed in the engineering design of systems to produce, store, and process agricultural products. Lecture, two hours; lab, two hours. Prereq: Junior standing in Agricultural Engineering or consent of instructor. ***Ross.***

406 *Environment for Plants and Animals as Related to Engineering.* (3) II
A study of the thermal, moisture, light, and gaseous components of plant and animal environment with emphasis on interactions between these biological systems and their environment. Lecture, two hours; lab, two hours. Prereq: AEN 405 or consent of instructor. ***Walker.***

417 *Energy Sources and Machinery for Agriculture.* (3) I
The use of fundamental concepts of energy and materials in analytical and experimental approaches to the development and design of energy converters and machinery for agriculture. Lecture, two hours; lab, two hours. Prereq: Senior standing in Engineering or consent of instructor. ***Smith.***

427 *Functional Design of Agricultural Structures.* (3) II
Functional requirements of farm buildings and structures; planning for plant and process efficiency; selection and utilization of environmental control equipment and structural materials; preparation of plans and design. Lecture, two hours; lab, two hours. Prereq: AEN 406, ME 220, MET 301. ***Walker.***

437 *Design of Engineering Systems for Soil and Water Management.* (4) I
Application of engineering principles to the management of surface and soil water for agricultural production. Surveying and mapping for the layout of water control facilities. Design and construction of facilities for runoff and erosion control, water storage, drainage, and irrigation. Lecture, two hours, lab, four hours. Prereq: ME 330. ***Haan.***

447 *Agricultural Processing and Electrification.* (3) II

Application of engineering principles to the processing and storage of agricultural products. The utilization of electricity in agriculture. Instrumentation and control of agricultural processes. Analysis of processing systems. Lecture, two hours, lab, two hours. Prereq: AEN 406, EE 305, ME 330. *White.*

505 *Engineering Analysis.* (3) II

A study of the professional method of dealing with engineering problems and the application of this method to problems encountered in the agricultural industry. Lecture, two hours; lab, two hours. Prereq: Senior standing or consent of instructor. *Smith.*

519 *Plant, soil and Machinery Relationships.* (3) I, II

Advanced concepts in the use of biological and soil parameters in the design of machinery for agriculture and agriculturally related industries. Lecture, two hours; lab, two hours.

525 *Environmental Design for Biological Systems.* (3) I, II

The influence of environmental factors on biological efficiency, design and selection of equipment and controls for providing environmental requirements of biological systems. Lecture, two hours, lab, two hours. Prereq: AEN 427 or consent of instructor. *Walker.*

535 *Soil and Water Conservation Engineering.* (3) I, II

Consideration of elements of hydrology related to agriculture; functional analysis, economic analysis and design of more complex systems for soil and water control and management. Lecture, three hours. Prereq: AEN 437 or consent of instructor. *Haan.*

548 *Advanced Agricultural Processing.* (3) I, II

Analytical study of engineering problems dealing with the handling and processing of agricultural products, such as grading, sorting, drying, and curing and the preparation of plans for these operations. To be offered as a formal class or as a special problems course. Lecture, two hours; lab, two hours. Prereq: AEN 447. *White.*

606 *Micrometeorology.* (3)

A study of the processes occurring at the earth-atmosphere boundary, including heat and energy balance, which are important to biological systems. Lecture, three class hours per week. Prereq: STA 521 or STA 523, one course in Thermodynamics, or consent of instructor.

618 *Advanced Plant, Soil, and Machinery Relationships.* (3) I, II

A consideration of fundamental concepts of energy and materials in the identification and mensuration of parameters needed in the development of new machines for agriculture. Lecture, two hours; lab, two hours. Prereq: AEN 417 and 505. *Smith.*

628 *Advanced Design of Structures for Biological Systems.* (3) I, II

The use of similitude, dimensional analysis, and statistical theory in the analysis of selected agricultural structural problems. The prediction of system performance as environmental conditions change; and the analysis of system reliability. Lecture, two hours; lab, two hours. Prereq: AEN 525 or consent of instructor. *Walker.*

635 *Advanced Soil and Water Conservation Engineering.* (3) I, II

A consideration of advanced techniques useful in research, analysis, and design related to soil and water conservation facilities. Mathematical and statistical techniques and theory of models are included. Lecture, three hours. Prereq: AEN 535 or consent of instructor. *Haan.*

645 *Electromagnetic Radiation in Agricultural Engineering.* (3) I, II

An advanced study of the theory and engineering aspects of electromagnetic radiation as applied to the Agricultural Sciences. Consideration is given to the ultraviolet, visible, infrared and radiofrequency types of electromagnetic radiation. Lecture, three hours. Prereq: AEN 548 or consent of instructor. *White.*

648 *Energy and Mass Transfer in Agricultural Processing.* (3) I, II

A comprehensive and in depth study of the principles of energy and mass transfer as they apply to the processing of agricultural and biological materials. Lecture, three hours. Prereq: AEN 548 or consent of instructor. *Ross.*

658 *Instrumentation in Agricultural Engineering Research.* (3) I, II
The principles and application of measuring instruments and devices for obtaining experimental data. Lecture, three hours. Prereq: Consent of instructor. *Staff.*

660 *Similitude in Engineering.* (3) II
An advanced approach to engineering problems through the theory of similitude and its application to models. The use of geometrically similar, distorted, and dissimilar models will be discussed. Lecture, three hours. Prereq: Graduate standing. *Smith.*

750 *Special Problems in Agricultural Engineering.* (1-3) I, II, S
Independent work on selected research problems in one of the various fields of Agricultural Engineering. Consultation and laboratory by appointment. Prereq: Approval of Department Chairman.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

775 *Seminar.* (0) I, II, S
Weekly meetings with members of the staff for reports and discussions on research and current trends and practices in agricultural engineering. One class hour. May be repeated twice. *Staff.*

795 *Thesis* (0) I, II
May be repeated twice.

CHEMICAL ENGINEERING

422 *Mass Transfer.* (3) II
Fundamentals of diffusional and convective transport operations with applications to distillation, absorption, extraction, and air-water contact operations. Prereq: ME 330 and/or concur: ME 325.

430 *Advanced Problems in Chemical Engineering.* (2) I
Lecture and problems presenting fundamental principles and design procedures for several selected operations from the broad areas of mass, momentum, and heat transfer. Prereq: CME 422.

431 *Chemical Engineering Laboratory I.* (1) I
Quantitative study of fluid flow, heat transfer, evaporation, etc., comparing the operation of actual equipment with theory. Special consideration of instruments and measurement techniques and report writing. Lab, 4 hours. Prereq: CME 422.

432 *Chemical Engineering Laboratory II.* (2) II
Continuation of CME 431, covering diffusional operations such as distillation, absorption, and drying. Lab 6 hours. Prereq: CHE 422, 531.

455 *Chemical Engineering Process Design.* (4) II
A lecture and problem course dealing with the application of engineering fundamentals and applied economics to the analysis and design of chemical process systems. Lecture, 3 hours; lab, 3 hours. Prereq: CHE 442, ME 325, CME 422.

505 *Analysis of Chemical Engineering Problems.* (3) I
The application of numerical methods, differential equations, and transforms to complex chemical engineering problems. Prereq: MA 432 or consent of instructor.

515 *Air Pollution Control.* (3)
Kinetics and equilibria of photochemical and "dark" atmospheric reactions. Atmospheric statics and dynamics including lapse rates, inversions, and vertical and horizontal air motion. Single and area source diffusion. Stack meteorology. Prereq: CME 220 or ME 220.

520 *Equilibrium Thermodynamics.* (3) I
A detailed study of the criteria for physical and chemical equilibria, including: predictive equations, solution theory, chemical activity, and external constraints. Prereq: CHE 442, CME 220 or ME 321, or consent of instructor.

530 *Transport I.* (3) I
A unified study of physical rate processes in liquids and vapors, including: mass, energy, and momentum transport, transport in chemically reacting systems, and similarities.

550 *Chemical Reactor Design.* (3) I
A lecture and problem course dealing with interpretation of kinetic data and application in the design of chemical reactor systems. Prereq: CME 220 or ME 321.

562 *Process Control.* (3) I
The theory of automatic control devices and their application in industrial chemical plants. Lecture, 2 hours; lab, 3 hours. Prereq: consent of instructor.

565 *Petroleum Refinery Engineering.* (3)
Application of chemical engineering fundamentals to petroleum processing methods and equipment. Prereq: CME 422 or equivalent and consent of instructor.

615 *Advanced Air Pollution Control.* (3)
Principles and techniques of the control of atmospheric pollution, including process design for the removal of gaseous and particulate pollutants from air streams. Legal and administrative aspects of control. Prereq: CME 515 or consent of instructor.

617 *Air Sampling and Analysis.* (3)
Theory and techniques of air sampling, including aerosal sampling. Instrumental, gravimetric, and volumetric analysis of gaseous and particulate air pollutants with emphasis on the most modern methods of instrumental analysis. Two class hours per week; lab, three hours per week. Prereq: Concurrent with CME 515 or consent of instructor.

619 *Community Health Aspects of Air Pollution Control.* (3)
Effects of specific air pollutants such as sulfur dioxide, particulates, and "smog" constituents on humans, materials, and on the environment. Solid waste disposal by incineration. Air pollution control and water pollution control interrelationships. Prereq: CME 515 or consent of instructor.

621 *Nonequilibrium Thermodynamics.* (3) II
An introductory course in the thermodynamics of irreversible processes, including: phenomenological equations relating flows and forces, Onsager's law, and entropy production in continuous processes. Prereq: CME 520, or ME 620, or consent of instructor.

631 *Transport II.* (3) II
A continuation of Transport I. Interphase transport of mass, energy, and momentum is discussed. Boundary Layer theory is applied to combined transport and chemical reaction. Theories of turbulent transport are examined. Prereq: CME 530 or consent of instructor.

635 *Staged Mass Transfer Operations I.* (3) I
An advanced lecture and problem course dealing with staged mass transfer processes involving vapor-liquid systems. Binary, multi-component, and azeotropic distillation. Design and performance of distillation systems. Prereq: CME 422, CME 520.

636 *Staged Mass Transfer Operations II.* (3) II
Mass transfer between two liquid phases or between solid and liquid phases, including: extraction, leaching and adsorption, molecular and eddy diffusion. Application of finite difference calculus. Design of staged processes including: efficiencies, pulsed columns and controlled cycling. Prereq: CME 422.

642 *Advanced Process Control I.* (3) I

Linear and nonlinear automatic control theory, dynamics of chemical process systems, design of systems. Prereq: CME 562.

643 *Advanced Process Control II.* (3) II

A continuation of CME 642. Prereq: CME 642.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)

May be repeated to a maximum of 6 credits equivalence.

771 *Seminar.* (0) I, II

Review of current literature in the field of chemical engineering, general discussion and presentation of papers on departmental research. One lecture per week. Required for all graduate students in chemical engineering.

780 *Special Problems in Chemical Engineering.* (3) I, II, S

Independent study, design, or research in chemical engineering topics. Six laboratory hours per week. May be repeated to a maximum of 12 credits. Prereq: Approval of the Departmental Director of Graduate Studies.

CIVIL ENGINEERING

425 *Soil Mechanics.* (3) I, II

A study of soil and its utilization in foundations for structures and subgrade for highways. Stabilization and improvement of bearing values. Lectures and recitations, two hours; lab, 3 hours per week. Prereq: or concur: GLY 200 EM 322. *Hardin, Huang and Divenick.*

435 *Mine Plant and Machinery.* (3) II

Theory and practice of mine haulage, hoisting, drainage, pumping and compressed air as power. Application of engineering principles to the mineral industries. Lecture and recitation, two hours; lab, three hours. Prereq: CE 231, or consent of instructor. *Wright.*

480 *Structural Mechanics II.* (3) I, II

Continuation of CE 380 with emphasis on sophisticated methods of analyzing complex structures. Prereq: CE 380. *Korn.*

515 *Geometronics.* (3) I

Fundamental principles of geodesy, engineering astronomy and precise survey procedures; triangulation, trilateration and adjustment computations; theory of electronic distance measurement; applications to the horizontal and vertical control of engineering construction and photogrammetric mapping. Lecture, 2 hours; lab, 3 hours. Prereq: MA 431. *Dearinger.*

523 *Photogrammetry.* (3)

Fundamentals of the photogrammetric method including: geometry of the single photographs and terrestrial photographs; planning the photographic mission and ground control for mapping and an introduction to analytic photogrammetry, stereophotogrammetric plotting instruments, photo interpretation and remote sensing. Applications to problems in engineering, geography, geology and other disciplines are emphasized. Two class hours per week; lab, three hours per week. Prereq: MA 113 and consent of instructor.

531 *Coal Preparation I.* (3) I

Principles and practice of coal preparation and associated operations. Lecture and recitation, two hours; lab, three hours. Prereq: CE 231, or consent of instructor. *Haley.*

532 *Coal Preparation II.* (3) II

A continuation of CE 531. Lecture and recitation, two hours; lab, three hours. Prereq: CE 531. *Haley.*

533 *Rock Mechanics.* (3) I

An engineering science course leading to an understanding of the stresses in the earth, properties of the materials resisting these stresses and methods of determining these stresses. Stability of excavations. Lecture and recitation, three hours. Prereq: MET 301, EM 322, GLY 200 or consent of instructor. *Wright.*

540 *Pavement Analysis and Design.* (3) II

Pavement types and wheel loads; stresses in flexible and rigid pavements; effect of climate and subgrade soils on pavement performance; evaluation of strength and other properties of soils, base courses, and paving materials; structural design of flexible and rigid pavements; pavement performance. Prereq: CE 302, 340.

543 *Development of Transportation Facilities.* (3) II

Analysis of factors affecting development of transportation facilities: history of transportation development; problems of highway geometrics, design standards and traffic estimates and assignment; basic planning and location principles; programming improvements, maintenance and new construction; concepts of highway management, finance and public relations. Lecture, 3 hours. Prereq: Credit or registration in CE 342. *Hutchinson.*

550 *Engineering Hydraulics.* (3) II

Analysis of flow in closed conduits and natural and artificial open channels. Design of hydraulic structures. Lecture, 3 hours. Prereq: ME 330. *Land.*

553 *Hydrology.* (3) I, II

A study of the factors affecting the occurrence, movement and utilization of water including meteorological considerations, evaporation, transpiration, runoff relationships, hydrograph analysis, and ground water management. Lecture, 3 hours. Prereq: ME 330 or consent of instructor. *James and Foree.*

555 *Engineering Economy.* (3) I

Economic evaluation and financial analysis of engineering alternatives in which the goal of economic efficiency is applied to engineering design. Lecture, 3 hours. Prereq: ECO 261 or consent of instructor. *James.*

566 *Public Health Engineering.* (3) II

Application of engineering principles to the control of the environment, as used by sanitary engineers in federal, state or international health agencies. Lecture, three hours. Prereq: consent of instructor. *Staff.*

568 *Sanitary Engineering Laboratory.* (3) I

Lectures and laboratory practice in principles, application and interpretation of analytical tests used in sanitary engineering research and plant control. Lecture, two hours; lab, three hours. Prereq: consent of instructor. *Lauderdale.*

580 *Theory of Structures III.* (3) I

Plastic design of steel. Introduction to theory of arches. Theory and design of continuous trusses. Lecture and recitation, three hours. Prereq: CE 480 and MA 431. *Gesund.*

621 *Engineering Aspects of Surficial Soils and Landforms.* (3) II

Techniques of terrain analysis for civil engineering purposes through the use of air photo interpretation (quantitative and qualitative) and other sources of pedologic, geologic and topographic information. Lecture, 2 hours; lab, 3 hours. Prereq: GLY 200. *Dearinger.*

625 *Advanced Soil Mechanics I.* (3) I, II

Detailed study including experimental determination of the strength and deformation properties of granular and cohesive soils. Co[illegible]phenomena in soils as related to the behavior of clay soils are included. Lecture, two hours per week; lab, three hours. Prereq: CE 425 or consent of instructor. *Hardin or Deen.*

626 *Advanced Soil Mechanics II.* (3) I

Study of seepage through soils and drainage methods for control of seepage. Study of the stress distribution in earth masses and detailed study of soil identification, classification and distribution for engineering planning and design. Lecture, three hours per week. Prereq: CE 425 or consent of instructor. *Hardin.*

627 *Soil Engineering for Transportation Facilities.* (3) I, II

Study of frost action and moisture movement in soils and of soil compaction and stabilization. Study of engineering analysis and design for the stability of earth slopes and embankments. Lecture, three hours per week. Prereq: CE 425 or consent of instructor. *Hardin.*

628 *Advanced Foundation Engineering.* (3) II

Application of the principles of soil mechanics to the design and analysis of foundations. Lectures, three hours. Prereq: CE 625 or consent of instructor. *Hardin.*

629 *Soil Dynamics.* (3) II

A study of the response of soils to dynamic loads including foundation vibration problems and the response of footings to impulse loads. Theories of wave propagation in granular and porous media and methods of measurement of the dynamic properties of soils in the laboratory are included. Lecture, 3 hours. *Hardin.*

631 *Advanced Prospecting.* (3) I, II

Study of the principles involved in the geophysical investigation of the minerals of the earth's crust. Lecture and recitation, two hours; lab, three hours. *Wright.*

632 *Preparation and Uses of Industrial Minerals.* (3) I, II

Sources, processing, marketing, utilization and economics of non-metallic minerals, and product specifications. Clay, limestone, asbestos, refractories. Lecture and recitation, three hours. Prereq: B.S. degree in Engineering. *Wright.*

633 *Mine Organization.* (3) I, II

Detailed study of the structure and function of a mining enterprise from both the financial and the engineering standpoint. Lecture and recitation, three hours. *Wright.*

634 *Advanced Mine Engineering.* (3) I, II

Procedures and methods of collecting and recording data for the systematic development and exploitation of a mining property. Lecture and recitation, three hours; drawing and mapping, six hours. May be repeated for a total of six credits. *Wright.*

640 *Highway Administration, Economics and Finance.* (3) I

A study of highway administration, economics and finance; including organization of highway departments, sources and types of revenue, road costs, classification of roads, benefits from improvements, and program planning. Lecture, three hours. Prereq: CE 340. *Staff.*

641 *Highway Traffic Characteristics.* (3) I

Vehicle operating characteristics; driver, pedestrian and roadway characteristics as they individually, and collectively as traffic stream characteristics are related to the planning, design and operation of highway facilities. Lecture, three hours. Prereq: CE 340. *Hutchinson.*

642 *Highway Location Analysis.* (3) I, II

Optimization of highway location through a study of the effects of terrain, traffic, geometrics, standards and specifications, earthwork, structures, pavement, drainage, right of way acquisition, maintenance and road user costs; application of computer oriented methods of volumetric computations and economic analysis. Lecture, 2 hours; lab, 3 hours. Prereq: CE 340. *Dearinger.*

643 *Urban Transportation Planning.* I (3 credits)

A detailed review of the transportation planning process; inventory methodologies; trip generation, distribution and assignment with associated mathematical models and theories; prediction of future travel; land use models; modal split; developing and testing proposed systems; simulation. Lecture, three hours. Prereq: CE 543 or equivalent and MA 521, AEC 630 or equivalent statistics course. (Same as GEO 643). *Dearinger.*

644 *Operational Effects of Geometrics in Transportation.* II (3 credits)

Operational effects of the geometry of transportation facilities; includes capacity, safety, and economic considerations prompting current and impending changes in geometric design of intersections, interchanges, horizontal and vertical alignment, clearances, cross section elements and interfaces between elements of the transportation system. Lecture, three hours. Prereq: CE 340; credit or registration in CE 641 or equivalent. *Hutchinson.*

645 *Highway Design, Construction and Maintenance.* (3) II

A study of highway design, construction and maintenance; including physical aspects of design, drainage, road types, structural pavement design, construction methods and supervision and maintenance methods. Lecture, three hours. Prereq: CE 340 or consent of instructor. *Staff.*

646 *Bituminous Paving Materials.* (3) II

Origin, production, use-classifications and significant engineering properties of bituminous materials; design of bituminous concrete pavements and highway wearing surfaces. Includes the most recent developments of practical and potential significance in the highway industry. Covers specifications and materials testing. Lecture, two hours; lab, three hours. Prereq: CE 540 or consent of instructor. *Havens.*

647 *Cements, Concretes and Aggregates.* (3) I

Origin, production, use-classifications and significant engineering properties of Portland cements, concretes and mortars. Covers: precise methods of design and control of mixes; durability considerations; pozzolans; additions and admixtures; mineral aggregates; structural, paving and mass concretes; specifications and materials testing. Lecture, two hours; lab, three hours. Prereq: CE 540 or consent of instructor. *Staff.*

652 *Open Channel Flow.* (3) II

The hydraulics of free surface flow including such topics as uniform flow, varied flow, unsteady flow, the hydraulic jump flow transitions, spillways and channel delivery. Lecture, 3 hours. Prereq: CE 550. *Staff.*

653 *Advanced Hydrology.* (3) II

Advanced discussion of special topics relating to hydrology including sediment transport, flow through culverts and bridges. frequency analysis, waves, infiltration, and computer models. Lecture, 3 hours. Prereq: CE 553. *James.*

654 *Hydraulic Structures.* (3) I

Structural and hydraulic analysis required for the design of concrete and earth dams and appurtenant structures. Land lecture, 3 hours. Prereq: CE 550. *Staff.*

655 *Water-Resources Planning.* (3) II

Presentation of techniques for evaluating water-resource projects to meet social objectives with specific reference to such purposes as flood control, drainage, water supply, hydropower, navigation and recreation. Lecture, 3 hours. Prereq: CE 555. *James.*

659 *Advanced Sanitary Engineering Design I.* (3) I

Application of theory of water treatment processes to the functional and hydraulic design of water treatment facilities. Lecture, two hours; lab, three hours. *Lauderdale.*

660 *Advanced Sanitary Engineering Design II.* (3) II

Application of theory of waste treatment processes to the functional and hydraulic design of waste treatment facilities. Lecture, two hours; lab, three hours. *Lauderdale.*

662 *Water Works and Water Treatment.* (3) I

Theory of water supply and purification, microbiology of fresh water, design of water works and water distribution systems. Lecture, three hours. Prereq. or concur: CE 568, MB 400 and MB 401. *Burkhead.*

663 *Water Quality Control Laboratory.* (3) II

Laboratory studies of pollution control processes and techniques discussed in CE 662 and 664. One hours lecture, six hours lab per week. Prereq: CE 568 or consent of instructor.

664 *Sewerage and Sewage Treatment.* (3) II
Aerobic and anaerobic methods of waste stabilization, biochemical oxygen demand, stream purification, design of sewerage and sewage treatment plants. Lecture, 3 hours. Prereq: CE 568, MB 400 and 401. *Burkhead.*

668 *Advanced Instrumentation for Water Resources Research.* (3) II
The theory and application of advanced techniques of analysis to water resources research. *Lauderdale.*

674 *Mechanics of Liquid Flow in Pipes.* (3) II
Steady and unsteady one dimensional pipe flow. Water hammer and surge tank analysis. Steady two dimensional pipe flow. Digital and analog computer applications. Lecture 3 hours. Prereq: CE 550. *Wood.*

678 *Fluid Dynamics of Multiphase Systems.* (3)
A study of the dynamics of multiphase systems, consist of mixtures of solid particles, liquid droplets, or bubbles in fluids. Prereq: ME 330; MA 431.

681 *Dynamics of Structures.* (3) II
Behavior of materials under dynamic stresses, dynamic response of multidegree of freedom-concentrated mass systems, dynamic response of distributed mass structures, design of structures for earthquake, wind, traffic and machinery loads. Prereq: EM 513 or permission of instructor. *Gesund.*

682 *Experimental Structural Analysis.* (3) I
Theory and practice of model analysis to facilitate the solution of unusual problems in structural engineering. Dimensional analysis, similitude requirements, materials, fabrication, loading and instrumentation of models, and interpretation of results. Lecture, 1 hour, lab, 6 hours. *Pincus.*

686 *Advanced Metal Structures.* (3) I
Plastic analysis and design; shear, local and lateral buckling, compression members, welded, riveted and bolted connections, deflections and shakedown. Light gage cold-formed steel design. Strain hardening and stress concentrations; residual stresses, brittle fracture, fatigue. Torsion, thin-walled sections, multicell sections. Lecture, 3 hours. Prereq: CE 480 and EM 531 concurrent. *Korn.*

690 *Suspended Structures.* (3) I, II
Theory and application of stress analysis and design as applied to suspended structures and suspension systems. Lecture, two hours; lab, two hours. Prereq: consent of instructor. *Korn.*

691 *Advanced Reinforced Concrete Theory.* (3) II
Background and origin of modern reinforced concrete design procedures and codes. Comparison of American and foreign methods of analysis. Review of current research and projection to anticipated future changes in design and construction practices. Prereq: EM 531. *Gesund.*

692 *Slab and Folded Plate Structures.* (3) I, II
Design and analysis of reinforced concrete floor slabs and folded plate roofs. Elastic and inelastic methods. Lecture, three hours. Prereq: CE 480, EM 531, MA 431, or consent of instructor. *Gesund.*

693 *Shell Structures.* (3) I, II
Design and analysis of reinforced concrete shell structures, including domes, barrel shells, hyperbolic paraboloids and cylindrical tanks. Lecture, three hours. Prereq: CE 692 or consent of instructor. Lecture, 3 hours. *Gesund.*

694 *Advanced Structural Analysis I.* (3) I, II
Theory and application of classical methods for the solution of complex planar structural systems. Prereq: CE 480 or consent of instructor. *Korn.*

695 *Advanced Structural Analysis II.* (3) I, II

Theory and application of matrix methods of analysis to complex plane and space structures. *Korn.*

768 *Residence Credit for the Master's Degree.*

(1 to 6 credits equivalence)

May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*

(1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

771 *Seminar.* (0) I, II

Review of current literature in the field of Civil Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. Two hours. *Staff.*

780 *Special Design Problems in Civil Engineering.* (1-6)

Individual work on some selected design problems in one of the various fields of Civil Engineering. Laboratory, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

790 *Special Research Problems in Civil Engineering.* (1-6)

Individual work on some selected research problems in one of the various fields of Civil Engineering. Lab, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

ELECTRICAL ENGINEERING

401 *Electronic Analog Computation.* I (3 credits)

Analog computer components and their interconnection. Time and amplitude scaling. Simulation of linear and non-linear physical systems from all fields of engineering. Two class hours per week; three lab hours per week. Prereq: MA 431 or consent of instructor.

415 *Electromechanics.* (3) I, II

A study of construction, operating characteristics (by mathematical analysis), and applications of electrical machines. Prereq: EE 221, 467. Concur: EE 416. *Nasar.*

416 *Electrical Engineering Laboratory III.* (2) I, II

Laboratory practice and experimental studies related to EE 415. Lecture, one hour; lab, three hours. Prereq: or Concur: EE 415. *Petway.*

420 *Engineering Analysis I.* (3) I, II

A study of engineering analysis stressing fundamental mathematical and physical principles; electrical duals, electrical-mechanical analogs; time domain and frequency domain analysis; Fourier series and integral, Laplace transforms; series solutions of Bessel's and LeGendre's equations. Lecture and recitation, three hours. Prereq: MA 431. *Allison.*

435 *Circuits III.* (3) I, II

Fundamentals of network theory in communications circuits; Laplace transforms and wave filters. Three class hours. Prereq: EE 221. *Romanowitz, Collins.*

461 *Electronics and Communications I.* (3)

Transistor and vacuum-tube characteristics. Graphical and mathematical analysis of audio amplifiers, rectifiers and smoothing filters as power supplies. Prereq: EE 221. Concur: EE 462. *Distler.*

664 *Sewerage and Sewage Treatment.* (3) II
Aerobic and anaerobic methods of waste stabilization, biochemical oxygen demand, stream purification, design of sewerage and sewage treatment plants. Lecture, 3 hours. Prereq: CE 568, MB 400 and 401. *Burkhead.*

668 *Advanced Instrumentation for Water Resources Research.* (3) II
The theory and application of advanced techniques of analysis to water resources research. *Lauderdale.*

674 *Mechanics of Liquid Flow in Pipes.* (3) II
Steady and unsteady one dimensional pipe flow. Water hammer and surge tank analysis. Steady two dimensional pipe flow. Digital and analog computer applications. Lecture 3 hours. Prereq: CE 550. *Wood.*

678 *Fluid Dynamics of Multiphase Systems.* (3)
A study of the dynamics of multiphase systems, consist of mixtures of solid particles, liquid droplets, or bubbles in fluids. Prereq: ME 330; MA 431.

681 *Dynamics of Structures.* (3) II
Behavior of materials under dynamic stresses, dynamic response of multidegree of freedom–concentrated mass systems, dynamic response of distributed mass structures, design of structures for earthquake, wind, traffic and machinery loads. Prereq: EM 513 or permission of instructor. *Gesund.*

682 *Experimental Structural Analysis.* (3) I
Theory and practice of model analysis to facilitate the solution of unusual problems in structural engineering. Dimensional analysis, similitude requirements, materials, fabrication, loading and instrumentation of models, and interpretation of results. Lecture, 1 hour, lab, 6 hours. *Pincus.*

686 *Advanced Metal Structures.* (3) I
Plastic analysis and design; shear, local and lateral buckling, compression members, welded, riveted and bolted connections, deflections and shakedown. Light gage cold-formed steel design. Strain hardening and stress concentrations; residual stresses, brittle fracture; fatigue. Torsion, thin-walled sections, multicell sections. Lecture, 3 hours. Prereq: CE 480 and EM 531 concurrent. *Korn.*

690 *Suspended Structures.* (3) I, II
Theory and application of stress analysis and design as applied to suspended structures and suspension systems. Lecture, two hours; lab, two hours. Prereq: consent of instructor. *Korn.*

691 *Advanced Reinforced Concrete Theory.* (3) II
Background and origin of modern reinforced concrete design procedures and codes. Comparison of American and foreign methods of analysis. Review of current research and projection to anticipated future changes in design and construction practices. Prereq: EM 531. *Gesund.*

692 *Slab and Folded Plate Structures.* (3) I, II
Design and analysis of reinforced concrete floor slabs and folded plate roofs. Elastic and inelastic methods. Lecture, three hours. Prereq: CE 480, EM 531, MA 431, or consent of instructor. *Gesund.*

693 *Shell Structures.* (3) I, II
Design and analysis of reinforced concrete shell structures, including domes, barrel shells, hyperbolic paraboloids and cylindrical tanks. Lecture, three hours. Prereq: CE 692 or consent of instructor. Lecture, 3 hours. *Gesund.*

694 *Advanced Structural Analysis I.* (3) I, II
Theory and application of classical methods for the solution of complex planar structural systems. Prereq: CE 480 or consent of instructor. *Korn.*

695 *Advanced Structural Analysis II.* (3) I, II
Theory and application of matrix methods of analysis to complex plane and space structures. *Korn.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Seminar.* (0) I, II
Review of current literature in the field of Civil Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. Two hours. *Staff.*

780 *Special Design Problems in Civil Engineering.* (1-6)
Individual work on some selected design problems in one of the various fields of Civil Engineering. Laboratory, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

790 *Special Research Problems in Civil Engineering.* (1-6)
Individual work on some selected research problems in one of the various fields of Civil Engineering. Lab, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

ELECTRICAL ENGINEERING

401 *Electronic Analog Computation.* I (3 credits)
Analog computer components and their interconnection. Time and amplitude scaling. Simulation of linear and non-linear physical systems from all fields of engineering. Two class hours per week; three lab hours per week. Prereq: MA 431 or consent of instructor.

415 *Electromechanics.* (3) I, II
A study of construction, operating characteristics (by mathematical analysis), and applications of electrical machines. Prereq: EE 221, 467. Concur: EE 416. *Nasar.*

416 *Electrical Engineering Laboratory III.* (2) I, II
Laboratory practice and experimental studies related to EE 415. Lecture, one hour; lab, three hours. Prereq: or Concur: EE 415. *Petway.*

420 *Engineering Analysis I.* (3) I, II
A study of engineering analysis stressing fundamental mathematical and physical principles; electrical duals, electrical-mechanical analogs; time domain and frequency domain analysis; Fourier series and integral, Laplace transforms; series solutions of Bessel's and LeGendre's equations. Lecture and recitation, three hours. Prereq: MA 431. *Allison.*

435 *Circuits III.* (3) I, II
Fundamentals of network theory in communications circuits; Laplace transforms and wave filters. Three class hours. Prereq: EE 221. *Romanowitz, Collins.*

461 *Electronics and Communications I.* (3)
Transistor and vacuum-tube characteristics. Graphical and mathematical analysis of audio amplifiers, rectifiers and smoothing filters as power supplies. Prereq: EE 221. Concur: EE 462. *Distler.*

462 *Electrical Engineering Laboratory II.* (2) I, II

Experimental exercises in transistor and vacuum-tube characteristics; basic A-F circuits, as voltage and power amplifiers, oscillators, and rectifiers. Lecture, one class hour; lab, 3 hours. Prereq: EE 222. Concur: EE 461. *Distler.*

467 *Electric and Magnetic Fields.* (3) I, II

Field laws and theorems in vector form; fields in dielectric and magnetic media; forces, moments, energy, power; brief introduction to time-varying fields. Prereq: PHY 232, MA 212. Three class hours. *Romanowitz.*

468 *Fields and Waves.* (3) I, II

Maxwell's equations; vector and scalar wave equations; bounded solutions (transmission lines; waveguides); unbounded solutions (antennas); Poynting's theorem; fields in moving media. Three class hours. Prereq: EE 420, 467.

507 *Electrical Controls I.* (3) I, II

Block diagram and transfer function representation of linear control systems. Basic servo characteristics. Stability and frequency response. Analysis and synthesis by Nyquest diagram, bode diagram and root-locus method. Three class hours. Prereq: EE 415, 435. *Yeh.*

508 *Electrical Engineering Laboratory IV.* (2) I, II

Laboratory study of control methods and systems employing magnetic and electronic components; analog computers. Lecture, one hour; lab, three hours. Prereq: or Concur: EE 507. *Jackson.*

511 *Information Theory.* (3) I

Time and frequency domains; sampling theorems; review of AM-FM; pulse modulation; probability and random signal theory; autocorrelation; entropy; coding schemes, channel capacity; noise. Prereq: EE 420. *Distler.*

517 *Electrical Machinery II.* (3) I, II

Electro-mechanical energy conversion systems studies. Development of generalized equivalent circuits for various conditions of operation. Prereq: EE 415, 416.

520 *Engineering Analysis II.* (3) I, II

Investigation of transient and steady-state conditions in electrical and mechanical systems, using Laplace transforms, vectors, complex variables: network analysis and synthesis. Feedback system stability criteria. Lecture and recitation, 2 hours; problem session, 2 hours. Prereq: EE 420. *Distler, Allison.*

523 *Electrical Equipment Problems.* (2) I, II

A creative design study of comprehensive engineering problems, primarily electrical but related to engineering in general. One class hour, five hours by appointment. Prereq: Senior classification.

537 *Electric Power Transmission I.* (3) I

Transmission line parameters, generalized circuit constants; analysis of line performance. Prereq: EE 415, 416. *Staff.*

538 *Electric Power Transmission II.* (3) II

Per-unit studies; symmetrical components, experimental studies on a-c network analyzer. Prereq: EE 537. *Staff.*

562 *Electronics and Communications II.* (3) I, II

Feedback amplifiers, tuned and untuned amplifiers; oscillators, AM and U-H-F energy. Three class hours. Prereq: EE 461, 462. *Adams.*

564 *Electronics and Communications III.* (3) I, II

Timing, scanning, trigger logic and pulse circuits:; video and broad-band R-F amplifiers. Generation, transmission and radiation of V-H-F and U-H-F energy. Three class hours. Prereq: EE 461. *Allison, Bradley.*

565 *Electrical Engineering Laboratory V.* (2) I, II

Laboratory practice and experimental exercises relating to studies in EE 564. Lecture, one hour; lab, three hours. Concur: EE 564. *Graham, Bradley.*

566 *Magnetic Amplifiers.* (3) II

Wave-form analysis of circuits with nonlinear magnetic elements; saturable reactors and self-saturating magnetic amplifiers in steady-state and transient operation; some characteristics of semiconductor diodes including Zener types; effects of negative and positive feedback on magnetic amplifiers. Three class hours. Prereq: EE 415. *Distler.*

572 *Electrical Controls II.* (3) II

Analysis and design of non-linear feedback control systems. Phase plane, describing function, and piecewise linear techniques are developed. Stability on non-linear feedback systems is studied. Three class hours. Prereq: EE 507. *Petway.*

580 *Logical Design of Digital Systems.* (3)

Computation elements; analysis and synthesis of systems, Boolean functions and applications to relay and electronic circuits; circuit logic, memory elements; design of counters, sequential devices, digital devices; brief treatment of programming. Three class hours. Prereq: EE 221. *Staff.*

581 *Advanced Logical Design.* (3) II

Boolean matrices; bridge circuits; bilateral, cascaded, and iterative networks; secondary assgnment methods for the design of sequential circuits. Design of actual digital computers. Prereq: EE 580. *Cosgriff.*

585 *Molecular Engineering.* (3) II

Molecular approach to the behavior of gaseous conductors, semi-conductors, dielectrics and magnetic materials; emphasis on modern semi-conductor electronic devices such as masers, lasers, Esaki diodes, Zener diodes, and micromodules. Prereq: EE 420, 467. *Kadaba, Bradley.*

595 *Independent Problems.* (1-3)

For electrical engineers. A problem, approved by the chairman of the department, provides an objective of study and research. May be repeated to a maximum of six credits.

596 *Independent Problems.* (2) I, II

Same conditions as EE 595. May be repeated to a maximum of six credits. *Staff.*

601 *Electromagnetic Energy Conversion I.* (3)

General dynamical theories are developed for electromechanical energy systems. Various constraints are applied to the generalized equations of motion and energy transfer. Prereq: Consent of instructor.

602 *Electromagnetic Energy Conversion II.* (3)

Continuation of EE 601, with special attention to specific areas of machine types. Prereq: EE 601.

606 *Electric Power Transmission.* (3)

The theory underlying the calculation and operation of long distance transmission circuits. Special attention to relay control. Recitation, 3 hours. Prereq: EE 538.

611 *Linear Circuit Analysis I.* (3)

Laplace and Fourier transform methods of analysis of linear lumped constant systems under transient and steady state conditions; feedback amplifiers; filter networks; stability and physical realizability. Prereq: EE 520. *Distler, Graham.*

612 *Linear Circuit Analysis II.* (3)

Continuation of EE 611 with an introduction to non-linear systems. Prereq: EE 611. *Distler, Graham.*

613 *Optimal Control Theory.* (3)
State-space modeling of control systems; variational techniques; system optimization by maximum principle, dynamic programming; Hamilton-Jacobi equations, design of linear optimal systems; computational methods for solving boundary value problems. Prereq: EE 611.

614 *Sampled-Data Control Systems.* (3) I, S
Z-transformers, Nyquist criterion, Bode and root-locus plots, error constants, finite settling-time design, sensitivity, state variables. Three class hours per week. Prereq: EE 520, or consent of instructor. ***Distler, Petway.***

615 *Stability Theory of Control Systems.* (3)
Stability theorems are studied with emphasis on application to closed-loop control systems. Three class hours per week. Prereq: EE 572.

616 *Advanced Topics in Control.* (3)
Current research and design practices in control devices and systems. May be repeated twice. Three class hours per week. Prereq: EE 613, EE 614 or consent of instructor.

621 *Introduction to Antennas.* (3)
Fundamental Antenna concepts, Array Theory, Linear Radiators, Loops, Helices, Mutual Coupling, Reflectors, Measurement Theory. Three class hours per week. Prereq: EE 567.

622 *Advanced Antennas.* (3)
Traveling wave concepts, line sources, Huygen's Principle, Babinet's Principle, synthesis techniques, traveling wave antenna design, practical traveling wave antennas, non-uniform arrays, supergain, Brillouin Diagrams. Three class hours per week. Prereq: EE 621.

623 *Lines and Wave Guides.* (3)
Open-wire and coaxial lines, standing waves, stub matching; impedance transformation, rectangular and circular wave guides. Prereq: EE 435, 467, 564. ***Allison, Kadaba.***

624 *Solid State Electronics.* (3) I
Bose and Fermi statistics. Semiconductor theory; solid-state devices; electrical properties of insulators; theory and applications of magnetic materials, including ferrites. Lecture and recitation, three hours. ***Kadaba, Bradley.***

625 *Electromagnetic Propagation and Scattering.* (3)
Propagation in various media: Plasmas, Magnetoplasmas, and Compressible Plasmas. Diffraction by spheres. Boundary Value Problems. Turbulence. Three class hours per week. Prereq: EE 520, EE 567.

626 *Microwave Engineering.* (3)
Generation, detection and measurement of microwave energy; vacuum tubes at ultra high frequencies, the klystron and the magnetron. Lecture, two hours, lab. three hours. Prereq: or Concur: EE 567. ***Allison, Kadaba.***

627 *Electromagnetic Fields.* (3)
Advanced studies in electromagnetic fields; antennas, radiation and propagation of energy. Prereq: Consent of instructor. ***Adams, Carver.***

631 *Discrete Information Theory I.* (3) I
Entropy, Markov sources, algebra of codes, classification of codes, Shannon's theorems, compact codes, linear codes, error detection and correction, syndrome vectors. Prereq: Consent of instructor. Lecture, three hours. ***Distler.***

632 *Discrete Information Theory II.* (3) II
Plotkin, Gilbert, and other bounds, Hamming Codes, Reed-Muller and other linear codes, cyclic codes, Bose-Chandhuri codes, sequential decoding, convolution encoding. Prereq: EE 631. ***Distler.***

633 *Advanced Information Theory.* (3)
Shannon type information theory regarding channel capacity, entropy, band-limited systems for both memory and memoryless channels. Three class hours per week. Prereq: EE 511, STA 523 or consent of instructor.

635 *Pattern Recognition.* (3)
Introduction to and equivalence of approaches to pattern recognition, matched filtering, decision theoretic methods, sequential approach and learning machines. Three class hours per week. Prereq: EE 640.

640 *Continuous Stochastic Processes I.* (3) I
Random variables, stochastcic processes, stationary processes, correlation and power spectrum, mean-square estimation, filter design, decision theory, Markoff processes, simulation. Three hours lecture per week. Prereq: STA 523.

641 *Continuous Stochastic Processes II.* (3) II
Continuation of EE 640. Three class hours per week. Prereq: EE 640.

650 *Electro-Optical Properties of Materials.* (3)
The effects of electric fields upon light propagation in media. Lasers, electro-optic modulation, non-linear optics, laser noise, optical parametric oscillator, stimulated Raman emission, coherent scattering. Three class hours per week. Prereq: EE 670.

653 *Optical Processing.* (3)
Emphasis on both the mathematical modeling and the use of optical equipment in the solution of diverse physical problems which lend themselves to a "photographic" type output. Two class hours; three lab hours per week. Prereq: PHY 508.

660 *Electronic Device Design.* (3)
An integrated treatment of the theory and application of electronic devices, with emphasis on methods of engineering analysis and design. Three class hours per week. Prereq: EE 585 or consent of instructor.

664 *Semiconductor Theory.* (3)
The electric, magnetic, optical and thermal properties of semiconductors. Three class hours per week. Prereq: PHY 598, PHY 599, MA 431.

670 *Quantum Electronics.* (3)
The interaction of electromagnetic radiation fields and atomic systems and devices that make use of such interactions. Three class hours per week. Prereq: PHY 713 and PHY 714.

683 *Automata Theory.* (3)
Decomposition of Sequential Machines, State Assignment, Finite Memory Machine, Shifting Operators as applied to Structural Machines, Turing Machines, Pattern Classification by State Machines. Three class hours per week. Prereq: EE 580, MA 561.

711 *Network Synthesis I.* (3) I
The first of a two-semester sequence of courses giving a comprehensive treatment of modern network synthesis. Prereq: EE 611. *Graham.*

712 *Network Synthesis II.* (3) II
The second of a two-semester sequence of courses giving a comprehensive treatment of modern network synthesis. Prereq: EE 711. *Graham.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for Doctor's Degree.* (0)
May be repeated indefinitely. (1 to 12 credits equivalence.)

771 *Seminar.* (0)
Review of current literature in the field of Electrical Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. Two class hours. ***Allison.***

783 *Special Problems in Electrical Engineering.* (1-3)
Open to graduate students only. Individual work on an assignment approved by the chairman of the department. May be repeated to a maximum of nine credits.

ENGINEERING MECHANICS

503 *Introduction to Continuum Mechanics.* (3) I
An introduction to the mathematical description and continuum concepts of deformable materials. Review of linear algebra and Cartesian tensor analysis. Finite deformation and rate of deformation. Balance principles. Principle of material indifference. Study of constitutive equations of linear elasticity, Newtonian fluids, linear viscoelasticity, hyperelastic materials and special non-Newtonian fluids. Sample problems. Prereq: MA 433 or consent of instructor. ***Vogel, Beatty, Leigh.***

513 *Mechanical Vibrations.* (3) I, II
Vibrations of systems of one and several degrees of freedom, critical speeds and torsional and lateral vibrations of shafts. Lecture and recitation, three hours. Prereq: EM 313. ***Dillon, Vogel, Shippy.***

531 *Advanced Strength of Materials.* (3) I, II, S
Unsymmetrical bending of beams, thin plates, stress analysis of thick-walled cylinders, and rotating discs. Theory of elastic energy, curved beams, stress concentration, and fatigue. Lecture and recitation, three hours. Prereq: EM 322. ***Adams, Rizzo.***

532 *Experimental Stress Analysis.* (3) II
Experimental stress analysis from an engineering viewpoint. Preliminary optics; stress-optic law; isoclinics and stress trajectories; strain gauges; rosettes; miscellaneous experimental techniques. Prereq: EM 531. ***Adams.***

533 *Aircraft and Missile Structural Analysis.* (3) I, II
Analysis of semi-monocoque structures in bending and torsion. Energy and approximate methods; shear lag; and thermal effects. Introduction to creep and plasticity. Three class hours per week. Prereq: EM 313. ***Dillon, Vogel.***

603 *Theoretical Plasticity I.* (3) I
An introductory mathematical treatment of the perfectly plastic solid. Real and idealized materials; yield criteria; flow rules; experimental basis of the theory; contained plastic flow; some two-dimensional problems. Prereq: MA 433 or consent of instructor. ***Dillon.***

604 *Theoretical Plasticity II.* (3) II
Continuation of EM 603. Limit analysis; plastic bending and torsion; structures and shells; thermoplasticity; plastic wave propagation. Prereq: EM 603. ***Dillon.***

605 *Foundations of Inelasticity.* (3) I
A critical and constructive discussion of the assumptions and experimental evidence for inelastic material response from a viewpoint of the mechanist. Lecture and recitation, three hours. Prereq: EM 604, 662. ***Dillon.***

606 *Theoretical Elasticity.* (3) II
A mathematical account of the linear elastic solid as special continuum. Solution of boundary value problems; two-dimensional examples; torsion and bending; stress concentrations; strain energy; thermoelasticity. Some direct methods of solution for difficult problems, and introduction to dynamic elasticity. Lecture and recitation, three hours. Prereq: EM 503 or consent of instructor. ***Dillon, Rizzo, Yau.***

607 *Advanced Inelasticity.* (3) II

A continuation of EM 605 with a study of the latest research results in the area of inelasticity. Lecture and recitation, three hours. Prereq: EM 605. *Dillon.*

613 *Nonlinear Oscillations.* (3) I

Analysis of various nonlinear oscillatory mechanical systems. Solutions of the differential equations of motion; response curves for forced oscillations; determination of stability criteria. Three class hours per week. Prereq: EM/ME 646 or permission of the instructor. *Shippy.*

614 *Mechanics of Space Vehicles.* (3) II

Description of rigid body orientation, angular velocity, and angular acceleration in terms of Euler angles, Euler parameters, and direction cosines. Gravitational forces and torques and their effect on the attitude motions of symmetrical and unsymmetrical near-earth satellites. Effects of gyroscopic devices, energy dissipation, and elastic flexibility on the stability of space vehicles. Three class hours per week. Prereq: EM 613 or consent of instructor. *Robe.*

632 *Theory of Elastic Stability.* (3) II

Buckling of centrally compressed bars. Detailed consideration of elastic and plastic buckling of prismatic bars under simultaneous action of axial and lateral loads. Buckling of frames, lateral buckling of beams, shear effect, energy methods. Lecture and recitation, three hours. Prereq: EM 531. *Adams, Beatty.*

644 *Advanced Dynamics I.* (3) I

Generalized rigid body kinemetics, concept of reference frames, generalized forces for holonomic and non-holonomic systems, inertia properties of rigid bodies, and energy functions. Lagrange's form of D'Alembert's principle for holonomic and non-holonomic systems. Prereq: EM 313, MA 432, or consent of instructor. (Same as ME 644.) *Robe, Shippy.*

646 *Advanced Dynamics II.* (3) II

Continuation of EM/ME 644. Application of Lagrange's equations in deriving equations of motion; first integrals and conservation theorems; Hamiltonian formalism. Applications to engineering systems. Prereq: EM/ME 644. (Same as ME 646). *Robe, Shippy.*

651 *Numerical Methods in Potential Theory.* (3) I

A modern numerical treatment of some classical problems in potential theory. Prereq: MA 433.

652 *Numerical Methods in Elasticity.* (3) II

A continuation of EM 651. Modern numerical treatments of more difficult problems in classical elasticity. Prereq: EM 651. *Rizzo.*

661 *Nonlinear Continuum Mechanics I.* (3) I

An introduction to the continuum physics and mathematical theory of the nonlinear mechanical behavior of materials. Review mathematical background. Principles of continuum mechanics. Principles of constitutive equations. Lecture and recitation, 3 hours. Prereq: MA 431 or MA 462 or consent of instructor. *Leigh, Beatty.*

662 *Nonlinear Continuum Mechanics II.* (3) II

Continuation of 661. Classes of materials. Finite elasticity and hyperelasticity. Nonlinear fluids with memory. Approximation theory for memory functionals. Approximations to memory materials. Thermodynamics of memory materials. Lecture and recitation, three hours. Prereq: EM 661. *Leigh, Beatty.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

790 *Special Problems in Engineering Mechanics.* (3) I, II

A forum for the presentation and discussion of a wide range of timely topics of interest to Engineering Mechanics. Three class hours per week. Prereq: Approval of Director of Graduate Study.

MECHANICAL ENGINEERING

475 *Introduction to Nuclear Engineering.* (3)

Introduction to basic topics of nuclear science. Interaction of radiation with matter. Design and operation of nuclear reactors, shielding, instrumentation, health physics, fuel cycles, use of radiosotopes. Three lecture hours per week. Prereq: PHY 232, MA 431.

480 *Thermal Environmental Engineering.* (3)

An introductory course emphasizing the engineering systems aspects of thermal environmental design. A case study approach treats measurement problems, modeling, and equipment specification for design of environmental systems. Examples drawn from terrestial, space and marine environments. Lecture three hours per week. Prereq: Consent of instructor.

514 *Nuclear Reactor Analysis I.* (3)

Neutron cross-sections, the fission process. Infinite medium criticality calculations, the four factor formula. Neutron diffusion and slowing down theory. Age theory, criticality calculations for the homogeneous reactor, elementary reactor kinetics. Reflected reactors multigroup methods. Control rod theory. Hetergeneous reactors. Prereq: or concur: PHY 554, MA 432.

517 *Instrumentation for Research.* (3)

An exploration of modern instrumentation techniques and problems; transducer principles; analysis of dynamic response of instrumentation systems; theory of measurements; random processes; pressure, temperature, strain gauges and inertial measurement techniques; magnetic, optical, electrostatic and other recording systems; automatic data reduction; measurement of errors. Prereq: consent of instructor. *Carter, Sharp.*

530 *Gas Dynamics.* (3)

Consideration of the mass, energy and force balances applied to compressible fluids. Isentropic flow, diabatic flow, flow with friction, wave phenomena, and generalized one-dimensional gas dynamics. Lecture and recitation, three hours. Prereq: ME 321. *Marshall.*

532 *Fluid Transients and Power Control.* (3)

A course in the analysis of fluid transients and the theory and design of fluid power controls and their application in engineering systems. Prereq: ME 330. *Bonnell, Funk.*

564 *Propulsion System Design.* (3)

Design of systems for aircraft or missile propulsion. Centrifugal compressors, axial-flow compressors, turbine and exhaust systems, and combustion chambers. Prereq: ME 530. *Marshall.*

567 *Air Pollution Engineering and Economics.* (3) I

The Mechanical Engineering aspects of Air Pollution resulting from Combustion processes. Two class hours per week; Lab three hours per week. Prereq: MA 431, ME 321 or equivalent, ME 330 or equivalent.

583 *Biotechnology.* (3)

The human body as a mechanical system responding to sustained and transient forces and pressures, such as occur in flight, space flight and industrial environments. The physical and behavioral reaction of organisms to dynamic, thermal, radiative and gravitational stresses. Mechanical, hydraulic and pneumatic performance of body subsystems. Use of the human parameters in the design of protective and prosthetic devices and life support systems. Prereq: Consent of instructor. *Lafferty, Lange.*

590 *Elements of Aero-Space Technology.* (4)

Flight performance of airborne and ballistic vehicles. Space vehicle propulsion and structures. The space environment. Man in space. Prereq: ME 321 and 330. *Lange.*

592 *Aero-Space Component Design.* (3)
Preparation of a formal proposal on a given requirement in the aero-space field. Execution of the design. Testing of a prototype under proper environmental conditions. Prereq: ME 590. *Lange.*

611 *Nuclear Reactor Analysis II.* (3) II
Advanced topics in reactor analysis. The Boltzman equation, spherical harmonics methods and other approximate solutions. Perturbation theory, neutron importance. Introduction to neutron thermalization. Special topics. Three class hours per week. Prereq: ME 610, PHY 555 or concurrent.

615 *Plasma Dynamics.* (3)
Discussion of the properties of ionized gases in magnetic and electric fields. Topics covered include motion of charged particles, statistical behavior of plasmas, conduction and diffusion in ionized gases, ionization phenomena, electromagnetic waves and radiation in plasmas, and derivation of the fundamental magnetogasdynamic equations; continuity, momentum and energy. Lecture, three hours. Prereq: ME 620. *Cremers.*

620 *Advanced Engineering Thermodynamics I.* (3) I
Critical treatment of the laws of thermodynamics, relations among thermodynamic properties; stability of systems; thermodynamic processes; selected special topics. Lecture, three hours. Prereq: ME 321. *Birkebak, Lienhard.*

621 *Advanced Engineering Thermodynamics II.* (3) II
Broad coverage of statistical mechanics, kinetic theory and theory of fluctuations. Relations between quantum and classical statistics; Boltzmann integro-differential equation and its consequences. Applications to reaction equilibrium property evaluation, and other topics. Prereq: ME 620. *Lienhard.*

622 *Dynamics and Thermodynamics of the Atmosphere.* (3) II
The thermodynamics of air and the dynamics of gaseous, liquid and solid diffusion and subsequent movement in the atmosphere. Three class hours per week. Prereq: MA 431, ME 321 or equivalent, ME 330 or equivalent. *Lange.*

625 *Advanced Heat Conduction.* (3)
Comprehensive study of heat conduction; derivation of governing equations; discussion of the various boundary conditions; review of classical heat conduction solutions; discussion of current problems, methods of solution and engineering applications of heat conduction. Prereq: ME 325, or concurrent, MA 432. *Cremers, Eichhorn.*

626 *Advanced Heat Convection.* (3)
Comprehensive study of heat convection; derivation of equations of convection of mass, momentum, and energy; boundary layer equations; classical solutions of laminar convection problems; turbulent convection; analogies between momentum and energy. Prereq: ME 625. *Eichhorn.*

627 *Radiation Heat Transfer.* (3)
Principles of thermal radiation, the determination of radiation properties, and the analysis of radiation heat transfer. Results of recent radiation researches are included in the discussions. Prereq: ME 325 or equivalent. *Birkebak.*

628 *Convective Mass Transfer.* (3)
A unified treatment of convective mass transfer; theory of mass transfer; Reynolds flow; calculation procedures; application to systems; simultaneous heat and mass transfer. Prereq: ME 325, 530. *Lienhard.*

630 *Fluid Dynamics I.* (3)
Stress at a point (introduced as a tensor of rank two). Equation of conservation of mass, rate of strain tensor, derivation of Navier-Stokes equation, source-sink flows, motion due to a doublet, vortex flow, two and three dimensional irrotational flow due to a moving cylinder with circulation, two-dimensional airfoils. Prereq: ME 330, MA 432.

631 *Fluid Dynamics II.* (3)
A continuation of ME 630 with emphasis on viscous flow. Exact and approximate solutions, boundary layer theory. Jets, wakes, rotating systems, compressible boundary layer and hydrodynamic stability. Prereq: ME 630 or consent of instructor.

632 *Compressible Fluid Flow.* (3)
Review and extension of one dimensional gas dynamics. Subsonic flow, Hodograph method. Supersonic flow, perturbation method, method of characteristics, oblique shocks. Unsteady wave motion and shock waves. Compressible boundary layers and interaction wave motion and shock waves. Prereq: ME 330, MA 432. *Lienhard.*

633 *Rarefield Gas Dynamics.* (3)
Dynamics of Rarefield Gases: Solution of Boltzmann and Krook equations moment methods, integral iteration, boundary layer in hypersonic flow of a slightly rarefied gas, shock wave structure, Fokker-Planck and Vlasov equations. Lecture, three hours. Prereq: ME 621 and ME 630 concurrent. (Offered every other year.)

634 *Turbulent Flows.* (3)
Physical and analytical description of turbulent flows, isotropic turbulence, boundary layers and shear flows, free turbulence in jets and wakes. Measurement techniques. Lecture, three hours. Prereq: ME 631 or consent of instructor. (Offered every other year.)

642 *Advanced Kinematics of Machinery I.* (3)
Fundamentals in the analysis and synthesis of mechanisms including coupler curves, guided plane systems and linkage design. Lecture, three hours. Prereq: Approval of director of graduate study. *Tao.*

643 *Advanced Kinematics of Machinery II.* (3)
A continuation of ME 642 dealing with the motion of rigid planes passing through multiple positions. Theory and application. Lecture and recitation, three hours per week. Prereq: ME 642. *Tao.*

644 *Advanced Dynamics I.* (3)
Generalized rigid body kinematics, concept of reference frames, generalized forces for holonomic and non-holonomic systems, inertia properties of rigid bodies, and energy functions. Lagrange's form of D'Alembert's principle for holonomic and non-holonomic systems. Same as EM 644. Prereq: EM 313, MA 432 and consent of instructor.

645 *System Concepts and Analysis.* (3)
Conceptual development and study of complex systems; their synthesis and design; analysis and optimization of system parameters. Input-output relationships; formulation of mathematical models, parameters and constraints on physical systems. Prereq: consent of instructor. *Funk, Bonnell.*

646 *Advanced Dynamics II.* (3)
Continuation of EM/ME 644. Application of Lagrange's equations in deriving equations of motion; first integrals and conservation theorems; Hamiltonian formalism. Applications to engineering systems. (Same as EM 646). Prereq: EM/ME 644.

647 *System Optimization.* (3)
The theory and application of optimization techniques with emphasis on large engineering systems. Prereq: MA 433; or CS 220. *Bonnell, Carter.*

648 *Automatic Guidance and Control.* (3)
Theory of the automatic control of machines and vehicles. Mathematical models of sensors, computers and actuators. Transfer functions of various vehicles and machines. Effects of non-linearities and noise. Problems of reliability; pneumatic, hydraulic, and electrical systems. Prereq: consent of instructor.

649 *Dynamic Analysis of Mechanical Systems and Components.* (3) I
The analysis of actual dynamic devices with emphasis on the selection of valid and meaningful Engineering techniques and prediction of performance for reliable operation of these mechanical systems. Three class hours per week. Prereq: MA 432. *Wilson, Carter.*

650 *Fluidic Systems.* (3 credits)
Introduction to combinational, threshold and sequential logic design; digital fluidic devices and sensors, proportional fluid amplifiers. fluidic digital control system design. Three class hours per week. Prereq: ME 532 or consent of instructor.

651 *System Optimization II.* (3 credits)
Introduction to optimal control and its applications, calculus of variations, dynamic programming, maximum principle, differential game theory, adaptive control systems, learning systems. Lecture and recitation, three hours. Prereq: ME 647.

662 *Propulsion Systems.* (3)
Theory of propulsion by jet; efficiencies, specific consumptions; specific impulse. Primary jet devices; turbojet, ducted fan, ramjet, rocket, ram rocket, nuclear power plants. Secondary jet devices for space propulsion; solar propulsion, arc heating devices, ion drive, electromagnetic drive. Prereq: ME 530. *Marshall.*

663 *Energy Conversion Processes.* (3)
Basic considerations of direct conversion of thermal to electrical energy. Thermodynamic and performance characteristics of solid state conversion devices including thermoelectric, thermionic, and photovoltaic systems. Thermodynamic principles and operating characteristics of fuel cells. Analysis of MHD generators and accelerators. Space application of direct energy conversion devices and sources of power. Prereq: ME 325. *Cremers.*

664 *Experimental Methods in Nuclear Engineering.* (3)
A lecture and laboratory course covering the utilization of radiation in engineering, measurement and analysis of parameters pertinent to reactor design and operation, and radiation shielding; reactor response and control studies using analog computer. Prereq. or concurrent: ME 514. *Hahn, Lafferty.*

665 *Nuclear Reactor Dynamics.* (3)
Analysis of dynamic behavior of nuclear reactor systems; transfer function methods applied to nuclear reactor operation and control, stability and analysis from Nyquist and Bode plots, effects of feedback and compensation; instrumentation for reactor start-up and operate conditions. Prereq: ME 343, ME 514. *Hahn, Lafferty.*

666 *Radiation Damage and Shielding.* (3)
The effects of radiation on reactor materials and instrumentation. Macroscopic study of radiation absorption applied to radiation shielding and heat generation in reactors. Prereq: PHY 554. *Staff.*

667 *Nuclear Reactor Design.* (4)
The development of a reactor design from a set of specifications. The synthesis of reactor theory, heat transfer, properties of materials and economics. Prereq: ME 514.

685 *Biofluid Mechanics.* (3)
Rheology of biological fluids with special emphasis on blood; hemodynamics and related blood trauma; biological flow instrumentation; fundamental investigation of circulatory processes; and engineering implication of biological flow processes. Lecture, two hours; lab, three hours. Prereq: ME 330.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Seminar.* (0)
Review of current literature in the field of Mechanical Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. *Staff.*

772 *Bio-Mechanics Seminar.* (1) II

A weekly meeting of the staff and graduate students in Engineering, Physiology Science, Biophysics, Psychology, etc. for the discussion of research and recent developments in Biomedical Engineering such as Biodynamics. May be repeated two times. Prereq: consent of instructor. *Lafferty, Knapp.*

780 *Special Problems in Mechanical Engineering.* (3)

This course consists of individual work in one of the various fields of Mechanical Engineering. Laboratory, six hours. Prereq: approval of the instructor. May be repeated to a maximum of twelve credits. *Staff.*

781 *Special Problems in Bioengineering.* (3)

Discussion of advanced and current topics in Bioengineering. Individual work on research problems of current interest. May be repeated to a maximum of 9 credits. Lecture, three hours.

782 *Advanced Topics in Heat Transfer.* (3)

Contemporary topics in heat transfer will be discussed using the current literature. May be repeated to a maximum of 9 credits. Prereq: Consent of instructor.

783 *Topics in Advanced Systems Theory.* (3)

A survey and evaluation of current research results in systems theory. A course designed to permit full ultilization of specialized abilities of individual and visiting faculty. May be repeated to a maximum of 9 credits. Lecture, three hours. Prereq: Consent of instructor.

METALLURGICAL ENGINEERING AND MATERIALS SCIENCE

443 *Minerals Beneficiation.* (3) II

Principles and mechanics of beneficiation involved in the preparation of mine products, principles of plant design, and current developments. Lecture and recitation, three hours. Prereq: PHY 232. *Swift.*

444 *Minerals Beneficiation Laboratory.* (1) II

Application of the principles studied in MET 443. Labratory, three hours. Prereq: concur: MET 443. *Swift.*

451 *Metallurgical Thermodynamics II.* (3) I

Application of fugacity, activity and equilibrium constants to metallurgical systems. Analysis of ideal, non-ideal and regular solutions and their relation to non-metallic solutions at elevated temperatures, molten salt solutions and slags. Discussion and application of the phase rule to metal systems. Lecture, three hours. Prereq: CME 220. *Skaggs.*

453 *Metallurgical Kinetics.* (3) II

Rate processes in heat and mass transfer, nucleation and growth. Fluid flow in molten metal systems. Lecture, three hours. Prereq: CME 220. *Skaggs.*

461 *Physical Metallurgy II.* (3) I, II

High purity metals, nuclear alloys, powder metallurgy techniques. Lecture, 2 hours; laboratory, 3 hours. Prereq: or concur: MET 361. *Staff.*

463 *Structure of Alloys II.* (3) II

Age hardening and diffusion in metal systems. Laboratory concerned with senior thesis type problems. Lecture, two hours; lab, three hours. Prereq: MET 363. *Staff.*

521 *The Casting of Metals.* (3) I, II

Ferrous and non-ferrous foundry practice. Theory and metallurgy of metal castings. Application of engineering principles to the design and production of castings. Lecture and recitation, three hours. Prereq: MET 301 or 303. *Duncan.*

531 *Powder Metallurgy.* (3) I, II

Study of the principles of powder metallurgy relating to alloys of unusual compositions, metal and non-metal combinations, porous and laminated products, composite metals, and high-melting alloys. Lecture and recitation, three hours. Prereq: consent of instructor. *Swift.*

532 *Materials Science I.* (3)

Modern ideas on the engineering properties of solids. Crystallography; properties; relation of properties to structure; thermodynamics; solid state reactions. Prereq: Consent of instructor. *Staff.*

535 *Advanced Mechanical Metallurgy I.* (3) I, II

Elastic and plastic deformation of metallic crystalline solids; crystallographic nature of slip and twinning; work hardening, fracture and recovery. Lecture and recitation, three hours. Prereq: Consent of instructor. *Gillis, Conrad, Sargent.*

536 *Ceramic Engineering.* (3) I, II

The nature of ceramic materials. The forming and thermal treatment of ceramic products. Consideration of the various properties usually encountered and required of ceramic materials inclusive or cements. Lecture and recitation, three hours. Prereq: consent of instructor. *Leibold.*

539 *Nuclear Metallurgy.* (3) I, II

The metallurgy of such materials as are used in the various components of nuclear reactors with special emphasis on their physical metallurgy, Scientific principles in their broadest sense are emphasized. Material applicable to nuclear-reactor components in the ceramics, metal-ceramics, and other fields. Prereq: B.S. in Metallurgical Engineering or consent of instructor. *Mateer.*

550 *Corrosion.* (3) I, II

The fundamental principles of corrosion control and the basic mechanisms related to a better understanding of the causes of corrosion. The application of principles to practical situations. Lecture and recitation. three hours. Prereq: consent of instructor. *Staff.*

551 *Advanced Chemical Metallurgy I.* (3)

Study of reactions occurring during refining, based on principles of thermodynamics and kinetics. Examples from both ferrous and non-ferrous metallurgy. Lecture and recitation, three hours. Prereq: consent of instructor. *Skaggs.*

566 *Crystallography & X-ray Metallography.* (4) I, II

Elements of crystallography, nature of x-rays, diffraction by crystal lattice, the structure factor and crystal structure determinations in metallic lattices, x-ray camera and diffractometer techniques and application of these to determination of phase diagrams, preferred orientation and residual stresses. Lecture, three hours; lab, three hours. Prereq: MET 361. *De Angelis.*

632 *Materials Science II.* (3) I, II

Continuation of MET 532. Classification of solids; atomic structure and bonding, relation of structure to properties; deformation behavior and failure. Prereq: MET 532. *Staff.*

633 *Special Purpose Alloy Steels.* (3) I, II

Fundamental principles of the more complicated and special alloy steels and their heat treatment. Carbon, mild alloy, N.E., S.A.E., tool and super alloys are included. Alternate alloy steels for application are considered. Lecture, three hours. Prereq: consent of instructor. *Staff.*

635 *Advanced Mechanical Metallurgy II.* (3) I, II

Theory of dislocations in crystals and their role in strength, plasticity, work hardening and fracture of crystalline solids. Lecture and recitation, 3 hours. Prereq: MET 535. *Conrad, Gillis, Sargent.*

637 *Materials Engineering.* (3) I, II

Factors in specification and testing of materials for lightweight construction, mechanical and electrical applications, and severe service conditions. Material failures, trouble shooting, and testing are discussed. Lecture, two hours; lab, three hours. Prereq: consent of instructor. *Staff.*

641 *Advanced Production Metallurgy.* (3) I, II
Principles and practices used in the production of alloys with special stress upon any particular group of alloys that the student may choose. Reference reading and laboratory work are emphasized. Lecture, two hours; lab, three hours. Prereq: consent of instructor. *Swift.*

650 *Advanced Chemical Metallurgy II.* (3) I, II
Study of reactions of materials with chemical environments. Introduction to irreversible thermodynamics. Emphasis on current literature. Prereq: MET 551. *Skaggs.*

659 *Advanced Phase Diagrams.* (3) I, II
Review of thermodynamic fundamentals and application to binary pressure-temperature-composition diagrams. Construction and interpretation of ternary temperature-composition diagrams. Review and discussion of important ternary diagrams. Lecture and recitation, three hours. Prereq: MET 451 or equiv. *Staff.*

661 *Advanced Physical Metallurgy I.* (3) I, II
Study of the theory of phase transformations in metallic systems. Analysis of rate controlling processes for nucleation and growth controlled phase changes and for order-disorder reactions. Prereq: MET 463 or permission of instructor. *Morris, Staff.*

662 *Advanced Physical Metallurgy II.* (3) I, II
Solidification theory and mechanisms. Diffusion in solids. Prereq: MET 661 or permission of instructor. *Morris, Staff.*

663 *Theoretical Structural Metallurgy.* (3) I, II
Interatomic forces of crystal bonding; free electron; zone theory; equilibrium and rate of approach thereto; thermal behavior, structure and free energy of alloy phases; equilibrium diagrams; diffusion; order-disorder change, nucleation and phase growth. Lecture, three hours. Prereq: MET 461. *Staff.*

666 *Diffraction Methods in Metallurgy.* (4)
Application of thin foil electron transmission methods to the study of the defect structure of metals, theory of electron diffraction contrast phenomena, sample preparation, x-ray theory and methods applied to the study of deformation characteristics of metals, order-disorder transformations, and crystal structure analysis. Prereq: MET 566. *De Angelis.*

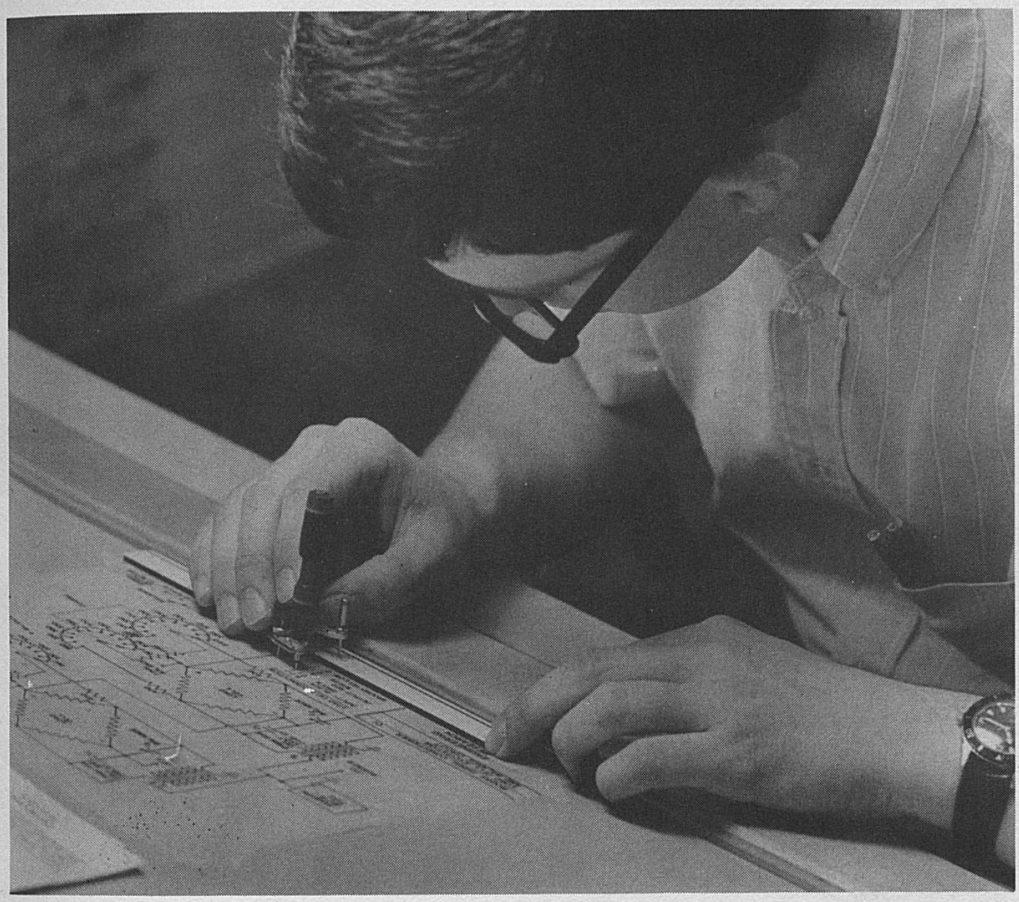
768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

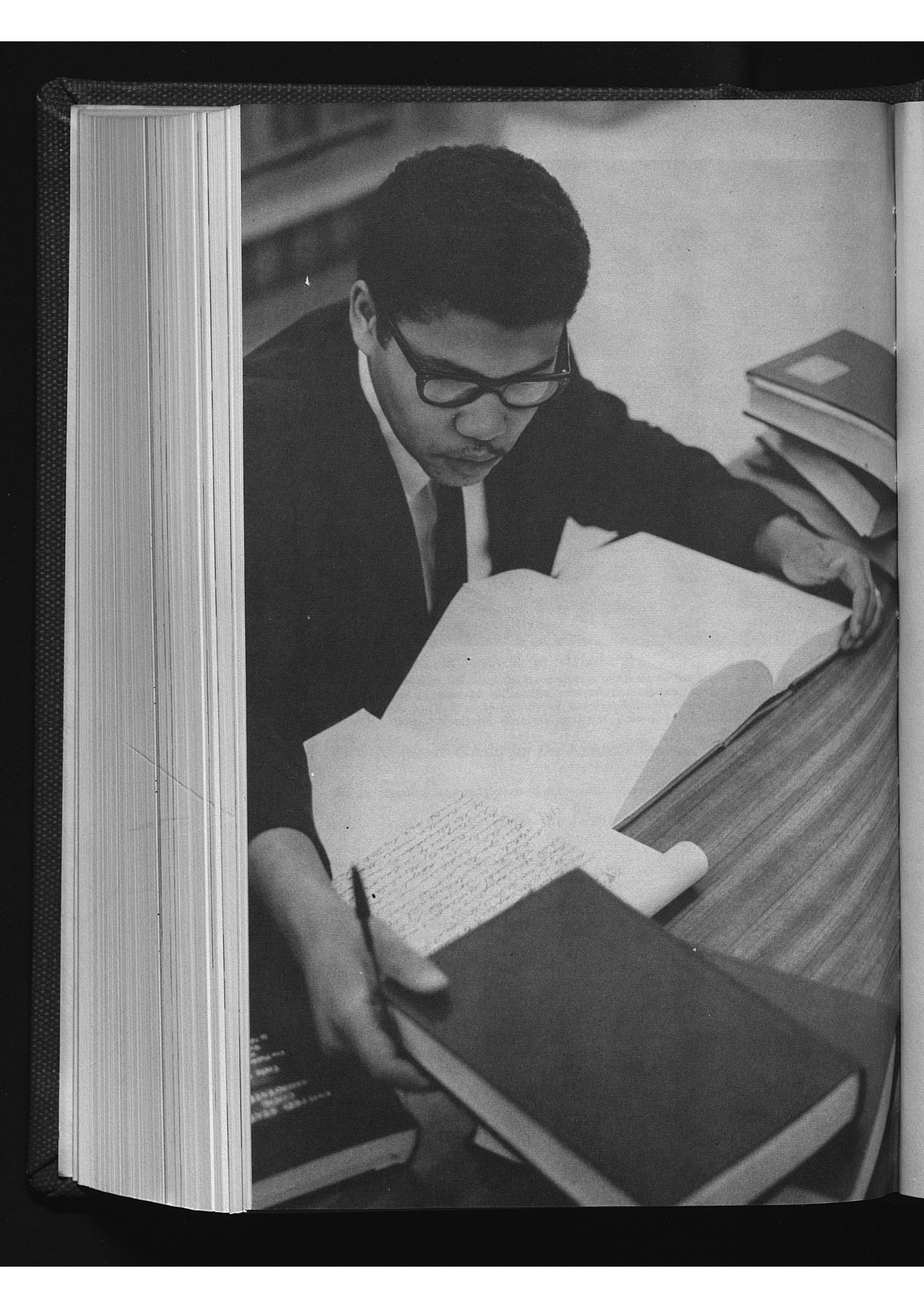
769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Seminar.* (0) I, II
Review of current literature in the field of metallurgical engineering and presentation of papers thereon. Presentation of talks on departmental research. Group and panel discussion. Required of all graduate students, every semester. *Staff.*

781 *Special Problems, Literature and Laboratory.* (1-3) I, II, S
Literature research and planning of research programs; shop problems and technical writing, including a term paper, are required. Consultation, lab, and lecture by appointment. May be repeated to a maximum of nine credits. *Staff.*

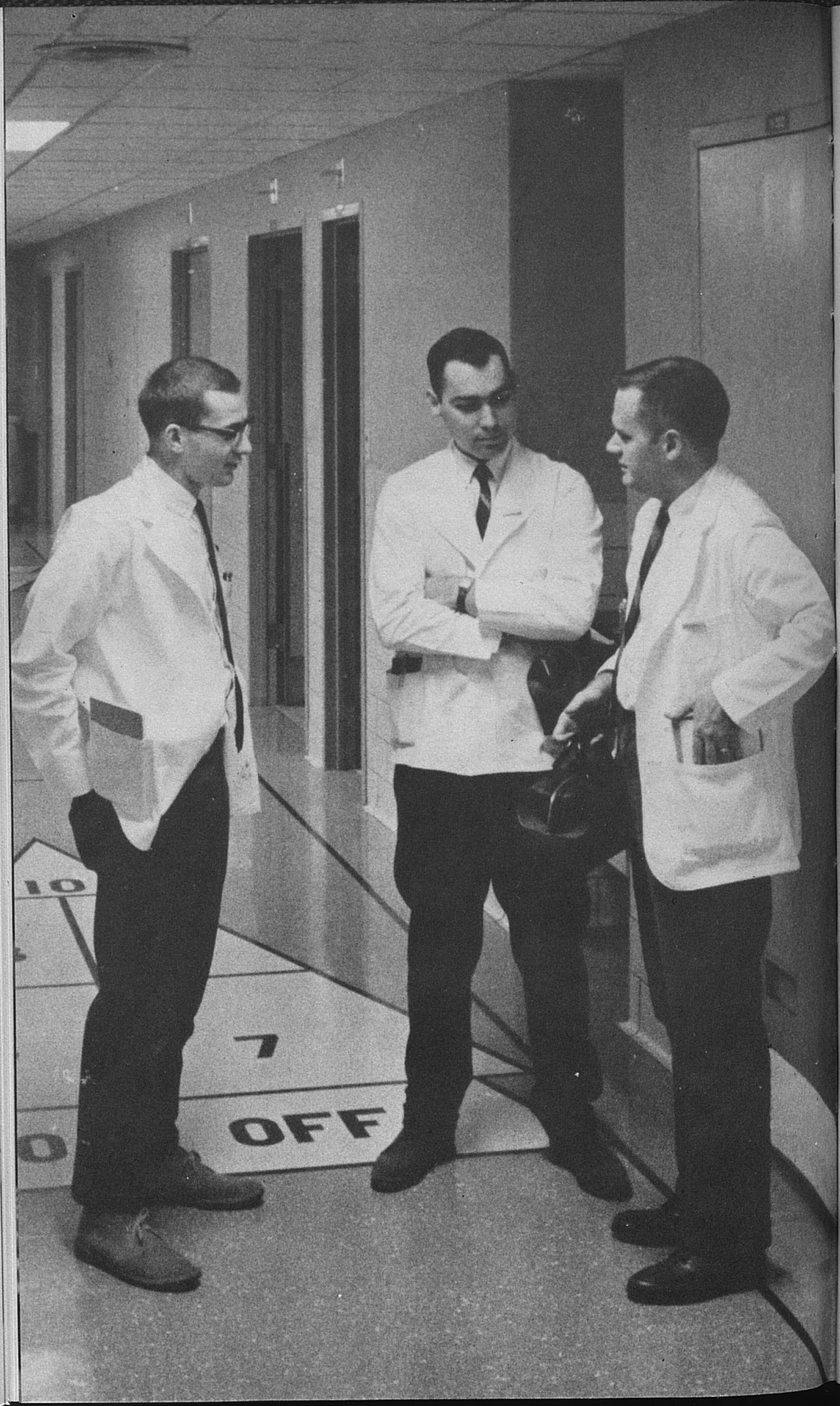
782 *Special Problems, Literature and Laboratory.* (3) I, II
A continuation of MET 781, lab, 6 hours; consultation and lecture by appointment. May be repeated to a maximum of nine credits. *Staff.*





VI. LAW

No major programs of study are offered in Law at present leading to a degree other than Juris Doctor (J.D.) Students wishing to obtain graduate credit for courses in Law should consult the Dean of the Graduate School or the Dean of the College of Law.


10
7
OFF

VII. MEDICINE

ANATOMY

The program of graduate studies in Anatomy is intended to provide educational opportunities for people with several different objectives. Some students will pursue graduate work in Anatomy with the intention of teaching in departments of anatomy; some will have already obtained a professional degree, such as an M.D. or D.M.D., and may be interested in obtaining specific training in some region or system of the body to complement their professional education. Others may study in Anatomy as a minor or simply for specific credit.

Preparation for graduate work in Anatomy can be broad and varied. Ordinarily some biological sciences will be required. However, backgrounds in the physical sciences or, in special cases, in the social sciences or humanities would be accepted.

The Department is prepared to offer the M.S. and Ph.D. degrees with major training in gross human anatomy, microscopic human anatomy, embryology, endocrinology, genetics, and neuroanatomy. Also, a major interest can center in tissues, organs, regions or systems of the body, in which, for example, professional graduates such as dentists or orthopedic surgeons might wish to take specific training. Certain students with special needs will, with permission of the Director of Graduate Studies, be permitted to work toward the M.S. degree on Plan B; however, in most cases students will follow Plan A.

Potential applicants for graduate work in Anatomy are requested to write directly to the Chairman of the Department of Anatomy.

503 *Independent Work in Anatomy.* (3)
Reading and laboratory work in a defined area of anatomy are carried out under the direct supervision of one staff member. Hours of discussion and lab work by individual arrangements. May be repeated to a maximum of 12 credits. Prereq: An introductory course in Biology, Zoology, or Botany and permission of chairman. *Staff.*

511 *Introduction to Anatomy.* (4)
The principles of organization of the human body are presented. Several methods of studying anatomy are utilized. Gross anatomy lectures follow a systemic development. Other methods include radiology, palpation of living structures, *in vivo* microscopy, and the demonstration of prosected fresh and fixed materials. Prereq: Some background in biology and consent of instructor. *Cotter and Staff.*

512 *Microscopy and Ultrastructure.* (3)
The organization of cells, tissues and organs are presented through lectures and in the laboratory, through the microscopic study of *in vivo* materials, histological sections, and illustrations. Prereq: Some background in biology and consent of instructor. *N-Winer, Traurig, and Staff.*

513 *Developmental Anatomy.* (2)
The development of the human body is presented through lectures, visual aids including motion pictures, histological sections, laboratory demonstrations and exercises. A majority of the time is spent on intra-uterine development; however, postnatal growth and common morphological changes associated with aging are also taken up. Prereq: Some background in biology and consent of instructor. *Fowler and Staff.*

516 *Anatomy of the Nervous System.* (4)

The gross and microscopic structure of the central and peripheral nervous systems and their blood supply will be studied. The course will include the functional interpretation of anatomical structures. Prereq: ANA 511, 512, 513; PGY 511; consent of instructor. *Gillilan and Staff.*

529 *Concepts of Morphology. Special Topics.* (2)

The objective of this course is to present concepts of morphology as they concern cells, tissues, or organs, systems and/or regions of the human body. Necessarily, the history of the development of ideas about the selected topic will be surveyed. Inherent also in the presentation of concepts of structure will be the presentation of controversies which have resulted from differing methods and interpretations. Prereq: Advanced work in biology, preferably a major or minor in a biological science, and consent of the instructor. May be repeated once. *Staff.*

531 *Combined Gross and Neuroanatomy.* (6)

The course includes a presentation of principles and generalizations about the morphology of the human body and several techniques for studying gross and neuroanatomy of the head, neck, and thorax. Neuro and gross anatomy will be given 3 hours of lab work. Dissection guide, texts, atlases and original articles will be assigned. Prereq: Some background in biology and consent of instructor. *Fowler and Staff.*

532 *Combined Histology and Embryology.* (4)

The course includes the microscopic study of tissues and organs of the human body and the general development of the human embryo and fetus, with emphasis placed upon the development of head, neck, and face. Texts and additional literature references are assigned. Prereq: Some background in biology and consent of instructor. *Elwood and Staff.*

533 *Oral Histology.* (2)

A detailed study of the microscopic organization and ultrastructure of the several gross structures of the oral cavity and tooth development. Texts and original articles are assigned. Discussion will be carried out within the laboratory periods. Prereq: ANA 531 and 532, or their equivalent, and consent of instructor. *Elwood and Staff.*

611 *Regional Gross Anatomy.* (8)

The course will include 1) a detailed dissection of the human body 2) a study of specific relations of the systems within major regions 3) a familiarization with reference sources in the field of gross human anatomy. Prereq: Courses in Comparative Anatomy and Embryology and ANA 511 or the equivalent and consent of instructor. *Benton and Staff.*

629 *Techniques of Anatomical Research.* (2)

The objective of this course is the familiarization of students with research techniques in anatomy. The relationship will be tutorial. Students will work under the direction of given staff members for determined periods of time, usually on a problem. The exact length of time will depend upon the student's purposes, progress and the techniques. The problem may be new research or a repetition of previous work. Prereq: Previous senior college or graduate level work in biology and consent of chairman. May be repeated once. *Staff.*

631 *Advanced Gross Anatomy.* (3-5)

The objective of this course is to meet individual student needs for increased knowledge in particular areas of gross human morphology. Investigations of problems involving gross morphology will be carried out. One or several defined areas of the body will be studied in considerable detail by dissection, by intensive use of the pertinent literature, by the use of visual aids, prosected materials and other appropriate learning aids. Prereq: A background in gross human anatomy equivalent to a medical school course in regional anatomy and consent of instructor. May be repeated at discretion of student's committee. *Benton and Staff.*

633 *Advanced Developmental Anatomy.* (2-5)

The objectives of the course include a detailed study of the intrauterine development of the human fetus as well as of fetal physiology and comparative aspects of gestation. Prereq: Comparative Anatomy, Embryology, and consent of the instructor.

634 *Advanced Endocrinology.* (2-5)

The objectives of this course include interrelating the microscopic and ultrastructural morphology of endocrine glands with the functions of these glands. Emphasis will be placed on functional aspects, chemistry, and mode of action of specific hormones. All endocrine organs will be studied and given equal importance. The relationship between the central nervous system and the endocrine system will be covered in detail. Prereq: Fundamental background in biology including some previous work in endocrinology and consent of the instructor. *Winer and Staff.*

636 *Advanced Neuroanatomy.* (3 to 5)

The objectives include specific and detailed correlation of anatomical materials with clinical data particularly in the areas of the sub-specialties of Neurology, Psychiatry, Ophthalmology, Otolaryngology, Internal Medicine, and Neurosurgery. Clinical data from these sub-specialties will be related to the location of neuclei, the precise patterns of fiber tracts and to blood supply. The detailed content and emphasis will depend upon both the background and the purposes of the student. Prereq: ANA 511, 512, 513, 516, or their equivalent and consent of instructor. *Gillilan and Staff.*

638 *The Genetic Basis of Human Morphology.* (2-5)

The course will provide an historical survey of human genetics as background for current concepts. The genetics of man will be studied together with the problems of data gathering which are unique and are inherent in this field. The interrelations of known errors of human metabolism to alterations of cell and system morphology will be presented. Prereq: Elementary Genetics and consent of instructor. *Cotter.*

651 *Special Projects in Anatomy of Head and Neck Correlated with Neuroanatomy.* (3 to 5)

The objective of the course is to provide the opportunity for the learning of detailed information about gross anatomical relations in the head and neck. Prereq: A course in regional gross anatomy and neuroanatomy and consent of instructors. *Gillilan, Benton, and Staff.*

662 *Ultrastructural Anatomy.* (2-5)

The objectives of this course are to advance the students' knowledge of the mammalian tissues and the human body. Those students registering for more than 2 hours of credit will do laboratory work in electron microscopy and micro-radiographic techniques. Correlation of intra- and extra-cellular morphology and function will be stressed. Prereq: Previous work in microscopy including histology or cytology and previous technique work with electron microscopy such as Microbiology 660, or its equivalent, and consent of instructor. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

BEHAVIORAL SCIENCE

The Concentration and the Minor in Medical Behavioral Science

A program of concentration or a minor in medical behavioral science is offered for doctoral candidates in sociology, anthropology, psychology or other behavioral science disciplines through the Department of Behavioral Science in the Medical Center. The Concentration includes three aspects: First, a group of core courses. Second, a planned program of observation and participation in Medical Center activities designed to afford each student an opportunity to be-

come fairly thoroughly enculturated to the social structure, attitudes, beliefs, values and objectives of health personnel and organizations, and the nature of behavioral science research in these areas. As far as possible, students in the Concentration are provided office space in the Medical Center so that they may have ready access to resources and events. Third, a health-related topic for the doctoral dissertation.

Students may elect to minor in medical behavioral science by taking a group of approved courses with the sponsorship and guidance of a designated faculty member.

The Concentration is partially supported by a training grant from the National Institute of Mental Health for Research Training in the Social Sciences, under which selected students are provided with traineeship stipends.

Courses for the Concentration include:

546 *Social Factors in Mental Illness.* (3)
The significance of social and cultural factors in the recognition, course, and management of mental health problems; social organization of the mental hospital and cultural alternatives to hospitalization. Prereq: consent of instructor. (Same as SOC 546). *Gallagher.*

670 *Seminar on Role Theory.* (3)
An exploration of differences and similarities in the utilization of the concept of role in sociology, anthropology and psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Prereq: consent of instructor. (Same as SOC 670.) Same as ANT 670. *Hall and Gallaher.*

765 *Research Problems in Medical Anthropolgy.* (3)
History and theory of medical anthropology; research design, field work, analysis of data, and report writing. Prereq: Graduate status in ANT, SOC or PSY, and a concentration or minor in medical behavioral science. Same as ANT 765. *Pearsall.*

766 *Concepts in Medical Sociology.* (3)
A systematic review of sociological concepts and methods which have been applied to the study of health and medicine; the contributions of medical sociology to general sociological theory; the roles of sociology in education for the health professions and in research on health-related problems of society. Prereq: Predoctoral status in one of the social or behavioral sciences with a concentration or minor in medical behavioral science. (Same as SOC 766). *Straus.*

772 *Topical Seminar in Medical Behavioral Science.* (1-3)
Advanced study of topics of current importance in medical behavioral science such as alcoholism, social psychological processes related to health, social structure of mental hospitals, social epidemiology of disease, institutional dependency, computer-aided medical diagnosis. May be repeated to a maximum of 6 credits. Prereq: consent of instructor. *Staff.*

790 *Research in Medical Behavioral Science.* (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. By appointment. Prereq: For students taking a concentration or a minor in Medical Behavioral Science as part of their doctoral programs or as elective for graduate, medical or dental students. *Staff.*

ALSO AVAILABLE IN THE DEPARTMENT OF BEHAVIORAL SCIENCE

527 *Society and Health.* (3)
The study of human behavior in illness and of medicine as a complex form of social organization in perspective of historical, cross-cultural and contemporary analysis. This course is designed primarily for students preparing for careers in an allied health science and profession. (Same as SOC 527). *Hall.*

BIOCHEMISTRY

The program of graduate studies in biochemistry is designed primarily for doctoral candidates who plan to pursue a research career in this field. Creative research in biochemistry requires broader training and more extensive laboratory experience than can be achieved at the master's level. Therefore, candidates for the master's degree will be accepted only under unusual circumstances.

As preparation for graduate work in biochemistry, students should have completed courses in chemistry through physical chemistry, in mathematics through the calculus and must have had one year of work in physics and in one of the biological sciences. A reading knowledge of two modern foreign languages, of which one should be German and the other French or Russian, should be acquired as an undergraduate. Although students who have deficiencies in their preparation may be admitted to graduate study in the Department of Biochemistry, the time necessary for completion of their work will necessarily be lengthened. Although programs of study will be fitted to the preparation and interests of individual students, it is anticipated that most students will take advanced courses in chemistry and in physiology, cell biology, microbiology, zoology or botany.

Inquiries concerning availability of financial support for graduate students should be addressed to the chairman of the department.

501 *Biochemistry for Dental Students.* (6)
This is a course in general biochemistry in which particular emphasis is given to those aspects of the field which are of interest to students of dentistry.

511 *Biochemistry for Medical Students.* (7)
A selective summary of available information on cellular activities at the molecular level. Particular emphasis will be given to the processes by which metabolites are converted into compounds essential to the maintenance or growth of the cell or are oxidized to yield energy in a form which is useful to the cell. Discussions of respiration, nutrition and of the processes by which a constant extracellular environment is maintained are also included. Prereq: CHE 112, 232; CHE 442 is also highly desirable. *Staff.*

514, 515 *General Biochemistry.* (3 ea.) I
An intensive introductory course in the broader aspects of biochemistry. Topics stressed include the chemistry of naturally occurring materials, the nature of enzyme action, intermediary metabolism, and chemical aspects of the specialized behavior of animals, plants and microorganisms. Prereq: Chemistry 112, 226, 232 and one year of biological science. Chemistry 442 and 443 are desirable for students majoring in biochemistry but may be taken concurrently. Lecture and conferences. *Staff.*

517 *Experimental Methods in Biochemistry.* (2) II
A laboratory course dealing with the procedures and instruments of biochemical research. Various techniques are employed in the course of experiments demonstrating important biochemical findings. The course is designed to follow BCH 514, 515. Because the materials employed are labile, one full day per week is spent in the laboratory. Prereq: BCH 514, 515 or its equivalent.

610, 611 *Intermediary Metabolism.* (3 ea.) I, II
A lecture and seminar course devoted to a study of the detailed mechanisms of carbohydrate, lipid and nitrogen metabolism. Prereq: BCH 511 or 514, 515. *Lester, Bollum.*

614, 615 *Biochemistry of Proteins, Nucleic Acids and Enzymes.* (3 ea.) I, II

A lecture and seminar course devoted to the chemical, physical and biological properties of proteins, and nucleic acids and to the broad area of physical biochemistry including kinetic and thermodynamic aspects of enzyme-catalyzed reactions. Prereq: CHE 442, BCH 511 or 514, 515. *Schwert, Hu.*

618, 619 *Seminar in Biochemistry.* (1 ea.) I, II

A weekly seminar, required of all students majoring in biochemistry, and devoted to discussions of areas not covered in other courses and to recent developments in the field. *Staff.*

640 *Research in Biochemistry.* (1 to 15) I, II, S

Staff.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

CELL BIOLOGY

605 *General Cell Biology.* (Spring semester 1969 only) (4-5)

A general study of the genetics metabolic regulation, reproduction, and interactions of procaryotes, eucaryotes, and viruses. Four to five class hours per week. Prereq: BCH 511, 514-515 or equivalent and permission of instructor.

710 *Special Topics in Cell Biology.* (2) I

A variety of topics relating to modern molecular and cell biology. Two class hours per week. Prereq: Permission of instructor. Also offered in Medicine.

PATHOLOGY

While there is as yet no graduate program in pathology the department offers two courses which are open to qualified graduate students. The permission of the department chairman is required prior to enrollment.

421 *Fundamental Human Pathology.* (4)

This course will provide a general survey of the various types of reactions to injury, regeneration, repair, the granulomata and the fundamentals of neoplasia. The emphasis will be upon the pathogenesis, mechanisms, and natural history of disease processes with particular stress on the interrelationships of structural and metabolic abnormalities. For non-medical students. Prereq: For graduate students: ANA 511, 512, 513, PGY 511, BCH 511 or equivalent, and permission of instructor.

422 *Systemic Human Pathology.* (7)

The study of diseases of each organ system. For non-medical students. Prereq for graduate students: ANA 511, 512, 513, PGY 511, BCH 511 or equivalent. Permission of department chairman.

PHARMACOLOGY

The Department of Pharmacology offers M.S. (according to Plan A) and Ph.D. degree in Pharmacology.

Pharmacology is the study of the actions of drugs upon living matter. Pharmacologists in modern society find careers as teachers in academic professions, as scientists engaged in research of problems related to pharmacology, and in developing new drugs along with evaluating drugs for their potential efficacy, toxicity, side effects, etc.

Graduates from accredited colleges with bachelor degrees in the biological sciences, in chemistry, physics or pharmacy or with professional degrees in medicine, dentistry, veterinary medicine or pharmacy are eligible for candidacy for graduate degrees in pharmacology. It is advisable that the candidates obtain a good basic training in mathematics, physics, chemistry and biological sciences. The Ph.D. program involves extensive research work under the supervision of appropriate staff scientists. At the present, special training can be obtained in fundamental pharmacodynamics, in neuropharmacology, psychopharmacology, and in gnotobiotic biology.

Only one modern foreign language is required for the Ph.D. degree in Pharmacology.

Inquiries concerning the details of the program as well as possible financial support for graduate students should be addressed to the Chairman of the Department of Pharmacology.

521 *General Pharmacodynamics.* (2) I

A fundamental discussion of the response of the living organism to drugs analyzed primarily on the cellular and subcellular levels. Factors which affect the absorption, distribution and the disposal of drugs in the body will be discussed. The quantitative aspects of dose-response relationships to drugs will be analyzed including an introduction to the problems of biological assay. Prereq: consent of instructor. *Csaky and Staff.*

522 *Pharmacology in Medicine.* (3) I

Aimed to give a fundamental understanding of the pharmacodynamic action of drugs most commonly used in medical practice. Prereq: PHA 521 or 821; consent of instructor. *Csaky and Staff.*

541 *Biological Assay.* (3) I

A study of the estimation of potencies of treatments against some standardized scale. Prereq: BSC 421, 422, or equivalent. Consent of the department chairman. *Staff.*

555 *Gnotobiotic Methodology.* (2)

A practical course for students who wish to learn how to conduct gnotobiotic experiments. In this type of work animals are maintained either in absence or in association with known microbial contaminants. Prereq: MB 200. Consent of instructor. *Gordon.*

610 *Seminar in Pharmacology.* (1) I, II

May be repeated indefinitely. *Staff.*

612 *Quantitative Pharmacodynamics.* (2)

Quantitative treatment of dynamics of drug absorption, distribution, metabolism and excretion, including development of mathematical models for these processes and application of techniques such as analog simulation. This course is cross-listed with PHR 612. Prereq: PHA 521, MA 212, and consent of instructor.

621 *Advanced Pharmacodynamics.* (2) I

Continuation of PHA 521 with particular emphasis on recent developments in the field. Prereq: PHA 521 or 821, and consent of the Department Chairman. *Staff.*

631 *Pharmacological Methodology.* (3) II

Practical review of the important specialized methods in study of the effects of drugs. Prereq: PHA 521, 533, or 821, and consent of the Department Chairman. *Staff.*

645 *Physiology and Pharmacology of Biological Membranes and Transport.* (1)

Advanced study of the structure, functions, and permeability of biological membranes and the effect of change of chemical environment upon them. Prereq: BCH 514 515 or PCH 400 or CHE 552 or equivalent. PGY 502/503 or 511 or equivalent. PHA 521 or 821. Consent of instructor. *Csaky.*

650 *Host-Contaminant Relationships.* (2)

The course deals with the effects of microbial associates on various systems of the animal host with special reference to gastrointestinal, cardiovascular, defensive functions and aging. Material will be presented as a comparative study between gnotobiotic and conventional animals. Prereq: BSC 421/22, CHE 220, 230, 444, ZOO 200, MB 200, 550 or equivalent. Consent of instructor. *Gordon.*

658 *Advanced Neuropharmacology.* (4)

A study of the general theories of the mode of action of drugs upon nervous tissue and a review of the effects of analgesics, sedatives, hypnotics, anesthetics, tranquillizers, psychotomimetics, analeptics, antidepressants, anticonvulsants and drugs effecting motor dyskinesias upon neurones, synapses and functional components of the central nervous system. Prereq: PGY 416 or equivalent, PHA 521 and 522 or 821. Consent of instructor. *Martin.*

660 *Pharmacology of Steroids.* (4) II

Lectures and laboratory work dealing with the chemistry, metabolism and pharmacology of steroids. Emphasis will be placed on methods of research which will be illustrated in laboratory exercises. Prereq: CHE 232, BCH 514/515 or PCH 400 or CHE 522 or equivalent. PHA 521 or 821. Consent of instructor. *Flesher.*

664 *Advanced Molecular Pharmacology.* (2) II

An advanced discussion of actions of drugs at the molecular level. The mechanism by which alter the biochemical machinery which operates in the maintenance in the cellular integrity will be emphasized. Chemical events which occur when drug molecules interact with macromolecules with cell constituents which modulate the activities of cell will be discussed. Prereq: PHA 521, 522 or 821. Consent of instructor. *Diedrich.*

665 *Drug Receptor Interrelationship.* (1)

A seminar course in which the nature and topography of the reactive groups constituting the receptors of various drugs is discussed. Prereq: CHE 550/552 or BCH 514/515 or equivalent, PHA 521 and 522 or 821. Consent of instructor. *Diedrich.*

670 *Clinical Psychopharmacology.* (2) I

A fundamental discussion concerning the purposes, indications and contraindications, methods of administration and effects of psychotropic drugs on human behavior. Prereq: PHA 521 or 821, PSY 522 and 670. ANA 516, PGY 516, PSY 505, 507 and 509 and strongly recommended, and selection from among these courses will be made after consultation with the Director of Graduate Studies in Pharmacology. *Wikler.*

671 *Integrative Psychopharmacology.* (2) II

A discussion of the mechanisms of action of psychotropic drugs. Prereq: PHA 521, PHA 522 or 821 and 670, ANA 516, PGY 516, PSY 505, 507 and 509 are strongly recommended, and selection from among these courses will be made after consultation with the Director of Graduate Studies in Pharmacology. *Wikler.*

750 *Research in Pharmacology.* (1-5) I, II, S

May be repeated to a maximum of 15 credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

PHYSIOLOGY AND BIOPHYSICS

Physiology is the biological field concerned with function. It is, in fact, dynamic biology. The increase in knowledge in the field of physiology as well as the change in the nature and complexity of instrumentation necessary for experimentation and analysis of experimental data have lengthened doctoral programs in physiology or necessitated a restriction in the scope of the program.

The graduate program meets these problems in three stages:

(1) requirement of adequate physical, chemical and biological background before admission to the program or a reasonable plan to make up deficiencies that exist. In general, one year of physics, three years of chemistry, one year of biological science and mathematics through calculus are required. A reading knowledge of one modern foreign language is required of candidates for the Ph.D. degree;

(2) a basic program covering one to two years to allow instruction in basic mammalian and cellular physiology and the correlated instrumentation including project type laboratory work;

(3) special training and research including a thesis in the areas of physiology in which the department has competence. These include neurophysiology, cardiovascular physiology, respiratory physiology, temperature regulation, developmental physiology, cellular physiology, physiological correlates of behavior. Special programs may be developed in biophysics, space physiology, and biomedical engineering.

In general, the physiology studies program is designed primarily for the doctoral candidate. Today's research in physiology requires broader training than can be achieved at the master's level. Therefore, candidates for the master's degree (Plan A) will be accepted only under special circumstances. Graduates of accredited colleges with a bachelor's degree in biology, zoology chemistry, physics, psychology or engineering may become candidates for a graduate degree in physiology.

Inquiries concerning availability of financial support should be addressed to the Chairman of the department.

502 *Principles of Physiology Lectures.* (3) I

A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems. Three hours lecture. (Same as ZOO 502.) Prereq: One year Physics and Organic Chemistry. *Staff.*

503 *Principles of Physiology.* (5) I

PGY 502 lectures plus four hours related laboratory work. (Same as ZOO 503.) Prereq: One year Physics and Organic Chemistry. *Staff.*

504 *Independent Work in Physiology.* (2-4) I, II, S

A study of some advanced problems in physiology under the direct supervision of the instructor. Discussion period, one hour; lab, four hours. May be repeated to a maximum of 8 credits. Prereq: Instructor's consent. *Staff.*

507 *Introduction to Endocrinology.* (3) I, S

Introductory study of the development, structure and fundamental functions of endocrine glands. Lectures, three hours. Prereq: general chemistry, instructor's consent. *Archdeacon.*

511 *Medical Physiology.* (7) II

Medical Physiology provides advanced work in mammalian physiology approached from the biophysical point of view. Lectures and discussions include consideration of cellular function, excitable tissues, volume conductors, contractile tissues, circulation, respiration, gastro-intestinal tract, energy exchange, kidney, endocrines and the central nervous system. Laboratory experience will also include electrophysiological and mammalian surgical techniques with emphasis on experimental design and biometrics. For medical students. Graduate students admitted by permission of Instructor. *Staff.*

512,513 *Cellular Physiology.* (4) I

An intensive study of general physiological principles with emphasis on the chemistry and physics of the cell. Lecture, two hours; lab, 2 hours. Prereq: Physics and General Chemistry. *Staff.*

522 *Mathematical Biophysics.* (3) I

Mathematical approaches to biophysical problems in biology. Emphasis on the abstract representation of physiological systems and processes. Four class hours per week. Prereq: MA 211 or equivalent. *Engelberg.*

602 *Physiological Instrumentation I.* (3) I

Electronic circuits in physiological measuring systems. Prereq: MA 113, knowledge of integration and differentiation of simple functions or permission of instructor.

603 *Physiological Instrumentation II.* (3) II

Physical basis of physiological measurement and analogs of physiological systems. Prereq: MA 113, PGY 511, and PGY 602 or consent of instructor.

606,607 *Advanced Neurophysiology.* (3) II

Electrical analysis of nerve fibres and synapse; nerve impulse theories, reflexes, metabolism and central nervous function are considered from the cybernetic viewpoint. Lectures, two hours; lab, two hours. Prereq: PGY 511; instructor's consent. *Boyarsky.*

614 *Cellular Biophysics.* (3)

An analysis of cellular processes in the light of molecular physics. Topics include the physics of macromolecules, molecular forces, quantum phenomena, colloidal properties of protoplasm, muscular contraction, vision, membrane phenomena. Prereq: CHE 442, 552 or BCH 511 or 515, PGY 502, 511 or 512 or consent of instructor.

620 *Theoretical Biophysics.* (3) I

Introduction to similitude, information theory and systems analysis as related to contemporary problems in biology. Prereq: MA 113. *Engelberg.*

660 *Systems Biophysics.* (3) II

The development and analysis of models of physiological systems. Applications of probability theory, spectral analysis, transient and frequency analysis to these systems. Prereq: PGY 522, MA 211 or equivalent or consent of instructor.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits or equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

Staff.

774 *Graduate Seminar in Physiology.* (1) I, II, S

Staff.

796 *Research in Physiology.* (2-5) I, II, S

May be repeated to a maximum of 15 credits. *Staff.*

TOXICOLOGY

The Graduate Program in Toxicology is truly interdepartmental with members of the various faculties of the Medical Center, the College of Arts and Sciences, and the College of Agriculture participating. Both the M.S. (Plan A) and Ph.D. degree are offered.

It is designed to train individuals to utilize the biological, physical, and mathematical sciences in the study of the causes, mechanisms, and evaluation of poisoning as well as the sources, identification and quantitation of poisons. Toxicology, the science of poisons, is concerned with the interaction of chemical agents or changes in the physico-chemical environment with living systems.

Graduates of accredited colleges with baccalaureate degrees in the biological sciences, chemistry, or physics or professional degrees in medicine, dentistry, pharmacy, or veterinary medicine may apply for graduate study in the toxicology program. It is advisable that candidates have a good background in chemistry, physics, biological sciences, and mathematics. Students with other advanced degrees may be considered for admission. However, the number of credits and courses transferable will be considered on the merits of each individual case.

Since each candidate may be expected to have specific interests, the actual curriculum will be tailored to meet individual needs. Only one modern foreign language is required for the Ph.D. degree in Toxicology.

Inquiries concerning the details of the program as well as possible financial support for graduate students should be addressed to the Chairman of the Department of Pharmacology.

MM 620 *Biotoxicology.* (3 or 5) I

An advanced course in toxicology and toxicodynamics concerned with the sources, isolation, purification identification as well as the physiologic effects on man, animals, and plants of the various toxic substances encountered in the occupations, home, as well as rural and urban environments. Special attention will be given to type compounds as well as structure-activity relationships. Lecture, three hours; lab, four hours. Prereq: BCH 514, 515, CHE 532, PHA 521, and PGY 503 or MM 334 and 346; or consent of instructor. *Luckens.*

MM 630 *Biotoxicology.* (3 or 5) II

A continuation of MM 620. Prereq: MM 620 or permission of the instructor. *Luckens.*

MM 640 *Environmental Toxicology and Occupational Hygiene.* (3) II

An advanced course concerned with the recognition, analysis, evaluation, and control of the physical, physiologic, and toxicologic factors arising from occupational and natural environments; their effects on the well-being of the worker and the community; and current practices in their recognition, elimination and/or mitigation. The occupational environment will be considered as a special case of the ambient environment. Special attention will be given to the development of design data for practical problems. Lecture, three hours per week. Prereq: MM 620, 630 or permission of the instructor. *Luckens.*

PHA 680 *Applied Toxicology.* (5) I

The course will acquaint students with the various toxicological principles as they apply to problems arising from the complexities of modern society. Lectures, demonstrations and informal discussions. Lecture, five hours per week. Prereq: Consent of the Director of Graduate Studies in Toxicology. (Offered as a Conjoint Course.) *Conjoint Staff.*

PHA 770 *Seminar in Toxicology.* (1) I, II

Prereq: Consent of Director of Graduate Study in Toxicology. *Conjoint Staff.*

PHA 790 *Research in Toxicology.* (1-5) I, II, S
Conjoint Staff.

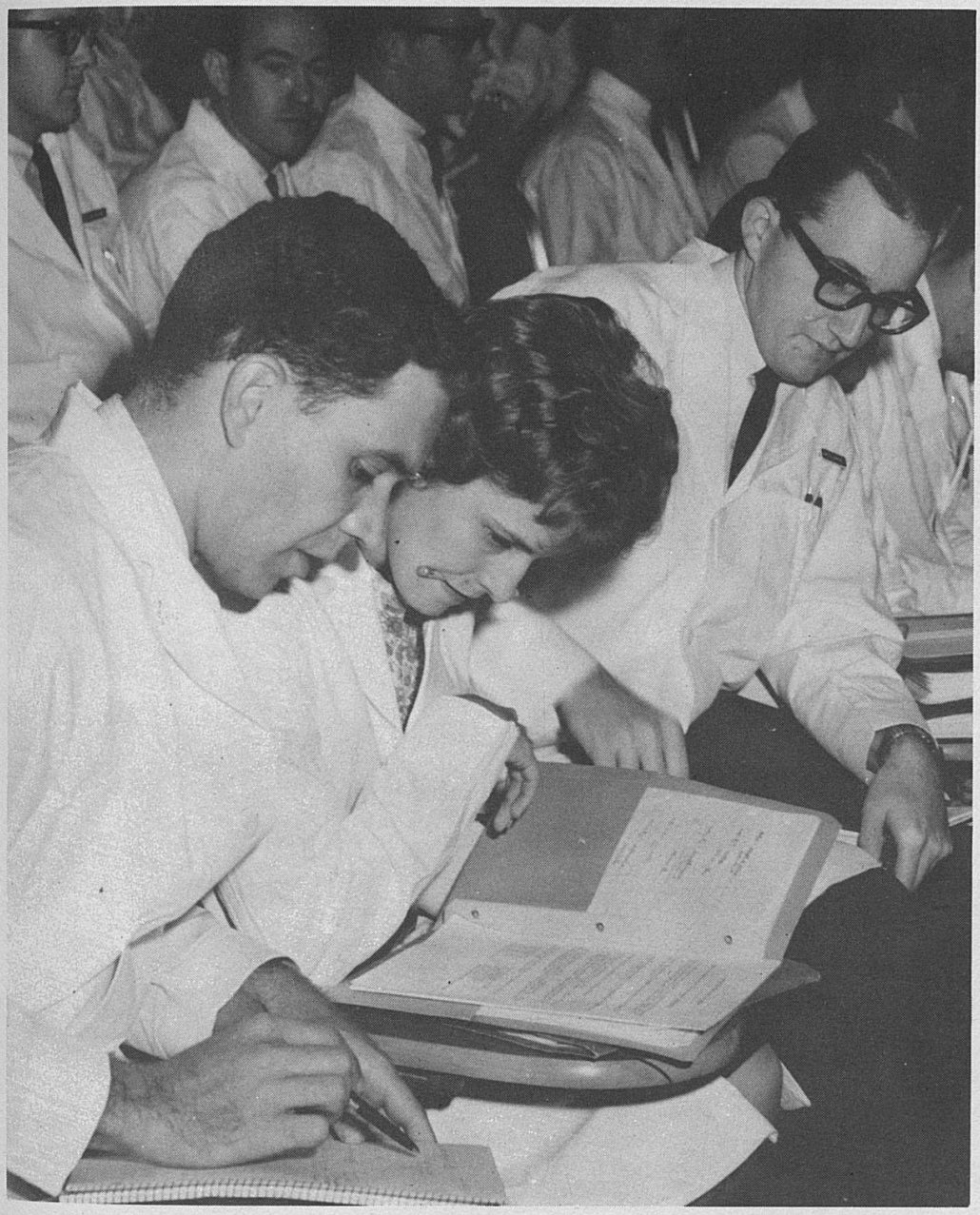
PHA 768 *Residence Credit for the Master's Degree in Toxicology.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. ***Conjoint Staff.***

PHA 769 *Residence Credit for the Doctor's Degree in Toxicology.*
(1 to 12 credits equivalence)
May be repeated indefinitely. ***Conjoint Staff.***

I, II, S

gy.
valence)

gy.
valence)





VIII. PHARMACY

PHARMACEUTICAL SCIENCES

The College of Pharmacy offers M.S. and Ph.D. programs in Pharmaceutical Sciences, with areas of concentration in either Pharmaceutics (Physical Pharmacy or Biopharmaceutics) or Pharmaceutical Chemistry (Medicinal Chemistry and Pharmaceutical Analysis).

The M.S. degree is offered under a modification of Plan A which permits a student to take approximately one-half of his course work in areas outside the major area. Plan B may be employed only in exceptional cases.

The language requirement for both the M.S. and Ph.D. degrees is a reading knowledge of one foreign language chosen from French, German, or Russian.

Subject to some substitution at the recommendation of the candidate's committee, courses considered basic to the Ph.D. program are CHE 440, 442, 522, 532, 548, 633, 635, MA 431, STA 470, PHA 521, BCH 514, 515. Superimposed upon this base it is expected that the student will take graduate level courses within his major area of interest from the courses listed in the departments of Pharmacy and Pharmaceutical Chemistry.

For regular admission to graduate study in Pharmaceutical Sciences a student should have a sound background in pharmacy, chemistry, and biology, with a mastery of mathematics through calculus. Applicants lacking basic requirements in these areas will be required to make up such deficiencies by taking undergraduate courses for non-graduate credit.

PHARMACY

(Pharmaceutics)

540 *Industrial Pharmaceutical Technology.* (4)
The course is designed to give the student a basic understanding of the technology used in the preparation of the principle type of dosage forms by the pharmaceutical industry. Two class hours and four laboratory hours per week. Prerequisite, Theoretical Pharmacy or equivalent. ***Lesshafft, Billups, Dittert.***

612 *Quantitative Pharmacodynamics, Pharmacokinetics.* (2)
Quantitative treatment of dynamics of drug absorption, distribution, metabolism and excretion, including development of mathematical models for these processes and application of techniques such as analog simulation. This course is cross-listed with PHA 612. Two class hours per week. Prerequisite, PHA 521, Math 212, and consent of instructor. ***Doluisio, Staff.***

622 *Advanced Biopharmaceutics.* (2)
An advanced treatment of the factors affecting drug availability from dosage forms and the influence of the route of administration and the dosage regimen on drug availability. Two class hours per week. Prerequisite, PHR 612. ***Doluisio, Staff.***

630 *Pharmaceutical Rate Process.* (3)
Kinetics of reactions of pharmaceutical interest; mechanisms of drug decomposition and theoretical approaches to stabilization and preservation; accelerated stability analysis. Three class hours per week. Prerequisite, Physical Chemistry and Chemical Kinetics. ***Kostenbauder.***

631 *Equilibrium Phenomena in Pharmaceutical Systems.* (3)
An advanced study in special topics of a physical chemical nature which are applicable to pharmacy with special emphasis on physical properties and molecular structure, solubility, complexation and equilibria in solution. Three class hours per week. Prerequisite, Physical Chemistry. *Kostenbauder, Staff.*

632 *Pharmaceutical Disperse System.* (3)
The theoretical considerations basic to the technology of pharmaceutical disperse systems. Topics include colloidal dispersions, suspensions, emulsions, and rheology. Three class hours per week. Prerequisite, Physical Chemistry. *Billups.*

760 *Topics in Pharmaceutics.* (2)
This course deals with emerging basic concepts of pharmaceutical interest that are not being covered in other courses. Two class hours per week. *Staff.*

768 *Resident Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Resident Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

776,778 *Seminar in Pharmaceutics I and II.* (1 ea.)
Reports and discussion of pertinent research and literature in Pharmaceutics. Prerequisite, graduate standing. *Staff.*

780 *Special Problems in Pharmaceutics.* (1-3)
Special problems of a laboratory or literature nature in which a student pursues a topic of interest to him. Prerequisite, consent of instructor. May be repeated once. *Staff.*

790 *Research in Pharmaceutics.* (1-12)
Research work to be conducted in various areas of pharmaceutics. Prrequisites, approval of student's graduate committee and consent of instructor. *Staff.*

PHARMACEUTICAL CHEMISTRY

400 *Biochemistry.* (4)
A fundamental course in the chemistry and inter-relationships of carbohydrates, lipids, and proteins, as well as the role of enzymes, vitamins, and hormones in physiological process. Laboratory exercises parallel the lecture material. Lecture, three hours; lab, three hours. Prereq: PCH 302. *Glasser.*

402 *Pharmaceutical Analysis and Control.* (4)
A course which deals with the application of analytical methods in the determination of the strength, purity and quality of drugs and pharmaceuticals; and includes the means by which quality can be assured in a fabricated pharmaceutical product. Laboratory exercises include analysis of raw materials and dosage forms. Lecture, three hours; lab, three hours. Prereq: CHE 226. *Dittert.*

404 *Chemistry of Medicinal Products.* (3)
A study of the official and more important non-official medicinal agents with respect to their physical and chemical properties, relationships of chemical structure to physiological activity, as well as their potential incompatabilities. Lecture, three hours. Prereq: PCH 400 or equivalent. *Magarian.*

406 *Chemistry of Medicinal Products.* (3)
A continuation of PCH 404 including consideration of such topics as alkaloids, glycosides, steroids, and other chemotherapeutic agents. Lecture, three hours. Prereq: PCH 404. *Magarian.*

410 *Advanced Organic Pharmaceutical Chemistry.* (3)
A study of the synthesis, classification, properties, and uses of organic medicinal agents. Lecture, one hour; lab, six hours. Prereq: PCH 302 or equivalent. *Kornet.*

412 *Advanced Organic Pharmaceutical Chemistry.* (3)
A continuation of PCH 410. Lecture, one hour; lab, six hours. Prereq: PCH 302 or equivalent. *Kornet.*

510 *Modern Methods in Pharmaceutical Analysis.* (5)
Acourse which deals with the application of modern analytical methods, primarily instrumental methods, in the determination of the strength, purity, and quality of drugs and pharmaceuticals. Laboratory exercises include analysis of raw materials and finished dosage forms. Three class hours and four laboratory hours per week. Prereq: CHE 226. *Dittert.*

620 *Natural Products Chemistry.* (3)
A course designed to establish a bridge between organic chemistry, biochemistry and biology in terms of such areas as biogenisis, biotransformations, isolation, degradation, structure elucidation and synthesis of natural products of interest as medicinal agents. Three class hours per week. Prereq: PCH 400 or equivalent, consent of instructor. *Digenis.*

640 *Advanced Pharmaceutical Chemistry I.* (3)
Chemistry of Chemotherapeutic Agents. A course bridging synthetic organic chemistry and biological activity and considering those organic compounds used as therapeutic agents in infectious diseases emphasizing the synthesis, relationship between chemical structure, biological activity, molecular modification and metabolism. Three class hours per week. Prereq: Advanced Organic Chemistry and consent of instructor. *Glasser, Magarian.*

642 *Advanced Pharmaceutical Chemistry II.* (3)
Chemistry of Pharmacodynamic Agents. A course similar to PCH 640, but considering those agents altering physiological activity such as antihistaminic anesthetics, antispasmodics, hypnotics, etc. Three class hours per week. Prereq: Advanced Organic Chemistry and consent of instructor. *Glasser, Magarian.*

760 *Topics in Pharmaceutical Chemistry.* (2-4)
(Topic and credit to be listed when offered)
A study of selected areas of pharmaceutical chemistry such as drug-protein binding, synthetic methods in drug development, heterocyclic compounds, alkaloids, steroids, flavones, etc. May be repeated for a maximum of 10 hours. Prereq: Consent of the instructor. *Staff.*

768 *Residence Credit for Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

776,778 *Seminar in Pharmaceutical Chemistry I and II.* (1 ea.)
Reports and discussion on pertinent research and literature developments in pharmaceutical chemistry. Required of all graduate students. Prereq: Graduate standing. *Staff.*

780 *Special Problems in Pharmaceutical Chemistry.* (1-3)
Selected problems of laboratory or library nature in which a student pursues a topic of interest to him under the supervision of a faculty member particularly qualified in that area. May be repeated once. Prereq: Consent of the instructor. *Staff.*

790 *Research in Pharmaceutical Chemistry.* (1-12)
Research work to be conducted in the various areas of pharmaceutical chemistry such as synthesis of medicinal agents, analytical methods for drugs, structure action relationships, and related topics. Prereq: Approval of student's Graduate Committee and consent of instructor. *Staff.*

MATERIA MEDICA

450 *Pharmacology and Toxicology.* (5)
A presentation of the pharmacodynamic actions, modes of administration, toxic manifestations of drugs, and the relationship of pharmacorynamic action to therapeutic use. Lecture, four hours; lab, two hours. Prereq: MM 334, 346, PCH 400. *Staff.*

462 *Pharmacology and Toxicology.* (5)
A continuation of MM 450. Lecture, four hours; lab, two hours. Prereq: MM 450. *Staff.*

470 *Drug Literature Evaluation.* (3)
This course appraises the student of the pharmacological and toxicological principles and techniques employed in the clinical evaluation of drugs and enables the student to use clinical literature more effectively. It is designed as a natural continuation of MM 462. Prereq: MM 462. *Staff.*

472 *Clinical Drug Communications.* (3)
This course is designed as a natural continuation of MM 470 and serves the specific purpose of providing instruction and experience of such a nature and quality as to promote the professional role of the pharmacist in the communication of therapeutic information. 1 hour lecture, 6 hours laboratory. Prereq: MM 470 and permission of instructor. *Staff.*

474 *Independent Problems in Toxicology.* (1-3)
Selected problems requiring literature and laboratory research aee designed to meet specific needs of graduate minors in toxicology and satisfy professional elective requirements for pharmacy students. May be repeated for total of six hours. Prereq: permission of instructor. *Luckens.*

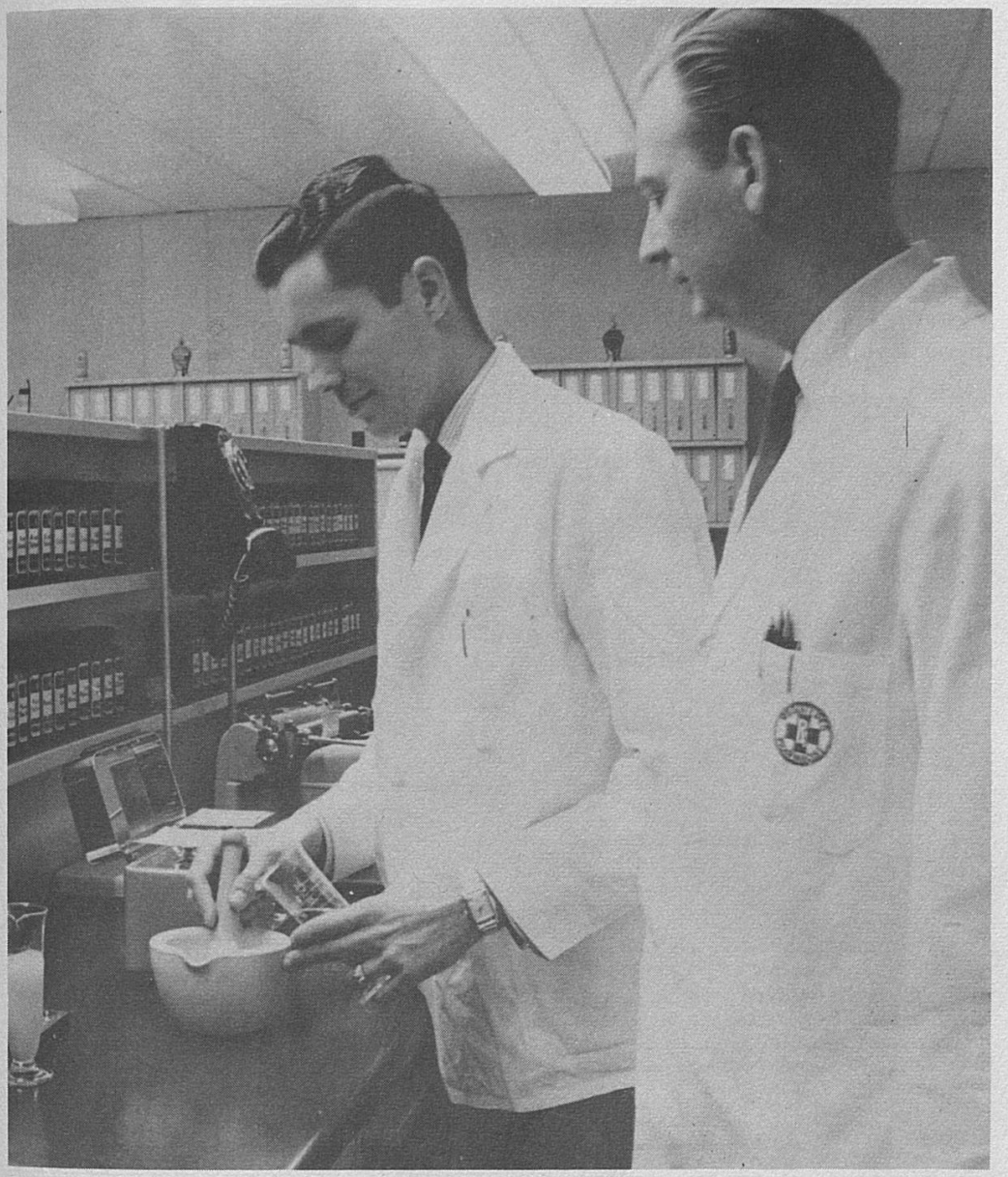
475 *Independent Problems in Pharmacognosy.* (1-3)
Selected problems requiring literature and laboratory research are designed to meet specific needs for graduate minors in pharmacognosy and satisfy professional elective requirements for pharmacy students. May be repeated for a total of six hours. Prereq: permission of instructor. *Digenis.*

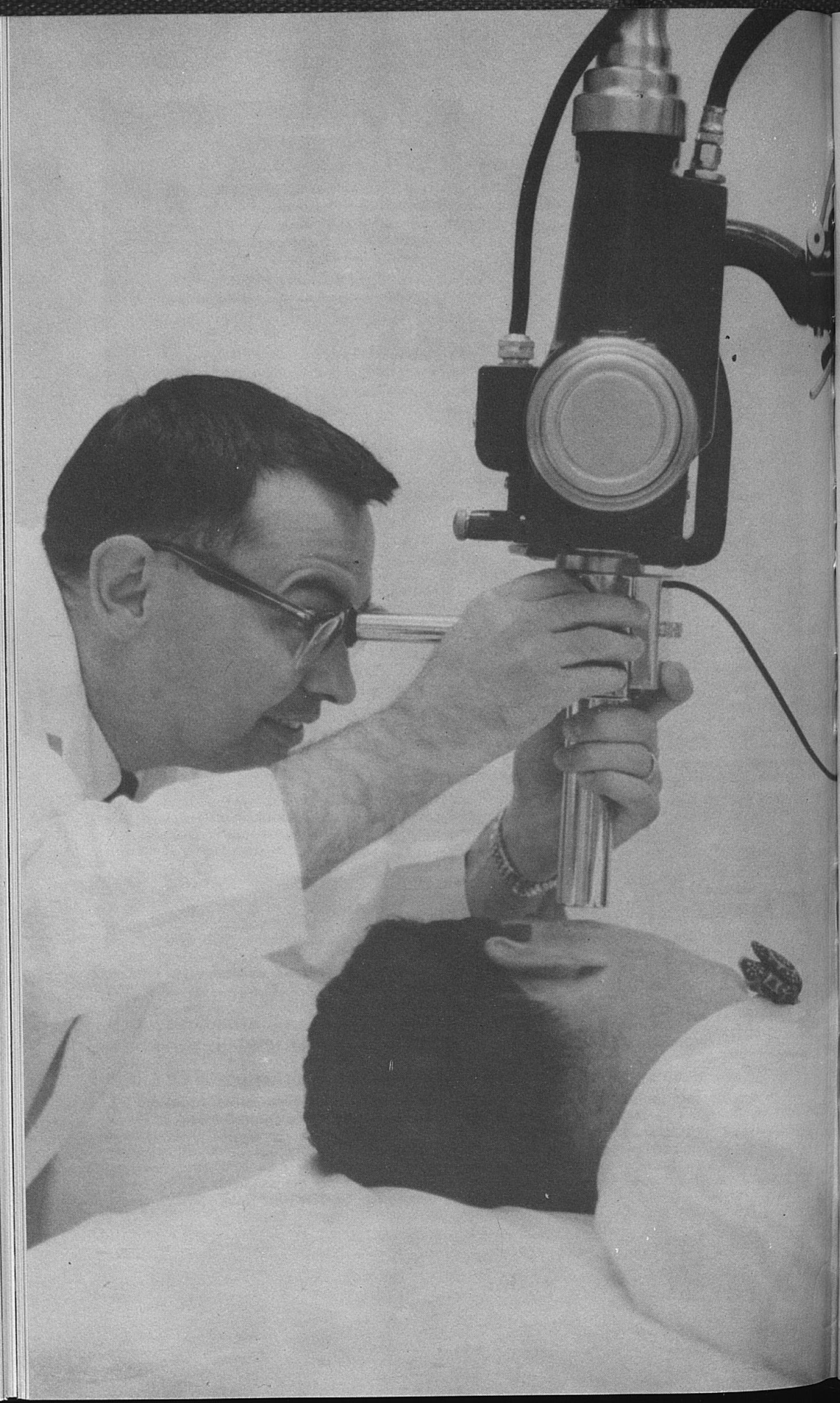
476 *Independent Problems in Pharmacology.* (1-3)
Selected problems requiring literature and laboratory research are designed to meet specific needs of graduate minors in pharmacology and satisfy professional elective requirements for pharmacy students. May be repeated for a total of six hours. Prereq: permission of instructor. *Diamond.*

620 *Biotoxicology.* (3 or 5)
An advanced course in toxicology and toxicodynamics concerned with the sources, isolation, purification identification as well as the physiologic effects on man, animals, and plants of the various toxic substances encountered in the occupations, home, as well as rural and urban environments. Special attention will be given to type compounds as well as structure-activity relationships. Lecture, three hours; lab, four hours. Prereq: BCH 514, 515, CHE 532, PHA 521, and PGY 503 or MM 334 and 346; or consent of instructor.

630 *Biotoxicology.* (3 or 5)
A continuation of MM 620. Prereq: MM 620 or permission of the instructor.

640 *Environmental Toxicology and Occupational Hygiene.* (3)
An advanced course concerned with the recognition, analysis, evaluation, and control of the physical, physiologic, and toxicologic factors arising from occupational and natural environments; their effects on the well-being of the worker and the community; and current practices in their recognition, elimination and/or mitigation. The occupational environment will be considered as a special case of the ambient environment. Special attention will be given to the development of design data for practical problems. Lecture, three hours per week. Prereq: MM 620, 630 or permission of the instructor.





IX. ALLIED HEALTH PROFESSIONS

CLINICAL NUTRITION

The Master's Degree Program in Clinical Nutrition provides an opportunity for graduate study in the fundamentals of Clinical Nutrition. The curriculum is designed specifically to provide practical experience in nutrition in the treatment of illness and the maintenance of health and to deepen the student's foundation in the sciences fundamental to nutrition. It is intended primarily for those who wish to undertake careers in dietetics and clinical nutrition in University Hospitals, large Community Hospitals, and Medical Centers, for those who intend to teach in the field of clinical dietetics and those who plan careers as members of a research team in clinical nutrition and metabolism.

The program is interdisciplinary in nature. The faculty is drawn from the basic sciences as well as the clinical departments medicine, pediatrics, community medicine. The University Hospital and its related clinical facilities will be used for clinical instruction. The staff of the department of dietetics will provide professional supervision.

521 *Community Health.* (3) II

An ecologic view of the community; the physical, biological, social, and cultural factors and the health services, as these relate to the state of health of the community. Basic epidemiology and biostatistics are introduced as necessary instruments for community health study. (Field experience.) *Staff.*

CNU 601 *Clinical Nutrition.* (4) II

An analysis of the process by which man ingests, assimulates, and utilizes all of the constituents of food in health and disease. Relationship of biochemical and physiological factors to the nutrient requirements of the human body. Evaluation of dietary status and rationale of dietary management. Prereq: Consent of instructor. Concur: BCH 501. *Thornton and Staff.*

CNU 602 *Current Trends in Nutrition.* (1) I

Review of the current literature of nutrition; development of the techniques for the preparation of abstracts, reviews, and bibliographies on current topics. Questions of editing, editorial styles, evaluation and graphic interpretation discussed. Prereq: Concur: BCH 501. *Thornton and Staff.*

701 *Advanced Clinical Nutrition.* (2) II

A course dealing primarily with the clinical application of the principles of nutrition; to include clinical conference and case studies. Prereq: CNU 601 or concurrent. *Beagle and Robinson.*

CNU 768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

COURSES IN COLLEGE OF MEDICINE

BCH 501 *Biochemistry.* (6) I

PGY 503 *Principles of Physiology.* (5)

600 or 700 *Elective.* (3-4)
To be selected from University Graduate School in the Departments of Psychology Sociology, Education, or Microbiology (610).

BSC 772 *Topical Seminar in Medical Behavioral Science.* (1-3) II

COMMUNITY HEALTH

Requirements for the Degree of Master of Science in Public Health

(See also pages 19-21.)

Students holding a bachelor's degree from a fully accredited institution or the M.D. degree from a recognized Medical School may obtain the degree of Master of Science in Public Health by satisfying the following requirements:

1. Twenty-four semester hours in graduate courses with an average standing of 3.0 or better.
2. No grade below C may be counted.
3. An acceptable thesis.
4. There is no language requirement for this degree.

500 *Public Health Sanitation.* (3) I, S
Environmental sanitation and the effects of environment on the control of communicable diseases. Prereq: MB 200 or 400 or equivalent. *Hamilton.*

501 *Public Health.* (3) II, S
A continuation of 500; introduction to administrative and organizational approach to disease prevention. *Heinz.*

510 *Health Education.* (3) II, S
A course dealing primarily with principles of health education, health service, and health protection. *Heinz.*

511 *Independent Work in Hygiene and Public Health.* (3) I, II, S
Prereq: Major and a standing of 3.0 in the department. May be repeated for a total of 12 credits. *Staff.*

515 *Communicable Diseases.* (3) I, S
A consideration of the cause, prevalence, transmission, and control of preventable diseases. *Hamilton.*

520 *Mental Hygiene.* (3) I, II, S
An introduction to mental hygiene including a consideration of the cause, treatment and prevention of mental disorders. Not open to students who have credit in PSY 520. *Staff.*

521 *Community Health.* (3) I, II
An ecological view of community health, a study of the demographic, social, cultural and physical environmental factors that influence a community's state of health. Basic epidemiology and biostatistics are introduced as necessary instruments of community health analysis. Five class hours per week. Prereq: Upper division or graduate standing and consent of instructor. *Eichenberger and Staff.*

522 *School and Community Health.* (2) I, S
A course designed to develop an idea of the cooperative nature of school health work and the importance of connecting it up with adult health work. *Heinz.*

550, 552 *Problems in Health Education.* (2 ea.) I, S
An individual problems course for students and teachers in service, based upon a systematic attack upon the health problems of a school. *Staff.*

600 *Epidemiology.* (3) I, II, S
A study of the natural history of disease. *Hamilton.*

603 *Public Health Records.* (2) I, II, S
General principles of recording, filing, and use of public health data. *Heinz.*

604 *Maternal and Child Health.* (2) I, S
A study of the principles of maternal, prenatal, infant, and child care. *Staff.*

612 *Public Health Administration.* (3) I, S
A consideration of the principles of public health administrat[illegible]nz.

613 *Public Health Administration.* (2) II, S
A continuation of 612. *Heinz.*

618 *Vital Statistics.* (3) I, S
Application of the statistics of population, births, deaths, [illegible] Public [illegible] *Staff.*

619 *Vital Statistics.* (2) II, S
A continuation of 618. *Staff.*

625 *County Health Practice for Health Officers.* (3) I, II, S
An internship in actual county health practice. *Staff.*

626 *County Health Practice for Health Officers.* (2) I, II, S
A critical analysis of one service of the Fayette County Health Department. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

770 *Seminar* (1) I, II, S
Staff.

RADIATION MEDICINE

Two programs in the Bioradiation Sciences are available leading to the degrees, Master of Science in Radiological Health and Master of Science in Medical Radiation Dosimetry.

Graduates of accredited colleges with an appropriate baccalaureate (for example, Biological Sciences, Physics, Public Health, Mathematics, Chemistry, etc.) may become candidates for one of these degrees. Physics 260 or its equivalent is a prerequisite for both programs and Computer Science 220 or its equivalent is also a prerequisite for the program in Medical Radiation Dosimetry.

Both programs are an interdisciplinary type. As such, Plan B is utilized for the graduate work, incorporating specific courses in several departments. There is no language requirement. A core of courses is common to both programs. Additional and special course work is prescribed for each program as degree requirements.

THE CORE PROGRAM

ZOO 540	*General Radiation Biology.*	(4)
ZOO 541	*Laboratory for* ZOO 540.	(0)
ZOO 640	*Biological Effects of Radiation.*	(3)
PHY 472	*Interaction of Radiation with Matter.*	(3)
PHY 535	*Experimental Physics, Atomic and Nuclear.*	(2)
RAD 545	*Radiation Hazards and Protection.*	(2)
RM 710	*Seminar in Bioradiation Science.*	(1)
STA 670	*Statistics.*	(4)
		19

Master of Science in Radiological Health Specialty

ADDITIONAL PROGRAM

PH 600	*Epidemiology.*	(3)
PH 612	*Public Health Administration.*	(3)
RM 720	*Advanced Problems in Radiological Health.*	(2-4)
Area Electives.		(5-7)
		13

Special Instruction in Radiological Health will run concurrently with the last semester of the Program. It will be under the staff of the Radiology Department. (0)

Total 32 minimum

Master of Science in Medical Radiation Dosimetry

ADDITIONAL PROGRAM

ANA 511	*Introduction to Anatomy.*	(3)
PGY 502	*Principles of Physiology Lectures.*	(3)
RM 715	*Advanced Problems in Radiation Dosimetry.*	(2-6)
Area Electives.		(2-5)
		12

Special instruction in Medical Radiation Dosimetry will continue for six months following completion of formal course work. This instruction will be under the staff of the Radiology Department. (0)

Total 31 minimum

RM 690 *Research in Radiological Health.* (1-3) I, II

Research in the area of radiological health. Prereq: Graduate standing in the Bioradiation Sciences. *Sayeg.*

RM 695 *Research in Radiation Dosimetry.* (1-3) I, II

Independent directed research on theoretical and practical problems in the measurement of radiation. Prereq: Graduate standing in one of the Bioradiation Sciences. *Sayeg.*

RM GVJ....*Seminar in Bioradiation Science.* (1) II

Topics of current interest relating to radiation and its biomedical significance will be discussed. Prereq: Graduate standing in a radiation-related science. *Calkins.*

RM 715 *Advanced Problems in Radiation Dosimetry.* (2-6) I, II

To be taken concurrently with supervised individual study. Problems in radiation measurement, distribution of energy, computation of dose, and biological and medical effects of an advanced nature will be analyzed, discussed, and described in written reports. Problems will require literature search and utilization of advanced analytical techniques. Prereq: Completion of formal course work in the Medical Radiation Dosimetry program or consent of instructor. *Greenlaw, Sayeg.*
(To be taken concurrently with six months of individual instruction.)

RM 720 *Advanced Problems in Radiological Health.* (2-4) I, II

Advanced problems in radiological health and related areas in physics, biology or medicine will be analyzed. Prereq: Completion of formal course work in Radiological Health Specialty program or consent of instructor. *Sayeg.*


VOLTAGE ADJUSTMENT
OFF ON
WALL SWITCH
LAMP FAILURE RESET
HOURS
HUMIDIFIER
OFF ON
INSPECTION LIGHT
OFF ON
TIME SWITCH
SPECIMEN TEMPERATURE
THERMOSTATIC CONTROLS
ARC ON — NO. 2 THERMOSTAT
ARC OFF — NO. 2 THERMOSTAT
TEMPERATURE EQUALIZING CYCLE
WET BULB NO. 1
ARCH
WATER RESERVOIR NO. 1

X. HOME ECONOMICS

Requirements for the Degree of Master of Science in Home Economics (See also pages 17-21).

Students who are graduates of fully accredited institutions of higher learning may obtain the degree of Master of Science in Home Economics by satisfying the following requirements.

1. The completion of 24 semester hours of graduate work with an average standing of 3.0 or better, and a thesis, or at the option of the major professor, the completion of 36 semester hours of graduate work with a standing of 3.0 or better, and no thesis requirement. At least one-half of the hours must be on the 600 level or above.
2. Under either plan no grade below C may be counted.
3. One-half of the work must be in one section or department, the remainder in any other department or departments approved by the major professor.
4. There is no language requirement for this professional degree.

A final oral examination is given the candidate not later than 8 days before the close of the semester in which the degree is to be secured. The candidate is expected to show a comprehensive knowledge of the subject matter related to the field of his major work and in case a thesis has been prepared to defend it.

The program of graduate study developed for each graduate student is based on his career objectives and previous academic background. Those without sufficient background or training will be expected to make up deficiencies indicated by the section or department. Except for courses in research methods and statistics, students selecting Family Life, Management and Family Economics, or Textiles and Design as an area of specialization are required to select one of the departments in the social and economic sciences for work to fulfill degree requirements.

FAMILY LIFE

552 *Nursery School Organization.* (3) I, S

Organization and administration, including housing, equipment, program, records, parent cooperation. Field trips to nursery schools. Lecture, three hours. Prereq: HE 350.

553 *The Child in His Family.* (3) II, S

Preparation and presentation of research reports of studies of family influences on the personality and development of children. Lecture, three hours. Prereq: HE 153, and six credits in SOC and/or PSY.

555 *Creative Experiences and Concept Development: Pre-school Years.* (3) I, II

Techniques, methods and materials necessary for creative experiences in play, music, graphic and plastic arts, literature, language, and science, and concept development in time, space and numbers for the preschool child. Lecture, two hours; lab, two hours. Prereq: HE 350 or consent of instructor.

557 *Infant Development.* (2) S

Study of development, care and guidance of the child during prenatal, natal and infant periods. Lecture, two hours. Prereq: PGY 206.

558 *Adolescence.* (3) I, II

The psychosexual development of the adolescent in relation to family, peers, and the adult world. Three class hours per week; laboratory, one hour. Prereq: HE 153, and HE 254 or SOC 510.

595 *Special Problems in Child Development and Family Relationships.* (1-3) I, II, S

Intensive work on specific problems. May be repeated for a total of six credits. Prereq: Consent of instructor.

775 *Seminar in Child Development.* (2-6) I, II, S

Preparation and presentation of reports of current investigations in child development. Prereq: graduate standing.

785 *Special Problems in Child Development and Family Living.* (1-3) I, II, S

Independent advanced work. May be repeated for a total of six credits.

MANAGEMENT AND FAMILY ECONOMICS

462 *Personal and Family Finance.* (3) I, II

A study of individual and family financing as related to planning the use of credit, savings, investments, insurance, taxes, home ownership and estates. Prereq: ECO 260.

463 *Home Management and Family Relationships.* (3-4) I, II, S

A residence period in the Home Management House is required of seniors in home economics. Experience in the application of principles presented in other courses. Prereq: HE 361 and NFS 206.

596 *Special Problems in Home Management.* (1-3) I, II

Intensive work on specific phases of home management. Prereq: Senior or graduate standing, consent of instructor. May be repeated for a total of six credits.

662 *Advanced Home Management and Family Relationships.* (3) II, S

A course affording opportunity for special study of social and economic problems affecting family life. Lecture, three hours. Prereq: HE 463. *Wilmore.*

786 *Special Problems in Home Management.* (1-3) I, II

Independent advanced work. May be repeated for a total of six credits. Prereq: Graduate standing. *Wilmore.*

TEXTILES AND DESIGN

420 *Tailoring.* (3) I, S

Analysis of tailoring techniques in the shop and in the home. Tailored garments are planned and constructed. Lecture, one hour; lab, four hours. Prereq: HE 227 or consent of instructor.

422 *Economics of Clothing.* (3) I, S

The clothing industry, its influence and economy. Field trips, class projects, and individual semester reports. Projects involve merchandising display and fashion show. Lecture, two hours; lab, two hours. Prereq: Consent of instructor.

520 *Textiles II.* (3) I, S

Consideration of recent textile developments with emphasis on man-made fibers, new construction techniques and finishes. Opportunity for individual investigation. Lecture, one hour; lab, four hours. Prereq: HE 120, CHE 104, or CHE 112.

523 *Socio-Psychological and Economic Aspects of Apparel.* (3) II, S
A study of the social, cultural, psychological and economic factors which influence apparel and apparel use with particular emphasis on present day apparel in America. Prereq: SOC 151 or ANT 121 and ECO 260.

524 *History of Costume.* (3) I, S
Development of costume from ancient to modern times with consideration of historic, social, and economic setting. Lecture, two hours; lab, two hours. Prereq: ART 130, HE 120, 227 or consent of instructor.

529 *The Child and His Clothing.* (3) S
A detailed study of the selection, cost and care of the pre-school child's clothing in relation to his needs. Lectures and occasional field trips. Prereq: HE 255. *Staff.*

530 *Advanced Interior Design.* (2)
The art of interior decoration throughout the past and today. Interiors are planned to meet today's needs. Lecture, one hour; laboratory, two hours. Prereq: HE 330.

532 *Retail Job Analysis.* (5) I
Supervised experience in apparel merchandising procedures through a cooperative program with a retail establishment. (One half semester of eight hours a day per week.) Prereq: HE 523, 422, BA 330.

534 *Decorative Textiles.* (2) II, S
Survey of techniques used in applying color and design to fabrics. Individual problems, demonstrating techniques, developed. Lecture, one hour; lab, two hours. Prereq: HE 120.

536 *Interior Decoration Projects.* (2) I, II, S
Selected projects in furnishing the home, including furniture refinishing, upholstering and slip cover making. Costs in terms of time and money are considered. Lab, four hours. Prereq: HE 330, or approval of instructor. *Bennett.*

537 *History of Furniture.* (4) II
Study of historic styles of furnishings, textiles, and decorative accessories through contemporary design. Supplementary information through slides and field trips. Application of information through research project on selected topics. Lecture, 4 hours. Prereq: HIS 104, 105.

538 *Materials and Methods in Interiors.* (3) I
Emphasis on lighting, built-in equipment, measurement, and cost specifications. Individual study of specific problems encountered in home design. One class hour per week; lecture and lab four hours per week. Prereq: HE 332.

592 *Special Problems in Clothing and Costume Design.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

593 *Special Problems in Housing and Interior Design.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

597 *Special Problems in Textiles.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

772 *Seminar in Textiles, Clothing, Costume Design, and Interior Design.* (2) S
Investigation of special textile, clothing, and costume design or interior design problems; lecture, two hours. May be repeated twice for a total of six credits. *Staff.*

782 *Special Problems in Clothing and Costume Design.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. *Staff.*

783 *Special Problems in Interior Design.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. *Staff.*

787 *Special Problems in Textiles.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. Concur: HE 528.

GENERAL COURSES

575 *Rural Community Analysis.* (3) I
The nature of the town-country community, with special emphasis on the function of institutional and agency programs and their leaders in relation to the community. Same as SOC 513. Prereq: SOC 151 or consent of instructor. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated once.

DEPARTMENT OF NUTRITION AND FOOD SCIENCE

Work leading to the master's degree must conform to general rules and regulations of the Graduate School and the School of Home Economics.

Bachelor of Science degree with a major in Foods, Nutrition, Life Science and/or Home Economics option with a background in biological and physical sciences will be required for admission. Those without sufficient background or training will be required to make up deficiencies indicated by the department. Emphases in Science, Education or Institutional Management are possible.

Programs are designed for individual interest and needs. The non-thesis option provides nutrition education emphasis useful to majors in public health nutrition, vocational education, dietitians, college teachers and extension specialists. Requirements for the Master of Science degree in Home Economics are: completion of 24 semester hours of graduate courses and a thesis or, at the option of the major professor and student, the completion of 36 semester hours of graduate work without a thesis.

Inquiries concerning the details of graduate programs (including work beyond the master's) as well as possible financial support of graduate students should be addressed to the Chairman of the Department of Nutrition and Food Science.

503 *Community Nutrition.* (3) I, II, S
Study of nutrition education programs on a community level. Experience is provided for presenting nutrition in health clinics, schools, and state institutions. Lecture, 2 hours; lab, 2 hours. Prereq: or concurrent; NFS 302. May be repeated for a total of six credits. *Staff.*

505 *Experimental Foods.* (3) II, S
Study of factors that affect results obtained in cooking and food preparation processes. Experimental work under controlled conditions. Lecture, one hour; lab, four hours. Prereq: NFS 204, 311. *Brownlie.*

507 *Workshop in Applied Nutrition.* (2)
The application of scientific knowledge of nutrition to the promotion of positive health. Emphasis is given to communications techniques and their use in field work. *Staff.*

508 *Seminar in Nutrition.* (1) I, II, S
Investigations of recent research in nutrition. Prereq: Senior or graduate standing. May be repeated twice for a total of three credits.

512 *Normal and Therapeutic Nutrition.* (5) I, II
Application of elementary bio-chemistry to understanding the utilization and function of nutrients in the body. Correlating metabolic changes due to disease with diet therapy. Lecture, four hours; lab, two hours. Prereq: NFS 311, CHE 236. *Chen and Packett.*

514 *Food Preservation.* (3) I, S
Principles of home food preservation. Canning, dehydration, and freezing of fruits, vegetables and meats; pickling of fruits and vegetables; making of jams, jellies and preserves; brining. Lecture, two hours; lab, two hours. Prereq: MB 200, NFS 204.

516 *Food for Children.* (3) II, S
Experience in selection, preparation and serving of food to young children. Emphasis is placed on the pre-school age and the factors important to establishing good food habits. Prereq: NFS 206, 311, HE 255. *Staff.*

517 *Food for Special Occasions.* (3) I, S
Advanced work in culinary arts and skills. Preparation of attractive and appetizing dishes to help the homemaker in planning buffet suppers, receptions, picnics, wedding parties, formal meals. Lab, six hours. Prereq: NFS 204, 206. *Taylor.*

540 *The School Lunch.* (3) I, II
Designed for teachers who manage the lunch room. Consideration is given to equipment, menus, purchase, storage, preparation and service of food. Lecture, two hours; lab, two hours. Prereq: NFS 204, ECO 260. *Brownlie.*

542 *Institution Equipment.* (3) I
Selection, arrangement, cost and care of equipment; problems of lighting, heating, ventilation and refrigeration. Two field trips are taken to neighboring cities to see equipment in use in institutions. Prereq: NFS 342. *Brownlie.*

546 *Institution Organization and Management.* (3) II
Principles of institution organization, types of institution service, personnel and financial management. Legal aspects of institution management. Personal and professional qualifications of an institution manager. Prereq: NFS 340, 342. *Brownlie.*

548 *Institution Administration.* (3) S
Application of scientific principles are developed in various aspects of food service management. Approval of instructor. May be repeated twice for a total of nine credits. *Brownlie.*

590 *Field Work in Nutrition.* (1) I, II, S
Nutrition problems at different age levels, correlated with surveys and experimental studies to show the relation between diet selection and its physical and mental effects. Lecture and laboratory. May be repeated 3 tims for a maximum of 4 credits. Prereq: NFS 503, or approval of instructor.

591 *Special Problems in Foods and Nutrition.* (1-3) I, II, S
Intensive work on a specific phase of the field. Senior or graduate standing. May be repeated for a maximum of six credits. Prereq: Consent of instructor.

594 *Special Problems in Institution Management.* (1-3) I, II, S
Intensive work on specific problems. Prereq: Senior or graduate standing. May be repeated for a total of six credits. *Staff.*

603 *Advanced Community Nutrition.* (3) I, II, S

Study of nutrition surveys and of bases for judging community nutrition. Emphasis is placed upon economic, geographic, social and educational causes of malnutrition. Experience is given in development of nutrition programs. Prereq: NFS 503. May be repeated once for a total of six credits. *Marlatt.*

610 *Human Nutrition I.* (4) I, II

The application of biochemical analytical and preparative analysis of blood, urine and tissues to the analysis of nutrient metabolism and human health status. Lecture, two hours; lab, six hours. Prereq: NFS 311, CHE 236, NFS 512. *Packett and Chen.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

771 *Seminar in Nutrition.* (2) II, S

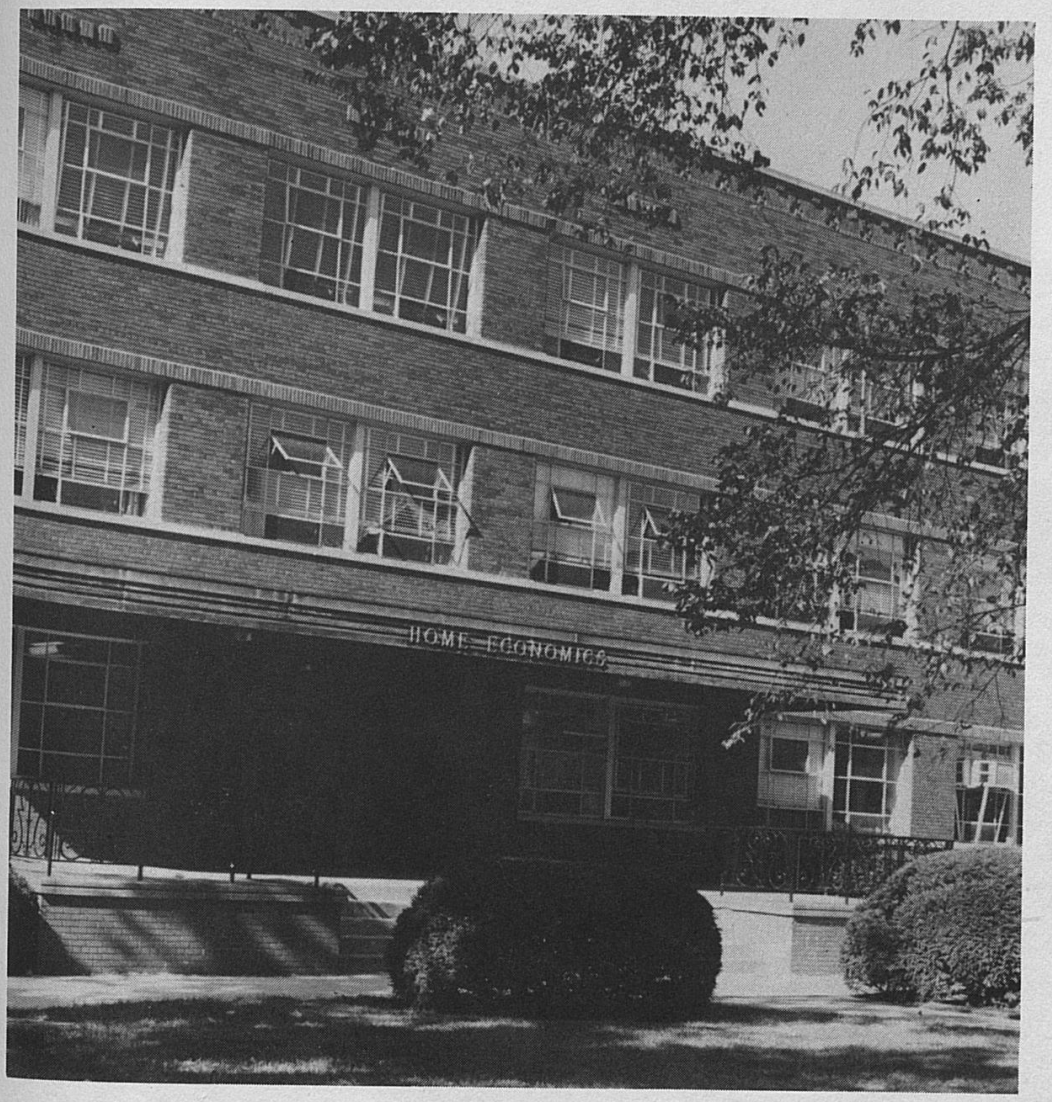
May be repeated twice for a total of six hours. *Staff.*

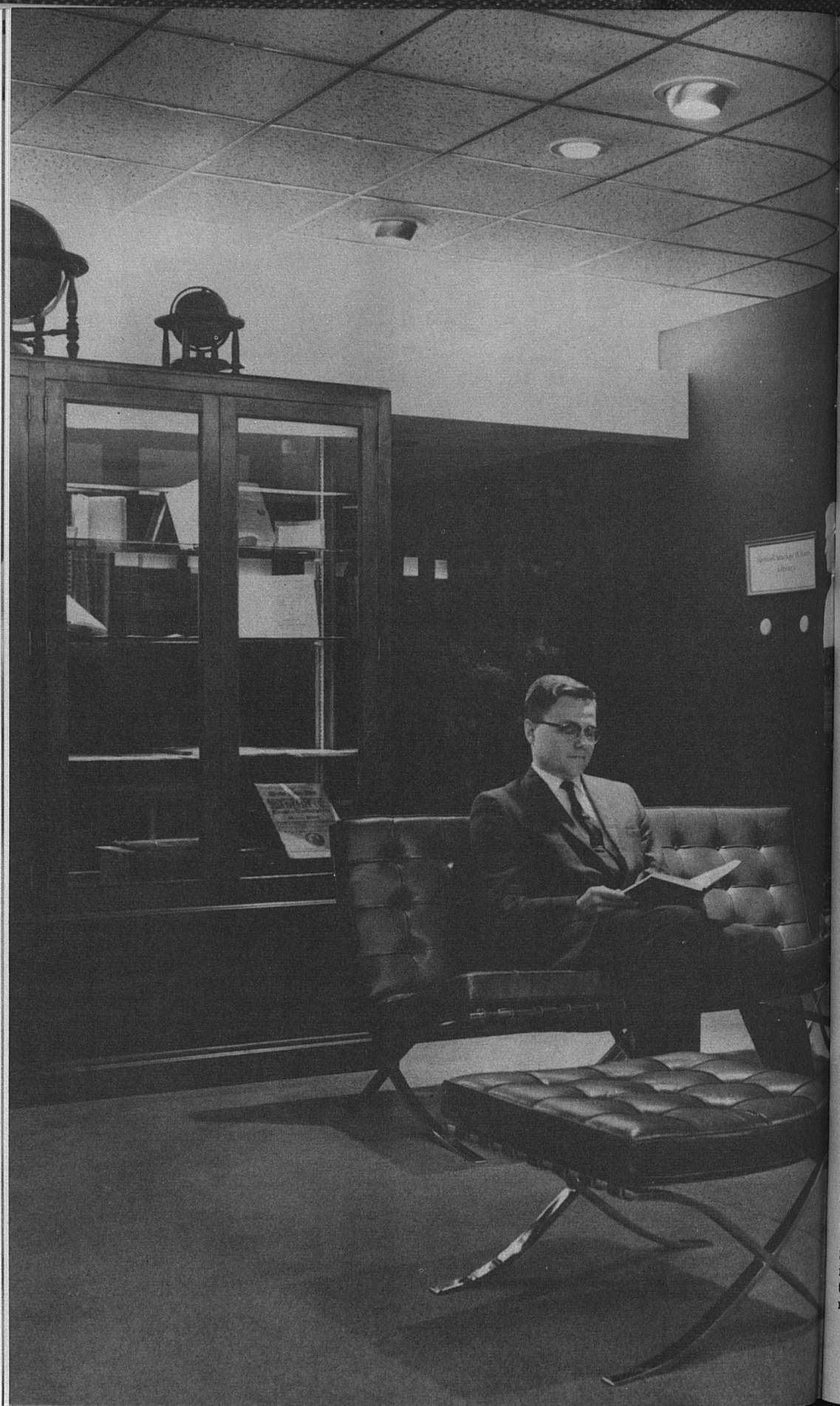
781 *Special Problems in Foods and Nutrition.* (1-3) I, II, S

Independent advanced work on a specific problem. May be repeated for a total of six credits.

784 *Special Problems in Institution Management.* (1-3) I, II, S

Independent advanced work. May be repeated for a total of six credits. *Brownlie.*


HOME ECONOMICS



T
and t
library
the 2
hours
Pr
yearly
requir

Req

(S
St
obtain
follow

1.

2.

3.

4.

500
Develop
library
librarian
for indi
Three cl

501
Principle
use. Stu
books ar

502
An intro
Emphasi
directorie
Larsen.

503
Selection
in the se
trade, m
major na

XI. LIBRARY SCIENCE

The School of Library Science offers the master's degree according to Plan A and the professional degree of Master of Science in Library Science. Six hours of library science courses at the 500 level are prerequisite to courses counted toward the 24 or 30 hours required in the master's degree programs. These prerequisite hours may be taken concurrently with graduate course work.

Prospective students should obtain a copy of the catalog which is published yearly by the School of Library Science for detailed information on admission, requirements and procedures.

Requirements for the Degree of Master of Science in Library Science

(See also pages 17-21.)

Students holding a bachelor's degree from a fully accredited institution may obtain the degree of Master of Science in Library Science by satisfying the following requirements:

1. Six hours of prerequisite work in library science. Courses taken more than eight years before admission into the graduate library science may not be counted as prerequisites.
2. Thirty semester hours in graduate courses (15 in courses numbered 600 or above).
3. An average standing of 3.0 or better on all work taken as a graduate student.
4. Two years of college credit (twelve semester hours with a grade of C or better) in a modern foreign language or a reading knowledge as demonstrated by the usual graduate examination. Successful completion of one of the special language courses provided for graduate students will also meet the foreign language requirement.

500 *Library Administration.* (3) I, II, S

Developing knowledge and skills of library management with emphasis upon organization, library relationships, personnel, quarters and equipment, budgets and reports. Growth of librarianship as a profession and important literature of the field. Provision will be made for individual study in each person's area so that principles will be applied to practice. Three class hours per week. *Staff.*

501 *Organization of Library Materials I.* (3) I, II, S

Principles, concepts, methods and problems in organizing library collections for effective use. Study of the fundamental principles and methods of classification and cataloging of books and non-book materials, bibliographical description and subject analysis. *Evans.*

502 *Reference and Information Services.* (3) I, II, S

An introduction to reference materials, their content, evaluation, organization and use. Emphasis will be placed upon essential works, including dictionaries, encyclopedias, atlases, directories, year-books, periodicals, indexes and other guides to basic reference materials. *Larsen.*

503 *Development of Library Collections.* (3) I, II, S

Selection and acquisition of library materials, analysis and evaluation of book selection aids in the several communication media. Emphasis will be placed on the structure of the book-trade, methods and criteria of selection, the organization of acquisitions work, and use of major national and trade bibliographies of the world. Three class hours per week. *Cazden.*

510 *Children's Literature and Related Materials.* (3) I, II, S

A survey of children's literature, traditional and modern. Reading and evaluation of books with emphasis on the relationship of the materials to the needs and interests of children. Covers various types of materials for use by and with children of grades 1-6. ***Pillon, Binger, Gallagher, M. Bobinski.***

511 *Literature and Related Materials for Young People.* (3) I, II, S

Covers types of materials for use by and with readers of grades 7-12. Emphasis upon materials for curricular and recreational reading. Attention is given to some types of adult materials suitable for more mature students. Practice in the use of standard book selection aids. ***Pillon, Martin.***

512 *School Library Practice.* (3) I, II, S

Observation and supervised work in a school library, fulfilling a state requirement for certification. Applications for placement must be submitted early in the semester preceding which placement is desired. Prereq: LS 500 501, 502, 510, 511. ***Pillon.***

586 *Utilization of Educational Media.* (3)

Surveys the broad area of educational media with an emphasis on utilization and the advantages and disadvantages of the various media. Provides experience in relating educational technology to productive learning activity. (Same as EDU 544).

600 *Advanced Library Administration.* (3) I

The library as a social system with emphasis upon organization, communications, leadership and an application of behavioral management theories to the library. Three class hours per week. Prereq: LS 500. ***Allen.***

601 *Organization of Library Materials II.* (3) II, S

Advanced studies in organization of library materials, including special materials such as pamphlets, clippings, pictures, slides, films, phonorecords, music, maps, manuscripts, archival records and rare books. Prereq: LS 501 or equiv. ***Evans.***

602 *Bibliography of Social Sciences.* (3) II, S

Survey and evaluation of library materials in the social sciences with emphasis on reference and bibliographical sources in the following areas: Anthropology, Business, Economics, Education, Geography, History, Law, Political Science, Psychology, Sociology, and other closely related subjects. Prereq: LS 502 or equiv. ***G. Bobinski.***

603 *Bibliography of the Humanities.* (3) I, S

Survey and evaluation of library materials in the humanities, with emphasis on reference and bibliographical sources in the following areas: the Arts, Language, Literature, Music, Philosophy, Religion and other closely related subjects. Three class hours per week. Prereq: LS 502. ***Cazden.***

604 *Bibliography of the Sciences.* (3) II, S

A survey and evaluation of library materials in the sciences with emphasis on reference and bibliographical sources in the following areas: Agriculture, Astronomy, Biology, Chemistry, Mathematics, Natural Resources, Zoology, and other closely related materials. Three class hours per week. Prereq: LS 502. ***Sanderlin.***

605 *Library Systems Analysis.* (3) I, II, S

Role of systems analysis in libraries with emphasis on the analysis, design and implementation of library systems. The application of tools and techniques used in systems analysis, such as flow charting, data gathering techniques. An introduction to electronic data processing and statistical evaluation methods. Prereq: LS 500. ***Sanderlin.***

606 *Automation and the Library.* (3) II, S

Introduction to the practice and literature of automation and its implication and application to Libraries. A survey and evaluation of electronic and other automated systems for the storage and retrieval of information. Emphasis on understanding the principles and concepts of automation and computers for librarians. Three class hours per week. Prereq: LS 605; CS 220 or equivalent. ***Sanderlin.***

608 *Methods of Research in Librarianship.* (3) I, II, S

Basic tools, techniques and methods of library research. Consideration to the role and purpose of research in librarianship and relationship to research in other fields. Critical evaluation of current research reports in library literature and the development of a research proposal. *Allen.*

609 *Public Libraries.* (3) II, S

An analysis of public library work with emphasis on problems in history and development, administrative and management and current trends. Some attention given to county and regional development. Prereq: LS 500. *Frey.*

610 *Academic Libraries.* (3) II, S

History, aims and functions of university and college libraries including organization, collection building and evaluation, finance and personnel. Recent trends in national and regional cooperation. Undergraduate libraries, community colleges and the "library college" will also be reviewed. Prereq: LS 500. *Forth.*

611 *Special Libraries.* (3) II, S

Organization, administration and services of the library serving a selective clientele with consideration of the role of the library as a part of the larger institution with well-defined functions. Three class hours per week. Prereq: LS 500.

612 *Instructional Materials Centers.* (3) II, S

Leadership responsibility of the librarian in an age of changing media of communication, the philosophy of the modern school and the librarian's role in implementing it, acquiring, organizing and assisting faculty in learning to use all available media. Relation of the individual school to the district materials center, type of personnel, equipment and collections needed in each. Prereq: LS 500. Three class hours per week. *Pillon.*

613 *Introduction to Information Sciences.* (3) I

Introduction to the major aspects of scientific and technical information centers, documentation and the use and users of scientific information. Knowledge of systems analysis would be helpful. Three class hours per week. Prereq: CS 220 or equivalent. (Same as CMO 613.) *Sanderlin.*

614 *Information Storage and Retrieval Systems.* (3) II

Review of the various solutions for storing and retrieving information, ranging from traditional records and devices to modern computers. Emphasis upon modern electronic equipment for information handling. Three class hours per week. Prereq: LS 613. (Same as CMO 614.) *Sanderlin.*

615 *Information Systems Design.* (3) I, S

Principles and problems of information systems: systems analysis applied to information systems. Design of information systems with particular attention to equipment, training of personnel, and evaluation. Three class hours per week. Prereq: LS 614. (Same as CMO 615.) *Sanderlin.*

617 *History of Books and Printing.* (3) I, II

The making of books from earliest times to the present, including the manuscript book, the invention and spread of printing, type design, methods and styles of illustration. Technological and political aspects will also be emphasized. *Cazden, Hammer.*

618 *Books for Adults.* (3) II, S

Selection, use and individual evaluation of books for the typical community library. Distinctions between the notable, the popular and the significant in books which meet the needs of adult library patrons. Prereq: LS 503 or equivalent. *G. Bobinski.*

619 *Adult Services.* (3) II, S

Emphasis on the library as an educational institution, influence of educational and sociological trends, with examination of reading and library surveys, practice in the utilization of adult education techniques. Determination of realistic goals for library participation in community action programs, services to groups such as labor unions, professional and business groups, the aged, culturally disadvantaged, etc. *Bobinski.*

620 *Rare Books Bibliography.* (3) II
(Alternate summers)
Introduction to descriptive bibliography and to a wide range of bibliographical reference works necessary for a modern special collections or rare book librarian. Topics include incunabula research, paper and watermarks, the canons of description, and recent trends in institutional collections. Prereq: LS 617. *Cazden.*

621 *Special Collections.* (3) II
The acquiring, processing and servicing of rare books, manuscripts and other special materials. Attention is given to the criteria for building a collection and for its interpretation through descriptive guides and catalogs, and to the relation of the special collection department to the research worker and the library as a whole. Three class hours per week. *Bull.*

623 *Subject Bibliography.* (3) S
Survey and evaluation of library materials in a special subject area, with emphasis on reference and bibliographical sources. Subject areas vary, e.g., theology, law, medicine, engineering, and other topics. Three class hours per week. (May be repeated for credit when topics vary to maximum of 9 hours.) Prereq: LS 502.

624 *Library of Congress Classification.* (3) S
Theory, development and practice of classification in libraries with a strong emphasis on Library of Congress Classification. Colon, Cutter Expansion, Dewey Decimal, Universal Decimal, and other classification schemes will be studied for comparative purposes. Three class hours per week. Prereq: LS 501. *Evans.*

625 *Publishing and the Booktrade.* (3) II
History of publishing and bookselling: the structure of the booktrade today. International in scope with special attention given the antiquarian and reprint trade. Three class hours per week. Prereq: LS 503. *Cazden.*

626 *Government Publications.* (3) II
Study of the nature and scope of government documents, including problems and methods of acquisition, organization, and reference use of federal, state, local and international publications. Prereq: LS 502 or equivalent. *Willis.*

627 *History of Libraries.* (3) II
Development of libraries from earliest times to the present with special reference to the relationship of the library to the contemporary social, economic, cultural and political trends. Three class hours per week. *G. Bobinski.*

628 *Library Buildings.* (alternate years) (3) I, S
Relationship between physical structure and library function: problems in planning and building procedures, library equipment, acoustics, illumination, and materials of construction. Three class hours per week. Prereq: LS 500.

629 *Public Library Systems.* (3) S
Survey of the changing nature of public library government, larger units of service financed by federal and state assistance, influence on the role of the small public library in new methods of evaluation and stimulation of long range planning. Three class hours per week.

639 *Organization and Administration of Youth Services in Public Libraries.* (3)
(Alternate years and summers)
Study of the historical development and changes in patterns of library service to young adults. Definition of the respective roles of the school and public library, cooperation with other community agencies, critical evaluation of current procedures. Three class hours per week. Prereq: LS 511 and LS 609. *Pillon.*

700 *Seminar: Library Organization and Management.* (3)
(Alternate years and summers)
Major problems and newer developments in the field of management and administration and casting them in the library environment. Current research in library management. For the advanced students. Three class hours per week. Prereq: LS 500 and 600 or equivalent. *Allen.*

701 *Seminar: Library Materials and Services for Children and Young People.* (3) II
Intensive study of special problems in the development of collections for young people, controversial aspects of book selection, studies of reading interests, relation of types of libraries: school, public, extension through bookmobile, and institutional services, regional and state plans. Three class hours per week. Prereq: LS 510, 511. *Pillon.*

702 *Seminar in Printing and Publishing History.* (3)
(Alternate years and summers)
Bibliographical and technical background for original research in various fields of bookmaking, printing, publishing and the dissemination of literature. Survey of current trends in research. For the advanced student. Three class hours per week. Prereq: LS 617 and 625. *Cazden.*

703 *Seminar: Technical Services.* (3)
(Alternate years and summers)
Survey and analysis of technical services in libraries, with special attention to both historical and recent developments, controversial issues, current trends, and literature of the field. Three class hours per week. Prereq: LS 501, 503 and 601 or permission of instructor. *Evans.*

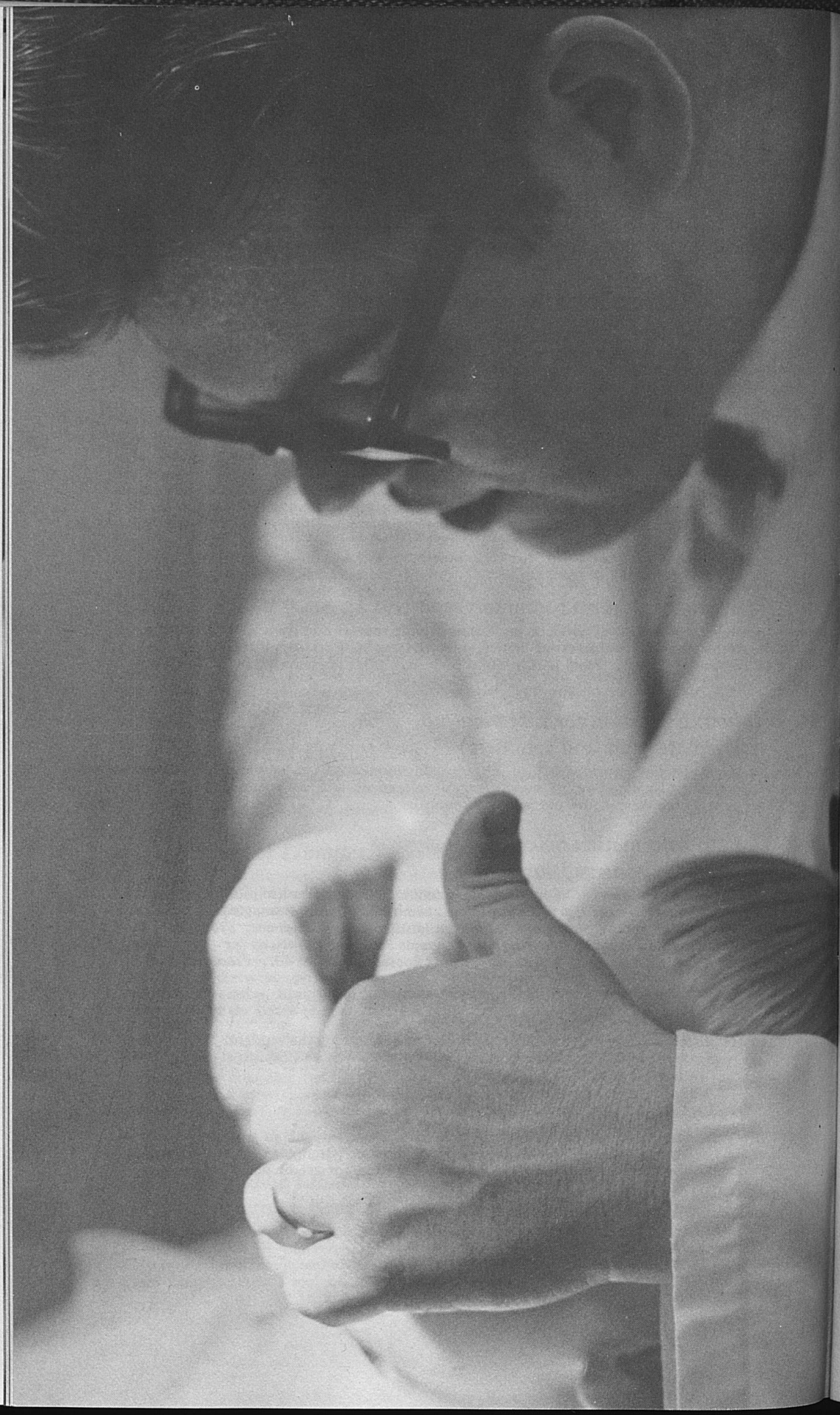
704 *Seminar: Education for Librarianship.* (3)
(Alternate years and summers)
Attention is given to the development of library education with an emphasis on current trends and problems. Explanation of curriculum development and instructional techniques in library schools. Three class hours per week. *Allen.*

705 *Seminar: Information Sciences.* (3)
(Alternate years and summers)
An investigation of the parameters of information science from an interdisciplinary approach. Investigation and analysis of the literature of communications, management science, cybernetics, information theory to identify the similarities and differences. From this investigation, both qualitative and quantitative, concepts of the directions of information science will be derived. Three class hours per week. (Same as CMO 705.) Prereq: LS 615. *Sanderlin.*

710 *Independent Study in Library Science.* (3) I, II, S
Opportunity for directed study in subject or problems of interest to the student. Observation and research is required, and a written report describing the work accomplished is required. May be repeated to a maximum of 6 hours.

711 *Workshops in Librarianship.* (1-4)
Intensive study in one aspect of liberarianship under the leadership of an authority in that field. Duration is normally shorter than a regular University term, and the student is expected to devote his full time to the course. May be repeated for credit when topics vary.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*



T
is de
speci
disci
dentr
C
three
lectu
ortho
be de
respe
T
than
clinic
ment
from
hensi

ORT
Applie
Prereq

ORT
Basic
per w
D.M.D

ORT
A cor
Two
Colleg

CDS
A sem
in den
Colleg

CDS
A sem
growth
hours
or D.M

CDS
This c
subject
progra

ORT
Semina
half cl
of Coll

XII. DENTISTRY

The Master of Science in Dentistry degree with specialty in Orthodontics is designed to provide the graduate dentist with clinical proficiency in the specialty of Orthodontics, creative research competance in a basic biological discipline, and experience in the fundamentals of teaching in the field of dentistry.

Only dental graduates of high academic standing will be accepted into this three academic year program. The first year is largely devoted to clinical training, lectures and seminars. The second year will be a continuation of clinical orthodontics and the active pursuit of basic science studies. The last year will be devoted to research, dental teaching techniques and added clinical refinements respectively.

The program is interdisciplinary in scope, and is taught by systems rather than the classic strict subject approach. The participating faculty is from the clinical departments of the College of Dentistry, from the medical center departments of Anatomy, Pediatrics, Obstetrics, Psychiatry, Behavioral Science, and from the University Hospital. An acceptable thesis and passage of a comprehensive oral exam is required for the award of the M.S.D. degree.

ORT 610 *Cranio-Facial Form.* (3) S

Applied radiographic anatomy for graduate students in dentistry. Three class hours per week. Prereq: Admission to graduate dental program; D.D.S. or D.M.D. degree.

ORT 620 *Oral-Pharyngeal Function.* (Part I) (2)

Basic and applied physiology for graduate students in dentistry. Two and a half class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

ORT 621 *Oral-Pharyngeal Function.* (Part II) (2) S

A continuation of ORT 620, emphasizing speech physiology and language development. Two and a half class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 611 *Child Growth and Development.* (Part I) (2)

A seminar course on nature and physiologic control of physical growth, for graduate students in dentistry. Two class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 612 *Child Growth and Development.* (Part II) (2) S

A seminar course for graduate students, in dentistry covering emotional and intellectual growth of children, and diseases and congenital anomalies of children. One and a half class hours per week. Prereq: Admission to graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 631 *Principles of Dental Occlusion.* (2)

This course is designed to give the student as broad as possible a view of the complex subject of dental occlusion. Two class hours per week. Prereq: Admission to dental graduate program; D.D.S. or D.M.D.

ORT 660 *Orthodontic Seminar-Clinic.* (2)

Seminar, laboratory and clinical instruction in orthodontic theory and practice. One and a half class hours per week; fifteen lab hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

ORT 661 *Orthodontic Seminar-Clinic.* (3) S
Seminar, laboratory and clinical instruction in orthodontic theory and practice. Three class hours per week. Fifteen lab hours per week. Prereq: ORT 660.

ORT 700 *Orthodontic Seminar.* (1)
Seminar in orthodontic theory and practice for advanced graduate and post-doctoral students in orthodontics; may be repeated to a maximum of five credits. Three class hours per week. Prereq: ORT 660, 661.

ORT 750 *Research in Orthodontics.* (1-5)
Research in orthodontics: maximum of five credits. Prereq: Admission to the orthodontic graduate program of the College of Dentistry; Special permission.

ORT 768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits.

ODM 610 *Developments in Oral Medicine.* (2)
A seminar course for graduate students in dentistry, covering medical implications of dental treatment and current research in oral medicine. Two class hours per week. Prereq: Admission to graduate program of the College of Dentistry.

PEN 661 *Modern Concepts in Periodontics.* (2) II
A seminar course designed to present the present understanding of the etiology of periodontal disease and current techniques for treatment of periodontal problems. Two class hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

PDO 631 *Dental Care for the Chronically Ill and Handicapped Child.* (2)
A seminar course for graduate students in dentistry dealing with special dental problems of handicapped children. Two class hours per week. Prereq: Admission to dental graduate program; D.D.S. or D.M.D. degree.

CDS 550 *Research Methodology and Instrumentation.* (2)
Seminars and laboratory work involving methods of several modern research fields. One class hour, and 2 lab hours per week. Prereq: D.D.S. or D.M.D. degree; admission to graduate dental program; or special permission of instructor.

CD 655 *Practice Environment and Practice Management.* (1)
A seminar course for graduate and post-doctoral students in dentistry, concerning community needs, attitudes and programs for dental services, particularly those provided by specialists. One and a half class hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

OP 651 *Patho-Physiology of Oral Disease.* (3)
Seminar course in advanced oral pathology. Three class hours per week. Prereq: Dental degree and enrollment in a graduate program of the College of Dentistry; or permission of the instructor.

OS 651 *Anatomical Relationships in Surgery.* (1)
A seminar course for dental graduate students in areas other than surgery, emphasizing anatomical and surgical principles applicable to all dental specialties. One class hour per week. Prereq: Admission to graduate or post-doctoral programs of College of Dentistry; D.D.S. or D.M.D. degree.

Fellows and Trainees for 1969-70

UNIVERSITY OF KENTUCKY RESEARCH FOUNDATION FELLOWS

Richard G. Alvey ..... Library Science
Daniel I. Cohen ..... Psychology
David H. Darst ..... Spanish
Judith M. Janssen ..... English
Juliet W. Morgan ..... Biology
Jane E. Nicholson ..... Anatomy

HAGGIN FELLOWS

Jeanne R. Angus ..... Chemistry
Damian A. Barthle ..... History
Richard Joseph Bunger ..... Music
Robin Y. Buckner ..... Botany
Jerry H. Carpenter ..... Zoology
Lois Mai Chan ..... English
Kenneth J. Cheverton ..... Engineering Mechanics
Mary Eunice Davis ..... Spanish
Martin Dickey ..... Mathematics
Richard Kent Franklin ..... Political Science
Charles C. Hay III ..... History
Joan Mary Hill ..... Spanish
Olga T. Impey ..... Spanish
Ronald R. Janssen ..... English
Herbert J. Kuehne ..... Anthropology
Joyce M. P. Lockard ..... Microbiology
Nedra D. Lundberg ..... English
Maureen W. Matkovich ..... Chemistry
Jesse G. Mayes ..... Engineering Mechanics
John C. Messenger ..... Botany
Edith F. Mongan ..... English
Kent R. Patterson ..... English
Marija Petrovska ..... French
Jitendra Saxena ..... Microbiology
David Lee Sewell ..... Microbiology
Martha C. Wohlforth ..... Music
Rachel P. Zimmerman ..... Spanish

PAUL I. MURRILL FELLOW

David Lee Greene ..... Chemistry

JEFFREY FELLOWS

Karan Kaul ..... Botany
Marlena Ann King ..... Plant Pathology
Abbas Nemati ..... Plant Physiology

GRADUATE FACULTY PREDOCTORAL FELLOWS

Jerry Allen Gaines ..... Political Science
Judith Gaile Jennings ..... History
Steven A. Short ..... Biochemistry
William E. Woods ..... Biochemistry

PATTERSON SCHOOL FELLOWS

John Franklin Copper ..... International Relations
Albert F. Eldridge, Jr. ..... Political Science
Donald Ellerman ..... Diplomacy
Hans Hoyer ..... Diplomacy
Manfred H. Ledford ..... Economics
Jens Lindemann ..... Economics
Clara Kathryn Shelton ..... International Relations
Stephen L. Traughber ..... History
Richard YuKhin ..... International Relations

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION TRAINEES

Lewis Berkley Davis, Jr. ..... Mechanical Engineering
Sanford S. Miller ..... Mathematics
Lynn R. Williams ..... Mathematics
Robert Dennis Zwicker ..... Physics & Astronomy

NATIONAL SCIENCE FOUNDATION TRAINEES

Neil D. Adams ..... Physics & Astronomy
Betty J. Addington ..... Microbiology
Wallace W. Angus ..... Biochemistry
Richard A. Bell ..... Mathematics
Roy E. Branstetter ..... Animal Sciences
Stephen A. Bullard ..... Mathematics
John E. Cooper ..... Zoology
Joseph W. Daniel ..... Mathematics
Dana L. Diedrich ..... Microbiology
Laurence W. Grossman ..... Physics & Astronomy
Aubin M. Higgins ..... Mechanical Engineering
Jeanne S. Humble ..... Sociology
Richard Wayne Lee ..... Mechanical Engineering
Sally Ann McCreery ..... Animal Sciences
Randall C. Merris ..... Economics
Steven R. Pierce ..... Zoology
Harold S. Rhoads ..... Mechanical Engineering
Sherilyn A. Sauer ..... Biology
Joyanne G. Stephens ..... Sociology
William H. Swatos, Jr. ..... Sociology

NATIONAL DEFENSE FELLOWS

David D. Adams ..... Biochemistry
Elizabeth S. Andrachek ..... Sociology
William Arthur Bachman ..... Economics
Donald R. Bailey ..... German
Wendy H. Baldwin ..... Sociology
Peter F. Barty ..... History
Mabel Ann Benson ..... English
Richard Lee Best ..... Animal Sciences
Diane Black ..... Psychology
Paul D. Blanchard ..... Political Science
John Paul Boyd ..... Spanish
John Michael Brown ..... Economics
Barbara Anne Burr ..... Anatomy
Annette C. Burt ..... Spanish
Janet Sue Cabaniss ..... Economics
Johnnie L. Call ..... Animal Sciences
Ronald H. Carty ..... Mechanical Engineering
Minor H. Chamblin ..... Psychology
Franklin D. Cheatham ..... Mathematics
John S. Cole III ..... Microbiology
Jeremiah P. Collins ..... Psychology
James V. Couch ..... Psychology
Bonnie Jean Cox ..... English
Gary Sherman Cox ..... Political Science
James R. Cruse ..... Psychology
S. Dare Davidson ..... Spanish
Sharon Ann Dennett ..... Physiology & Biophysics
Edward H. Dougherty ..... Psychology
John G. Duncan ..... Political Science
Travis T. DuPriest, Jr. ..... English
Deanna B. Durbin ..... Sociology
Francis H. Edelen, Jr. ..... Political Science
William R. Frieben, Jr. ..... Microbiology
Micheal W. Giles ..... Political Science
Darrell R. Gilliam ..... Economics
Sarah Granger ..... Sociology
Harvey N. Grannis ..... History
Justin J. Green ..... Political Science
Linda R. Gregory ..... French
Harry M. Griggs ..... Economics
Elizabeth B. Guth ..... Microbiology
Thomas F. Hale ..... History
Elizabeth J. Hall ..... English
Dennis W. Harmon ..... Diplomacy
Donna Kay Harris ..... French
Virginia F. Haughton ..... History

Sharon K. Hotchkiss ..... Microbiology
Hugh L. Huffman, Jr. ..... Chemistry
Robert J. Imholt ..... History
Dolores W. Jacome ..... Spanish
Larry Clinton Jenkins ..... Agricultural Economics
Donald Stuart Kammer ..... Mechanical Enginering
Paul S. Kaeser ..... Spanish
Nancy L. Kiefer ..... Microbiology
Susan Lee Klar ..... Political Science
Jack L. Kreider ..... Animal Sciences
Richard W. Leggett ..... Mathematics
Eugene R. McCane ..... History
Mary Carolyn McCorkle ..... History
Joann McFerran ..... Spanish
William Howard McNew ..... History
Carolyn S. Martin ..... French
Michael E. Martin ..... Physics & Astronomy
Donald J. Marxen ..... Mathematics
Kay Lynne Miller ..... Spanish
Rodney Morman ..... Mathematics
Thomas Conley Powell ..... Mechanical Engineering
Alice F. Queen ..... English
Ronnie V. Ragsdale ..... Physics & Astronomy
George R. Rice ..... Economics
Lorraine D. Rodriguez ..... Microbiology
Dale M. Royalty ..... History
William A. Samsonoff ..... Microbiology
Charles Alvin Shue ..... French
Christopher N. Sinback ..... Physiology & Biophysics
Sharron Williams Smith ..... Biochemistry
David G. Spruill ..... Animal Sciences
Marvin E. Taylor ..... Spanish
Donald W. Tripp ..... Political Science
Robert G. Waite ..... English
Harrell Walker ..... Plant Pathology
Margaret W. Wendelsdorf ..... Sociology
John E. White ..... Mechanical Engineering
Dennis A. Williams ..... History
Nancy A. Winkelman ..... Mathematics
John W. Woodring ..... Physics & Astronomy
George Lee Wyatt ..... Economics
Jack A. Yeager ..... French
Betty R. Yung ..... Spanish

DOCTORAL-YEAR FELLOWS

LaDonna H. Barnett ..... Physiology & Biophysics
Daniel M. Bartell ..... Physics & Astronomy
Ann Fowler Bowe ..... Mathematics

James Joy Bowe	Mathematics
Benjamin C. Brewster	Mathematics
Allen K. Chelgren	Mathematics
Ray L. Coleman	Chemistry
J. Douglas Ferry	Chemistry
John M. Gibson	Physiology & Biophysics
Larry A. Giesmann	Botany
Peggy Sue Gott	Physiology & Biophysics
Kenyon N. Griffin	Political Science
Charles W. Hartwig	Diplomacy
Lynda M. Kennedy	French
William J. Lattin, Jr.	Physiology & Biophysics
Porter P. Layne	Biochemistry
Liong-Hiem Liem	Physics & Astronomy
Gloria G. Marsosudiro	Education
Charles E. Matkovich	Chemistry
M. Michael Morgan	Physics & Astronomy
John K. Munro, Jr.	Physics & Astronomy
Carroll B. Myers	Mathematics
Calvin L. Schoulties	Plant Pathology
Mahendra J. Shah	Civil Engineering
Peter R. Sinclair	Biochemistry
Doris M. Thompson	Chemistry
Bandaru Venkateswarlu	Civil Engineering
Sung Chul Yang	Diplomacy

The Graduate Council and Graduate Faculty

ALBERT DENNIS KIRWAN, M.A., PH.D.
Interim President of the University

LEWIS W. COCHRAN, M.S., PH.D.
Dean of the Graduate School

JAMES CHARLES HUMPHRIES, M.S., PH.D.
Assistant Dean of the Graduate School

CARL CABE, PH.D.
Assistant Dean of the Graduate School

THE GRADUATE COUNCIL

RICHARD L. ANDERSON (Statistics) 1968-1971
CARL B. CONE (History) 1968-1971
JAMES E. FUNK (Mechanical Engineering) 1967-1970
ART GALLAHER (Anthropology) 1967 1970
LYMAN V. GINGER (Education) 1967-1970
RAY MARSHALL (Economics) 1967-1970
ARTHUR K. MOORE (English) 1968-1970
VERNON A. MUSSELMAN (Education) 1966-1969
ROBERT W. RUDD (Agricultural Economics) 1968-1971
GEORGE W. SCHWERT (Biochemistry) 1967-1970
WALTER T. SMITH, JR. (Chemistry) 1967-1970

THE GRADUATE FACULTY

STALEY F. ADAMS, PH.D. ..... Engineering Mechanics
WILLIAM Y. ADAMS, PH.D. ..... Anthropology
ARNOLD DEWALD ALBRIGHT, M.S., PH.D. ..... Education
M. I. H. ALEEM, PH.D. ..... Microbiology
LAWRENCE ALLEN, PH.D. ..... Library Science
NATHAN BRECKENRIDGE ALLISON, M.A., PH.D. ..... Electrical Engineering
RICHARD JOE AMICK, PH.D. ..... Agricultural Economics
CLIFFORD AMYX, M.A. ..... Art
RICHARD L. ANDERSON, PH.D. ..... Statistics
JAMES WILLIAM ARCHDEACON, M.S., PH.D. ..... Physiology and Biophysics
HARRY HUDSON BAILEY, M.S., PH.D. ..... Agronomy
ROBERT ALLEN BAKER, JR., PH.D. ..... Psychology
ALBERT BALOWS, PH.D. ..... Cell Biology
ROGER WILLIAM BARBOUR, M.S., PH.D. ..... Zoology
HARRY V. BARNARD, PH.D. ..... Education
CHARLES ELMER BARNHART, M.S., PH.D. ..... Animal Sciences
THOMAS CALHOUN BARR, JR., M.A., PH.D. ..... Zoology
HENRY H. BAUER, PH.D. ..... Chemistry
MILLARD F. BEATTY, JR., PH.D. ..... Engineering Mechanics
HOWARD W. BEERS, PH.D. ..... Sociology
JOHN JOSEPH BEGIN, M.S. in Agr., PH.D. ..... Animal Sciences
JAMES C. BEIDLEMAN, PHD. ..... Mathematics

VASANT PRABHAKER BHAPKAR, PH.D. ..... Statistics
HARMON CHARLES BICKLEY, JR., D.D.S., PH.D. ..... Pathology
NORMAN F. BILLUPS, PH.D. ..... Pharmacy
HAROLD R. BINKLEY, M.S. in Ed., Ed.D. ..... Education
WESLEY J. BIRGE, PH.D. ..... Zoology
RICHARD C. BIRKEBAK, PH.D. ..... Mechanical Engineering
RODNEY ELMER BLACK, M.S., PH.D. ..... Chemistry
DONALD A. BLOME, PH.D. ..... Geography
GEORGE S. BOBINSKI, PH.D. ..... Library Science
HARRY MAURICE BOHANNAN, D.M.D., M.S.D. ..... Periodontics
FREDERICK J. BOLLUM, PH.D. ..... Biochemistry
JOHN HARVEY BONDURANT, M.S., PH.D. ..... Agricultural Economics
PETER B. BOSOMWORTH, PH.D. ..... Anesthesiology
LOUIS J. BOUCHER, D.D.S., PH.D. ..... Dentistry
LOUIS L. BOYARSKY, M.S., PH.D. ..... Physiology and Biophysics
EUGENE B. BRADLEY, PH.D. ..... Electrical Engineering
NEIL W. BRADLEY, M.S., PH.D. ..... Animal Sciences
ELLIS V. BROWN, PH.D. ..... Chemistry
JAMES STEPHEN BROWN, M.A., PH.D. ..... Rural Sociology
WILLIAM RANDALL BROWN, M.A., PH.D. ..... Geology
JOHN J. BRYANS, M.S., PH.D. ..... Veterinary Science
JAMES DONNELL BUCKHOLTZ, PH.D. ..... Mathematics
ROBERT CECIL BUCKNER, M.S., PH.D. ..... Agronomy
GEORGE J. BUELOW, PH.D. ..... Music
JOE M. BUNN, PH.D. ..... Agricultural Engineering
COLLINS W. BURNETT, PH.D. ..... Education
GEORGE BOYD BYERS, M.S., PH.D. ..... Agricultural Economics
FOSTER B. CADY, JR., PH.D. ..... Statistics
JOHN C. CALKINS, M.S., PH.D. ..... Zoology
JAMES SUTHERLAND CALVIN, M.A., PH.D. ..... Psychology
CECIL CLAYTON CARPENTER, M.S., PH.D. ..... Economics
JOHN MELVIN CARPENTER, M.A., PH.D. ..... Zoology
WILLIS MERLE CARTER, M.S. in M.E., PH.D. ..... Mechanical Engineering
WILLIAM CHAMBLISS, PH.D. ..... History
SHUNG-KAI CHAN, PH.D. ..... Biochemistry
RICHARD ALEXANDER CHAPMAN, PH.D. ..... Plant Pathology
JEAN DANIEL CHARRON, M.A., PH.D. ..... Modern Foreign Languages
GARY D. CHRISTIAN, PH.D. ..... Chemistry
VIRGIL L. CHRISTIAN, PH.D. ..... Economics
MORRIS B. CIERLEY, M.A., Ed.D. ..... Education
LEWIS WELLINGTON COCHRAN, PH.D. ..... Physics
A. LEE COLEMAN, M.A., PH.D. ..... Sociology
DONALD B. COLEMAN, PH.D. ..... Mathematics
CARL BRUCE CONE, M.A., PH.D. ..... History
OWEN S. CONNELLY, JR., PH.D. ..... History
HANS CONRAD, PH.D. ..... Metallurgical Engineering
SAMUEL F. CONTI, PH.D. ..... Biological Sciences
ARTHUR LOUIS COOKE, M.A., PH.D. ..... English
ROBERT L. COSGRIFF, PH.D. ..... Electrical Engineering
EMMETT R. COSTICH, D.D.S., M.S., PH.D. ..... Dentistry
WILLIAM B. COTTER, M.A., Ph.D. ..... Anatomy
CHARLES MILTON COUGHENOUR, M.A., PH.D. ..... Sociology
MARCEL COZ, PH.D. ..... Physics

CLIFFORD JOHN CREMERS, PH.D. ..... Mechanical Engineering
TIHAMER Z. CSAKY, M.D. ..... Pharmacology
JOHN LEVI CUTLER, M.A., PH.D. ..... English
GUY MATTISON DAVENPORT, PH.D. ..... English
WAYNE HARRY DAVIS, M.S., PH.D. ..... Zoology
LYLE RAMSAY DAWSON, M.S., PH.D. ..... Chemistry
ROBERT J. DE ANGELIS, PH.D. ..... Metallurgical Engineering
JOHN O. DEARINGER, PH.D. ..... Civil Engineering
JESSE DEBOER, M.A., PH.D. ..... Philosophy
WENDELL CARDEN DEMARCUS, M.S., PH.D. ..... Physics
GEORGE W. DENEMARK, ED.D. ..... Education
WILLIAM H. DENNEN, PH.D. ..... Geology
DAVID E. DENTON, PH.D. ..... Education
MERRELL DEVOE, M.B.A., PH.D. ..... Business Administration
STEPHEN DIACHUN, M.S., PH.D. ..... Plant Pathology
DONALD F. DIEDRICH, PH.D. ..... Pharmacology
CHARLES FRANKLIN DIEHL, M.A., PH.D. ..... Psychology
OSCAR W. DILLON, JR., D.SC. ..... Engineering Mechanics
RAYMOND J. DISTLER, PH.D. ..... Electrical Engineering
JOHN C. DITTMER, PH.D. ..... Biochemistry
HENRY F. DOBYNS, PH.D. ..... Anthropology
JAMES T. DOLUISIO, PH.D. ..... Pharmacy
ROBERT LEWIS DONOHEW, PH.D. ..... Journalism
H. WYMAN DOROUGH, PH.D. ..... Entomology
JOHN DOUGLAS, M.B.A., PH.D. ..... Business Administration
ROBERT M. DRAKE, JR., M.S., PH.D. ..... Mechanical Engineering
PHILIP DRUCKER, PH.D. ..... Anthropology
J. HAROLD DRUDGE, D.V.M. ..... Veterinary Science
LATHEL F. DUFFIELD, PH.D. ..... Anthropology
PHILLIP AARON DUNCAN, M.A., PH.D. ..... French
W. G. DUNCAN, M.S., PH.D. ..... Agronomy
RAY HORN DUTT, M.S., PH.D ..... Animal Sciences
WILLIAM W. ECTON, PH.D. ..... Accounting
JAMES MARION EDNEY, M.A. ..... Zoology
OGDEN FRAZELLE EDWARDS, M.S., PH.D. ..... Microbiology
WILLIAM DONALD EHMANN, M.S., PH.D. ..... Chemistry
ROGER EICHHORN, PH.D. ..... Mechanical Engineering
EDWARD ENGEL, M.A., PH.D. ..... Psychology
JOSEPH ENGELBERG, M.S., PH.D. ..... Physiology and Biophysics
EDGAR ENOCHS, PH.D. ..... Mathematics
BETSY WORTH ESTES, M.A., PH.D. ..... Psychology
ROBERT OWEN EVANS, M.A., PH.D. ..... English
GEORGE PATTERSON FAUST, M.A., PH.D. ..... Anthropology
MISCHA H. FAYER, PH.D. ..... Slavic and Oriental Languages
THOMAS PARRY FIELD, M.A., PH.D. ..... Geography
VERNE CLIFFORD FINKNER, M.S., PH.D. ..... Agronomy
BERNARD FITZGERALD, M.M. ..... Music
FREDERICK J. FLERON, PH.D. ..... Political Science
JAMES W. FLESHER, PH.D. ..... Pharmacology
THOMAS R. FORD, M.A., PH.D. ..... Sociology
STUART FORTH, PH.D. ..... Director, Libraries
IRA FOWLER, PH.D. ..... Anatomy
DONALD T. FRAZIER, PH.D. ..... Physiology and Biophysics

THEODORE RUSSELL FREEMAN, M.S. in AGR., PH.D. ..... Animal Sciences
PAUL H. FREYTAG, PH.D. ..... Entomology
JOHN LEONARD FULMER, M.S., PH.D. ..... Economics
JAMES ELLIS FUNK, M.S., PH.D. ..... Mechanical Engineering
ROY FLETCHER GABBARD, M.A., PH.D. ..... Physics
EUGENE B. GALLAGHER, PH.D. ..... Behavioral Science
ART GALLAHER, JR., M.A., PH.D. ..... Anthropology
WESLEY PATTERSON GARRIGUS, M.S., PH.D. ..... Animal Sciences
HANS GESUND, D. of ENGR. ..... Civil Engineering
JAMES L. GIBSON, PH.D. ..... Business Administration
WILL D. GILLIAM, JR., M.A., PH.D. ..... History
LOIS A. GILLILAN, M.D., PH.D. ..... Anatomy
PETER PAUL GILLIS, PH.D. ..... Engineering Mechanics
LYMAN VERNON GINGER, M.A. in ED., ED.D. ..... Education
JAMES WALTER GLADDEN, M.ED., PH.D. ..... Sociology
ARTHUR C. GLASSER, PH.D. ..... Pharmaceutical Chemistry
HELMUT ALBERT GORDON, M.D. ..... Pharmacology
WILLIAM A. GORDON, PH.D. ..... English
BEN R. GOSSICK, PH.D. ..... Physics and Electrical Engineering
ZAKKULA GOVINDARAJULU, PH.D. ..... Statistics
JOHN G. GREEN, PH.D. ..... Agronomy
STUART I. GREENBAUM, PH.D. ..... Economics
ROBERT HIRAM GREENLAW, PH.D. ..... Radiology
ROBERT B. GRIEVES, PH.D. ..... Chemical Engineering
WARD O. GRIFFEN, JR., M.D., PH.D. ..... Physiology and Biophysics
WILLIS GRIFFIN, ED.D. ..... Education
ANDREW J. GRIMES, PH.D. ..... Business Administration
JOSEPH GRUBER, PH.D. ..... Physical Education
HALBERT E. GULLEY, PH.D. ..... Speech
CHARLES WILLIAM HACKENSMITH, M.A., PH.D. ..... Physical Education
JOHN V. HALEY, PH.D. ..... Behavioral Science and Psychology
HOLMAN HAMILTON, PH.D., L.H.D. ..... History
WILLIAM BROOKS HAMILTON, M.S., PH.D. ..... Public Health
ELLWOOD MEACHAM HAMMAKER, PH.D. ..... Chemistry
RAYMOND E. HAMPTON, M.S., PH.D. ..... Plant Pathology
CHARLES E. HAMRIN, JR., PH.D. ..... Chemical Engineering
RICHARD HANAU, M.S., PH.D. ..... Physics
HERBERT WALTER HARGREAVES, M.A., PH.D. ..... Economics
BOBBY OTT HARDIN, M.S. in C.E., PH.D. ..... Civil Engineering
JESSE GRAHAM HARRIS, JR., PH.D. ..... Psychology
ELLIS FORD HARTFORD, M.A., ED.D. ..... Education
TADAYO HASHIMATO, PH.D. ..... Microbiology
ROBERT D. HAUN, M.A., J.D. ..... Accounting
THOMAS LEE HAYDEN, PH.D. ..... Mathematics
VIRGIL W. HAYS, PH.D. ..... Animal Sciences
CHARLES F. HAYWOOD, M.A., PH.D. ..... Economics
WILBUR AUGUST HEINZ, M.S. ..... Hygiene and Public Health
J. W. HENDRIX, PH.D. ..... Plant Pathology
WILEY H. HENSON, JR., PH.D. ..... Agricultural Engineering
ANDREW J. HIATT, M.S. in Agr., PH.D. ..... Agronomy
JUDSON C. HICKEY, D.D.S., PH.D. ..... Dentistry
DALLAS M. HIGH, PH.D. ..... Philosophy
HENRY R. HIRSCH, PH.D. ..... Physiology and Biophysics

DONALD HOCHSTRASSER, PH.D. ..... Anthropology
JAMES FRANKLIN HOPKINS, M.A., PH.D. ..... History
HENRY C. HOWARD, PH.D. ..... Mathematics
ALFRED S. L. HU, PH.D. ..... Biochemistry
CHARLES V. HULTMAN, M.A., PH.D. ..... Economics
JAMES CHARLES HUMPHRIES, M.S., PH.D. ..... Microbiology
GEORGE S. HURST, PH.D. ..... Physics
JOHN W. HUTCHINSON, PH.D. ..... Civil Engineering
TAKAO IIJIMA, PH.D. ..... Art
WYATT MARION INSKO, JR., M.S., in AGR. ..... Animal Sciences
ROBERT DuRENE JACOBS, M.A., PH.D. ..... English
DON R. JACOBSON, M.S., PH.D. ..... Animal Sciences
L. DOUGLAS JAMES, PH.D. ..... Civil Engineering
WILLIAM HUGH JANSEN, PH.D. ..... English
LLOYD JENSEN, PH.D. ..... Political Science
MALCOLM EDWIN JEWELL, M.A., PH.D. ..... Political Science
ERNST JOKL, M.D. ..... Physical Education
JOSEPH R. JONES, PH.D. ..... Spanish
FRED E. JUSTUS, PH.D. ..... Agricultural Economics
PRASAD K. KADABA, M.S., PH.D. ..... Electrical Engineering
PRADYUMNA PRASAD KARAN, M.A., PH.D. ..... Geography
LOUIS J. KARMEL, PH.D. ..... Education
MICHAEL KASPERBAUER, PH.D. ..... Agronomy
EARL KAUFFMAN, JR., M.A., PH.D. ..... Physical Education
L. CLARK KEATING, A.M., PH.D. ..... French
JOHN E. KELLER, PH.D. ..... Spanish
JAMES DILLON KEMP, M.S. in AGR., PH.D. ..... Animal Sciences
WILLIAM A. KENDALL, M.S., PH.D. ..... Agronomy
WILLIAM F. KENKEL, PH.D. ..... Sociology
FRANK W. KEOGH, PH.D. ..... Mathematics
RICHARD I. KERMODE, PH.D. ..... Chemical Engineering
BERNARD DONALD KERN, M.S., PH.D. ..... Physics
JAMES B. KINCHELOE, PH.D. ..... Education
GORDON KINNEY, M.M., PH.D. ..... Music
ALBERT DENNIS KIRWAN, PH.D. ..... History
ROBERT W. KISER, PH.D. ..... Chemistry
STUART M. KLEIN, PH.D. ..... Business Administration
DONALD E. KNAPP, PH.D. ..... Pharmacology
FRED W. KNAPP, PH.D. ..... Entomology
JAMES A. KNOBLETT, PH.D. ..... Accounting
MILTON J. KORNET, PH.D. ..... Pharmaceutical Chemistry
HARRY B. KOSTENBAUDER, PH.D. ..... Pharmacy
BERND KRATZ, PH.D. ..... Germanic Languages
JOSEPH KRISLOV, M.A., PH.D. ..... Economics
WASLEY SWEN KROGDAHL, PH.D. ..... Mathematics
ROBERT A. KUEHNE, PH.D. ..... Zoology
RAYMOND LA CHARITÉ, PH.D. ..... French
VIRGINIA LA CHARITÉ, PH.D. ..... French
JAMES F. LAFFERTY, PH.D. ..... Mechanical Engineering
CARL F. LAMAR, PH.D. ..... Education
KARL OTTO LANGE, ENG.D. ..... Mechanical Engineering
CARL E. LANGENHOP, PH.D. ..... Mathematics
BRUCE E. LANGLOIS, PH.D. ..... Animal Sciences

WALTER G. LANGLOIS, M.A., PH.D. ..... French
MARGARET LANTIS, PH.D. ..... Anthropology
ALY M. LASHEEN, PHD. ..... Horticulture
ROBERT AMIS LAUDERDALE, JR., M.S. in CH.E., PH.D. ..... Civil Engineering
PAUL ROBERT LEHMAN, PH.D. ..... Music
DONALD C. LEIGH, PH.D. ..... Engineering Mechanics
MARTIN LEIPOLD, PH.D. ..... Metallurgical Engineering
MELVIN J. LERNER, M.A., PH.D. ..... Behavioral Science
CHARLES T. LESSHAFFT, JR., PH.D. ..... Pharmacy
ROBERT L. LESTER, PH.D. ..... Biochemistry
RUPERT T. LESLIE, PH.D. ..... Statistics
JOHN H. LIENHARD, PH.D. ..... Mechanical Engineering
JAMES T. LIGON, M.S., PH.D. ..... Agricultural Engineering
JOHN LIHANI, PH.D. ..... Spanish
C. ORAN LITTLE, PH.D. ..... Animal Sciences
JAMES W. LITTLE, D.M.D., M.S. ..... Oral Diagnosis and Oral Medicine
RAYMOND LOCKARD, PH.D. ..... Horticulture
CHARLES ROLLAND LOCKYER, PH.D. ..... Economics
REY MORGAN LONGYEAR, M.A., PH.D. ..... Music
ALBERT JOHN LOTT, M.A., PH.D. ..... Psychology
RICHIE H. LOWE, PH.D. ..... Agronomy and Biological Science
RICHARD LOWITT, PH.D. ..... History
MARK M. LUCKENS, PH.D. ..... Materia Medica
HARRY C. LUNDEEN, PH.D. ..... Restorative Dentistry
WILLIAM H. MCCOLLUM, PH.D. ..... Veterinary Science
WILLIAM C. MCCRARY, PH.D. ..... Spanish
MARCUS THOMAS MCELLISTREM, M.S., PH.D. ..... Physics
LERAY RANDOLPH MCGEE, PH.D. ..... Economics
JOHN MACK, PH.D. ..... Mathematics
DONALD WAYNE MACLAURY, M.S., PH.D. ..... Animal Sciences
WILLIAM C. MACQUOWN, JR., M.S., PH.D. ..... Geology
STEPHEN J. MANNING, PH.D. ..... English
RICHARD MARK, M.F., D.F. ..... Forestry
ABBY L. MARLATT, PH.D. ..... Nutrition and Food Science
RAY MARSHALL, PH.D. ..... Economics
HUBERT M. MARTIN, JR., PH.D. ..... Germanic Languages
WILLIAM R. MARTIN, M.D., M.S. in PHAR. ..... Pharmacology
HERBERT F. MASSEY, M.S., PH.D. ..... Agronomy
JOE LOGAN MASSIE, M.A., PH.D. ..... Business Administration
RICHARD SHELBY MATEER, M.S., PH.D. ..... Mining and Metallurgical Engineering
JACOB ROBERT MEADOW, M.S., PH.D. ..... Chemistry
RICHARD I. MILLER, M.A., ED.D. ..... Education
GEORGE E. MITCHELL, JR., PH.D. ..... Animal Science
HUBERT C. MOHR, M.S., PH.D. ..... Horticulture
WILLIAM G. MOODY, PH.D. ..... Animal Sciences
ARTHUR KEISTER MOORE, M.A., PH.D. ..... English
JAMES T. MOORE, JR., M.A., ED.D. ..... Education
ALVIN L. MORRIS, D.D.S., PH.D. ..... Dentistry
JAMES GRAHAM MORRIS, PH.D. ..... Metallurgical Engineering
THEODORE MUELLER, PH.D. ..... French
ROBERT D. MURPHY, PH.D. ..... Journalism
VERNON ARMOR MUSSELMAN, M.ED., ED.D. ..... Education
PAUL C. NAGEL, M.A., PH.D. ..... History

SYED ABU NASAR, PH.D. ..... Electrical Engineering
VINCENT EDWARD NELSON, PH.D. ..... Geology
EDWARD LEE NEWBURY, M.A., PH.D. ..... Psychology
KURT NIEDENZU, PH.D. ..... Chemistry
JAMES ROBERT OGLETREE, M.A., ED.D. ..... Education
GARTH L. OLDE, PH.D. ..... Behavioral Science and Computer Science
DURWOOD OLDS, M.S., D.V.M., PH.D. ..... Animal Sciences
LEONARD V. PACKETT, JR., PH.D. ..... Nutrition and Food Science
BLAINE F. PARKER, M.S., PH.D. ..... Agricultural Engineering
HAROLD F. PARKS, PH.D. ..... Anatomy
BOBBY C. PASS, PH.D. ..... Entomology
ALBERT W. PATRICK, PH.D. ..... Accounting
JOHN MILES PATTERSON, PH.D. ..... Chemistry
FRANK ACKLEN PATTIE, M.A., PH.D. ..... Psychology
MARION PEARSALL, PH.D. ..... Behavioral Science
DOYLE EUGENE PEASLEE, PH.D. ..... Agronomy
RONALD E. PHILLIPS, PH.D. ..... Agronomy
GEORGE PINCUS, M.S. in C.E., PH.D. ..... Civil Engineering
THOMAS P. PIRONE, PH.D. ..... Plant Pathology
WILLIAM KENNEDY PLUCKNETT, PH.D. ..... Chemistry
RALPH RUSSELL PICKETT, M.A., PH.D. ..... Business Administration
WILLIAM ROBERT PROFFIT, D.D.S., M.S.D., PH.D. ..... Orthodontics
JOHN L. RAGLAND, M.S. in Agr., PH.D. ..... Agronomy
EARL F. RANKIN, PH.D. ..... Education
JOHN C. REDMAN, M.S. in AGR., PH.D. ..... Agricultural Economics
DANIEL R. REEDY, PH.D. ..... Spanish
DOUGLAS E. REES, PH.D. ..... Pharmacology
BOYD RICHARDS, M.S., PH.D. ..... Forestry
HERBERT PARKES RILEY, M.A., PH.D., ... Botany
DONALD A. RINGE, M.A., PH.D. ..... English
JOSEPH M. RIPLEY, PH.D. ..... Radio-TV-Films
JOHN BISSELL ROBERTS, M.S. in AGR. ..... Agricultural Economics
JUAN G. RODRIGUEZ, M.S., PH.D. ..... Agricultural Entomology
HARRY ALEX ROMANOWITZ, M.S., PH.D. ..... Electrical Engineering
DAVID F. ROSS, PH.D. ..... Economics
IRA JOSEPH ROSS, PH.D. ..... Agricultural Engineering
SHELDON ROVIN, D.D.S., M.S. ..... Oral Pathology
WIMBERLY CALVIN ROYSTER, M.A., PH.D. ..... Mathematics
ISAAC RUCHMAN, M.S., PH.D. ..... Microbiology
ROBERT WILLIAM RUDD, M.S., PH.D. ..... Agricultural Economics
WILLIAM R. RUSSELL, PH.D. ..... Economics
JOHN K. RYANS, JR., PH.D. ..... Business Administration
GERARDO SAENZ, M.A., PH.D. ..... Spanish
DONALD EDGAR SANDS, PH.D. ..... Chemistry
FRANK A. SANTOPOLO, M.S., PH.D. ..... Rural Sociology
JOSEPH A. SAYEG, PH.D. ..... Radiology
G. WILLIAM SCHNEIDER, M.S., PH.D. ..... Horticulture
DOUGLAS WRIGHT SCHWARTZ, PH.D. ..... Anthropology
GEORGE W. SCHWERT, PH.D. ..... Biochemistry
PAUL G. SEARS, PH.D. ..... Chemistry
DON CASH SEATON, M.S., ED.D. ..... Physical Education
DWIGHT MOODY SEATH, M.S., PH.D. ..... Animal Sciences
S. M. SHAH, PH.D. ..... Mathematics

ROBERT EZEKIEL SHAVER, B.S. in C.E., C.E. ..... Civil Engineering
JOHN G. SHAW, PH.D. ..... Plant Pathology
D. MILTON SHUFFETT, M.S., PH.D. ..... Agricultural Economics
MALCOLM R. SIEGEL, PH.D. ..... Plant Pathology
GERARD SILBERSTEIN, PH.D. ..... History
JAMES E. SIMPSON, PH.D. ..... Mathematics
S. N. SINGH, PH.D. ..... Mechanical Engineering
JESSE E. SISKEN, PH.D. ..... Cell Biology
ELDON DEE SMITH, PH.D. ..... Agricultural Economics
STANFORD L. SMITH, PH.D. ..... Chemistry
WALTER THOMAS SMITH, JR., PH.D. ..... Chemistry
MARTIN B. SOLOMON, JR., PH.D. ..... Business Administration
DON M. SOULE, M.S., PH.D. ..... Economics
PAUL STAPF, PH.D. ..... German
EARL L. STEELE, PH.D. ..... Electrical Engineering
KINGSLEY M. STEVENS, M.D. ..... Microbiology
WELLINGTON B. STEWART, M.D. ..... Pathology
GRANVILLE WOOLMAN STOKES, M.S., PH.D. ..... Plant Pathology
HOWARD D. STOWE, M.S., D.V.M., PH.D. ..... Veterinary Science
ROBERT STRAUS, M.A., PH.D. ..... Behavioral Science
W. PAUL STREET, M.A., PH.D. ..... Education
ROBERT H. STROUP, PH.D. ..... Economics
THOMAS BRADLEY STROUP, M.A., PH.D. ..... English
WILLIAM GREGORY SURVANT, M.S. in AGR., PH.D. ..... Agronomy
WILLIS ANDERSON SUTTON, JR., M.A., PH.D. ..... Sociology
JAMES SUZUKI ..... Art
LEWIS A. SUMBERG, PH.D. ..... French
ROY ERWIN SWIFT, M.S. in MET. and MIN. ENG., D.ENG. ..... Metallurgical Engineering
JOSEPH SWINTOSKY, PH.D. ..... Pharmacy
LAWRENCE TARPEY, M.B.A., PH.D. ..... Business Administration
NORMAN LINN TAYLOR, M.S., PH.D. ..... Agronomy
TIMOTHY HENRY TAYLOR, M.S., PH.D. ..... Agronomy
WILLIAM C. TEMPLETON, PH.D. ..... Agronomy
PENTI TERASLINNA, PH.D. ..... Physical Education
GRANT W. THOMAS, PH.D. ..... Agronomy
JOHN WESLEY THOMAS, PH.D. ..... Germanic Languages
LAWRENCE SIDNEY THOMPSON, M.A., PH.D. ..... Classics
P. A. THORNTON, M.S., PH.D. ..... Physiology and Biophysics
ROBERT K. THORPE, PH.D. ..... Journalism
RICHARD THURSTON, PH.D. ..... Entomology
WILLIAM J. TISDALL, PH.D. ..... Education
LEE HILL TOWNSEND, M.S., PH.D. ..... Entomology
JOHN R. TUSKA, PH.D. ..... Art
S. SIDNEY ULMER, M.A., PH.D. ..... Political Science
KENNETH VANLANDINGHAM, M.A., PH.D. ..... Political Science
CLASINE VAN WINTER, PH.D. ..... Mathematics and Physics
HARWIN L. VOSS, M.S., PH.D. ..... Sociology
WILLIAM FREDERICK WAGNER, M.S., PH.D. ..... Chemistry
JOHN N. WALKER, M.S., PH.D. ..... Agricultural Engineering
WILLIAM SMITH WARD, M.A., PH.D. ..... English
ROBERT D. WARTH, PH.D. ..... History
RALPH HOLDER WEAVER, M.S., PH.D. ..... Microbiology

GILBERT T. WEBSTER, M.S., PH.D. ..... Agronomy
JESSE L. WEIL, PH.D. ..... Physics
DANIEL LEIGH WEISS, M.D. ..... Pathology
DAVID R. WEKSTEIN, PH.D. ..... Physiology and Biophysics
JAMES HOWARD WELLS, M.S., PH.D. ..... Mathematics
BRUCE H. WESTLEY, PH.D. ..... Journalism
HAROLD E. WETZEL, M.A. ..... Social Work
HARRY E. WHEELER, PH.D. ..... Plant Pathology
PAUL KNOWLTON WHITAKER, M.A., PH.D. ..... German
DAVID C. WHITE, M.D., PH.D. ..... Biochemistry
MARTIN MARSHALL WHITE, M.A., PH.D. ..... Psychology
ABRAHAM WIKLER, M.D. ..... Pharmacology
ALFRED D. WINER, M.S., PH.D. ..... Biochemistry
MIROSLAVA B. NIKITOVITCH-WINER, M.A., PH.D. ..... Anatomy
ALAN R. WINGER, PH.D. ..... Economics
RALPH F. WISEMAN, M.S., PH.D. ..... Microbiology
WILLIAM A. WITHINGTON, M.A., PH.D. ..... Geography
WAYNE WONDERLEY, M.A., PH.D. ..... Germanic Languages
DON J. WOOD, PH.D. ..... Civil Engineering
PATCH GREGORY WOOLFOLK, M.S. in AGR., PH.D. ..... Animal Sciences
LEONARD WORELL, PH.D. ..... Psychology
FREDERICK D. WRIGHT, PH.D. ..... Civil Engineering
KENNETH RICHARD WRIGHT, M.A., PH.D. ..... Music
FRANCIS L. YOST, M.S., PH.D. ..... Physics
E. GRANT YOUMANS, PH.D. ..... Sociology
WESLEY O. YOUNG, D.M.D., M.P.H. ..... Community Dentistry
FRED W. ZECHMAN, JR., M.S., PH.D. ..... Physiology and Biophysics
JAMES F. ZOLMAN, PH.D. ..... Physiology and Biophysics
LEON ZOLONDEK, M.A., PH.D. ..... Classics
JACK D. ZWEMER, D.D.S., M.S., PH.D. ..... Community Dentistry

ASSOCIATE MEMBERS OF GRADUATE FACULTY

ROY N. ADAMS, PH.D. ..... Electrical Engineering
DAVID M. ALLEN, PH.D. ..... Statistics
KURT R. ANSCHEL, PH.D. ..... Agricultural Economics
RONALD K. ATWOOD, ED.D. ..... Education
JOHN P. BAKER, PH.D. ..... Animal Sciences
BILLY J. BARFIELD, PH.D. ..... Agricultural Engineering
RICHARD IRVEN BARNHISEL, PH.D. ..... Agronomy
WILLIAM HOWARD BLACKBURN, PH.D. ..... Geology
A. EDWARD BLACKHURST, PH.D. ..... Education
ROBERT L. BLEVINS, PH.D. ..... Agronomy
BARRY J. BLOOMFIELD, PH.D. ..... Agronomy
THOMAS O. BLUES, PH.D. ..... English
BARRY W. BOBST, PH.D. ..... Agricultural Economics
LINCOLN BRAGG, PH.D. ..... Mathematics
RUSSELL H. BRANNON, PH.D. ..... Agricultural Economics
FREDERICK BROUWER, PH.D. ..... Philosophy
CARL EDWARD BURKHEAD, PH.D. ..... Civil Engineering
LOWELL P. BUSH, PH.D. ..... Agronomy
CHARLES W. CAMPBELL III, PH.D. ..... Economics

BRADLEY CANON, PH.D. ..... Political Science
JAMES G. CAUGHRAN, PH.D. ..... Mathematics
ROBERT EDGAR CAZDEN, PH.D. ..... Library Science
LINDA H. CHEN, PH.D. ..... Home Economics
GLENN BURTON COLLINS, PH.D. ..... Agronomy
WILLIAM L. CONGER, PH.D. ..... Chemical Engineering
RAYMOND H. COX, PH.D. ..... Mathematics
EUGENE CARSON CRAWFORD, JR., PH.D. ..... Zoology
GARY L. CROMWELL, PH.D. ..... Animal Sciences
EDWIN DALE, PH.D. ..... Zoology
EMMETT RANDOLPH DANIEL, PH.D. ..... History
JOHN A. DEACON, D. ENGR. ..... Civil Engineering
LOUIS DIAMOND, PH.D. ..... Pharmacy
JOHN ALVIN DICKINSON, ED.D. ..... Education
GEORGE A. DIGENIS, PH.D. ..... Pharmacy
LEWIS W. DITTERT, PH.D. ..... Pharmacy
VINCENT P. DRNEVICH, PH.D. ..... Civil Engineering
JOHN P. DRYSDALE, PH.D. ..... Sociology
CARL EBERHART, PH.D. ..... Mathematics
JOHN N. EDWARDS, PH.D. ..... Sociology
WILLIAM K. ELWOOD, PH.D. ..... Anatomy
JOSEPH B. FUGATE, PH.D. ..... Mathematics
GEORGE GADBOIS, PH.D. ..... Political Science
RICHARD E. GIFT, PH.D. ..... Economics
STEPHEN M. GITTLESON, PH.D. ..... Zoology
JOHN W. GORMAN, PH.D. ..... Cell Biology
CLAUS GRUNWALD, PH.D. ..... Agronomy
BURTON S. GUTTMAN, PH.D. ..... Cell Biology
CHARLES THOMAS HAAN, PH.D. ..... Agriciultural Engineering
OTTFRIED J. HAHN, PH.D. ..... Mechanical Engineering
DAVID S. HALL, PH.D. ..... Behavioral Science
MARY W. HARGREAVES, PH.D. ..... History
DENNY O. HARRIS, PH.D. ..... Botany
DAVIS HENDERSON, D.D.S. ..... Prosthodontics
RICHARD H. HENZE, PH.D. ..... English
ERIC C. HICKS, PH.D. ..... French
YANG HSIEN HUANG, SC.D. ..... Civil Engineering
JACK G. HUTTON, JR., PH.D. ..... Community Dentistry
DEAN JAROS, PH.D. ..... Political Science
MARGARET E. W. JONES, PH.D. ..... Spanish
DAVID T. Y. KAO, PH.D. ..... Civil Engineering
CHARLES N. KELLOGG, PH.D. ..... Mathematics
JERRY WAYNE KNUDSON, PH.D. ..... History
ALFRED KORN, D.SC. ..... Civil Engineering
ROGER O. LAMBSON, PH.D. ..... Anatomy
PAUL D. LEGG, PH.D. ..... Agronomy
JOSEPH R. LOGIC, PH.D. ..... Medicine
ROBERT G. LOY, PH.D. ..... Veterinary Science
W. ROBERT LUSZCZYNSKI, PH.D. ..... French
WILLIAM E. LYONS, PH.D. ..... Political Science
ERNEST P. McCUTCHEON, M.D. ..... Physiology and Biophysics
DONALD McVARISH, PH.D. ..... Behavioral Science
EDWARD O. MAGARIAN, PH.D. ..... Pharmacy
GENE L. MASON, PH.D. ..... Political Science

ALFRED M. MIRANDE, PH.D. ..... Sociology
HUMBERT S. NELLI, PH.D. ..... History
LOUIS A. NORTON, D.M.D. ..... Dentistry
DONALD G. NUGENT, PH.D. ..... History
THOMAS M. OLSHEWSKY, PH.D. ..... Philosophy
JON W. PETWAY, PH.D. ..... Electrical Engineering
HARVEY R. POUSSON, PH.D. ..... Mathematics
POTU N. RAO, PH.D. ..... Physiology and Biophysics
FRANK J. RIZZO, PH.D. ..... Engineering Mechanics
THURLOW R. ROBE, PH.D. ..... Engineering Mechanics
GORDON A. SARGENT, PH.D. ..... Materials Science
JOHN SAMUEL SCARBOROUGH, PH.D. ..... History
J. THOMAS SCHRODT, PH.D. ..... Chemical Engineering
JOHN SELDON, PH.D. ..... Mathematics
TAE KUN SEO, PH.D. ..... Mathematics
SHUH-JI SHEEN, PH.D. ..... Agronomy
DAVID J. SHIPPY, PH.D. ..... Engineering Mechanics
SHELDON SIMON, PH.D. ..... Political Science
JOHN L. SIMS, PH.D. ..... Agronomy
ROBERT L. SKAGGS, PH.D. ..... Metallurgical Engineering
STEPHEN D. SMITH, PH.D. ..... Anatomy
DONALD Z. SPICER, PH.D. ..... Mathematics
JOHN B. STEPHENSON, PH.D. ..... Sociology
LEONARD P. STOLZ, PH.D. ..... Horticulture
HARLAN G. STURM, PH.D. ..... Spanish
SARA H. STURM, PH.D. ..... Spanish
TED J. SUFFRIDGE, PH.D. ..... Mathematics
JOE ALLEN THOMPSON, PH.D. ..... History
WILLIAM O. THOMPSON, PH.D. ..... Statistics
JOHN THRAILKILL, PH.D. ..... Geology
FREDERICK AARON THRIFT, PH.D. ..... Animal Sciences
HAROLD H. TRAURIG, PH.D. ..... Anatomy
H. H. VAN HORN, JR., PH.D. ..... Animal Sciences
RAYMOND P. WHITE, JR., D.D.S., PH.D. ..... Dentistry
J. C. WILLIAMS, PH.D. ..... Agronomy
CHARLES Y. YANG, PH.D. ..... Plant Pathology

ADMINISTRATIVE ORGANIZATION

GENERAL

A. D. Kirwan, President

Arnold DeWald Albright, Executive Vice President

William Robert Willard, Vice President for the Albert B. Chandler Medical Center

Alvin L. Morris, Assistant Vice President for the Medical Center

Robert F. Kerley, Vice President—Business Affairs and Treasurer of the University

Glenwood L. Creech, Vice President—University Relations

Stuart Forth, Interim Vice President—Student Affairs

Lewis W. Cochran, Dean of Graduate School and Vice President for Research

John E. Barrows, Director of Institutional Studies

George J. Ruschell, University Business Manager

Frederick Woodress, Director of Public Relations

Elbert W. Ockerman, Dean of Admissions and Registrar

Keller Johnson Dunn, Associate Dean of Admissions

Ellis Ford Hartford, Dean, Community College System

Maurice Stanley Wall, Associate Dean, Community College System

Roy K. Jarecky, Associate Dean for Admissions and Student Personnel, Medical Center

Jack L. Mulligan, Director, University Health Service

Doris M. Seward, Dean of Student Affairs Planning

Jack Blevin Hall, Dean of Students

Rosemary Pond, Associate Dean of Students

Betty Jo Palmer, Associate Dean of Students

Robert Blakeman, Director of Auxiliary Services

Martin B. Solomon, Director of the Computing Center

Jay Brumfield, Acting Director, of Alumni Affairs

James Ingle, Administrator, Student Financial Aid

Harriet Rose, Administrator, University Counseling and Testing Center

Harold Gordon, Acting Director of Libraries

James P. Alcorn, Director of Placement Service

Howard W. Beers, Director, Center for Developmental Change

THE COLLEGES

Charles E. Barnhart, Dean of the College of Agriculture

Wimberly C. Royster, Dean of the College of Arts and Sciences

Robert M. Drake, Dean of the College of Engineering
Leonard V. Packett, Acting Dean of the School of Home Economics
William Lewis Matthews, Dean of the College of Law
George W. Denemark, Dean of the College of Education
Charles F. Haywood, Dean of the College of Business and Economics
Joseph V. Swintosky, Dean of the College of Pharmacy
William S. Jordan, Jr., Dean of the College of Medicine
Marcia Allene Dake, Dean of the College of Nursing
Harry M. Bohannan, Dean of the College of Dentistry
Joseph Hamburg, Dean of the School of Allied Health Professions
Raymon Dudley Johnson, Dean, University Extension
Lawrence A. Allen, Dean of the School of Library Science
Charles Parker Graves, Dean of the School of Architecture

INDEX

—A—

Academic Load, 15
Accounting, 172
Administrative Organization, 303
Admission, 11
  Advanced Degrees for Faculty Members, 12
  Application for Full Graduate Standing, 13
  Graduate Record Examination, 12
  Graduating Seniors as Part-time Graduate Students, 13
Advanced Degrees, 13
  Academic Load, 15
  Courses and Grades, 13
  Credit Equivalence, 15
  Dropping of Courses, 14
  Fees, 17
  Grades, 14
  Graduation, 17
  Registration and Classification, 15
  Short Courses: Weekly Courses, 16
  Time Limit for Degrees, 16
Advanced Study and Research by Guests of the University, 30
Advisers and the Special Committee, 22
Agriculture, 37
Agricultural Economics, 37
  Agricultural Economics Development, 39
  Agricultural Marketing, 38
  Agricultural Policy and Land Economics, 39
  Agricultural Prices and Finance, 40
  Farm Management, 38
  Production Economics, 39
  Mathematical Economics, 39
  Research Methods, 40
  Seminar, 40
  Special Problems, 40
Agricultural Education, 41
Agricultural Engineering, 217
Agronomy, 41
Allied Health Profession, 265
  Clinical Nutrition, 265
  Community Health, 266
  Radiation Medicine, 267
Animal Sciences, 44
Anthropology, 57
Art, 61
  Art History, 62
  Studio Art, 61
Arts and Sciences, 57
Assistantships, Research and Teaching, 32
Associate Members of Graduate Faculty, 300

—B—

Behavioral Science, 247
Biochemistry, 249
Biophysics, 253
Biological Sciences, 64
Botany, 65
Business Administration, 174
  Finance, 175
  International Business, 176
  Legal Environment, 175
  Management, 174
  Marketing, 174
  Quantitative Business Analysis and Production, 176
Business and Economics, 166
Business Education, 190

—C—

Calendar, University, 4
Cell Biology, 250
Center for Developmental Change, 30
Chemical Engineering, 220
Chemical Physics, 74
Chemistry, 75
Classics, 100
Communications, School of, 78
  Courses in, 80
  Journalism, 80
  Speech, 82
  Telecommunications, 82

Computer Science, 83
Community Health, 266
Cooperative Extension Education, 46
Credits, Transfer of, 18

—D—
Degrees Offered, 7
Dentistry, 285
Diplomacy and International Commerce, 84
Directors of Graduate Study, 32
Doctor of Business Administration, Requirements, 27
Doctor of Education
Requirements, 26
Joint-Doctoral Program with State Universities, 26
Doctor of Engineering, Requirements, 217
Doctor of Musical Arts, 27
Doctor of Philosophy,
Advisers and Special Committee, 22
Final Examination, 25
Language Requirements, 24
Major and Minor Subjects, 22
Qualifying Examination, 24
Residence Requirements, 23
Thesis, 25
Dropping a Course, 14

—E—
Econometrics, 181
Economics, 177
Econometrics, 181
Economic Development, 178
Economic History, 177
Economic Theory, 177
International Economics, 178
Labor Economics, 179
Mathematical Economics, 180
Monetary Analysis, 180
Public Finance, 179
Regional Economics, 180
Education, 185
Administration and Supervision, 194
Agricultural Education, 189
Business Education, 190
Certification in Administration and Supervision, 193
Counseling and Guidance for Master's Degree, 191
Counseling and Guidance for Sixth-Year Degree, 192
Curriculum and Instruction, 195
Educational Psychology and Counseling, 198
Elementary Education, 187
Health, Physical Education and Counseling, 198
Higher and Adult Education, 204
Home Economics Education, 190
Planned Fifth-Year Program, 193
Regulations Governing Graduate Work, 185
Plan A, 185
Plan B, 186
Secondary Education, 188
Social and Philosophical Studies in Education, 205
Special Education, 207
Vocational Education, 209
Engineering, 217
Agricultural Engineering, 217
Chemical Engineering, 220
Civil Engineering, 222
Electrical Engineering, 227
Engineering Mechanics, 232
Mechanical Engineering, 234
Metallurgical Engineering and Materials Science, 238
English, 85
Entomology, 47
Examinations, Masters' Degrees, 19

—F—
Faculty of Graduate School, 292
Fees, 17
Fellows and Trainees, 287
Fellowships, 31
Forestry, 49
French Language and Literature, 90

—G—
Genetics, 68

Geography, 93
Geology, 97
German, 102
Germanic and Classical Language and Literature, 100
Grades, 14
Graduate Council, 292
Graduate Faculty, 292
Graduate School Fellowships, 31
Graduate School,
  Organization of, 8
  Admission to, 11
Graduation, 17
Graduate Students Not Applicants for Degrees, 29
Greek, 101

—H—

Health, Physical Education, and Recreation, 201
History, 104
  American History, 109
  English and British Empire, 109
  European History, 106
  Far East, 111
Home Economics, 271
  Family Life, 271
  Management and Family Economics, 272
  Nutrition and Food Science, 274
  Textiles and Design, 272
Home Economics Education, 190
Horticulture, 49

—I—

International Business, 176
International Economics, 178
Italian, 154

—J—

Journalism, 80

—L—

Labor Economics, 179
Latin, 100
Law, 242
Legal Environment, 175
Library Science, 278

—M—

Materia Medica, 262
Management, 174
Marketing, 174
Masters' Degrees,
  General Requirements, 17
  On-Campus Residence, 17
  Transfer of Credits, 18
  Extension and Correspondence Work, 18
  M.A. and M.S. Degrees, 18
  Courses and Curricula, 18
  Examinations, 19
  Fees, 19
Master of Arts and Master of Science, Requirements for,
  Plan A, 19
  Plan B, 21
Masters' Degrees, Specialized, 21
Materials Science, 238
Mathematical Economics, 180
Mathematics, 114
Medicine, 245
  Anatomy, 245
  Behavioral Sciences, 247
  Biochemistry, 249
  Cell Biology, 250
  Pathology, 250
  Pharmacology, 250
  Physiology and Biophysics, 253
  Toxicology, 255
Microbiology, 69
Monetary Analysis, 180
Music, 119

—O—

Oak Ridge Associated Universities, Research Program At, 29
Organization of Graduate School, 8

—P—

Pathology, 250
Pharmaceutical Sciences, 259
Pharmaceutical Chemistry, 260
Pharmacy (Pharmaceutics), 259
  Materia Medica, 262
  Pharmaceutical Chemistry, 260
Pharmacology, 250

Philosophy, 128
Physics, 130
Physiology and Biophysics, 253
Plant Pathology, 50
Political Science, 135
  Comparative Government, 135
  International Relations, 136
  Political Process, 137
  Public Administration, 138
  Public Law and Judicial Behavior, 138
  Research Concepts and Methods, 139
  State and Local Government, 139
  Theory, 140
Psychology, 140

—Q—
Quantitative Business Analysis and Production, 176

—R—
Radiation Medicine, 267
Registration, 15
Russian Language and Literature, 146

—S—
Scandinavian, 104
Semitics, 147
Short Courses; Weekly Courses, 16
Slavic and Oriental Languages and Literatures, 146
Social Work, 147
Sociology, 52, 148
Southern Regional Training Program in Public Administration, 30
Spanish, 155
Spanish and Italian Languages and Literatures, 153
Special Education, 28
Specialist in Education, Requirements, 28
Statistics, 159
Subjects and Directors of Graduate Study, 32, 207

—T—
Telecommunications, 82
Theatre Arts, 163
Thesis, 25
Thomas Hunt Morgan School of Biological Sciences, 64
Time Limit for Degrees, 16
Toxicology, 255

—V—
Veterinary Science, 53
Vocational Education, 209

—Z—
Zoology, 71

Other Publications Available

University Catalogue

Agriculture Bulletin

Engineering Bulletin

Architecture Bulletin

Community College Bulletin

Dentistry Bulletin

Law Bulletin

Medical Bulletin

Pharmacy Bulletin

Library Science Bulletin

Chemical Brochure

Home Economics Brochure

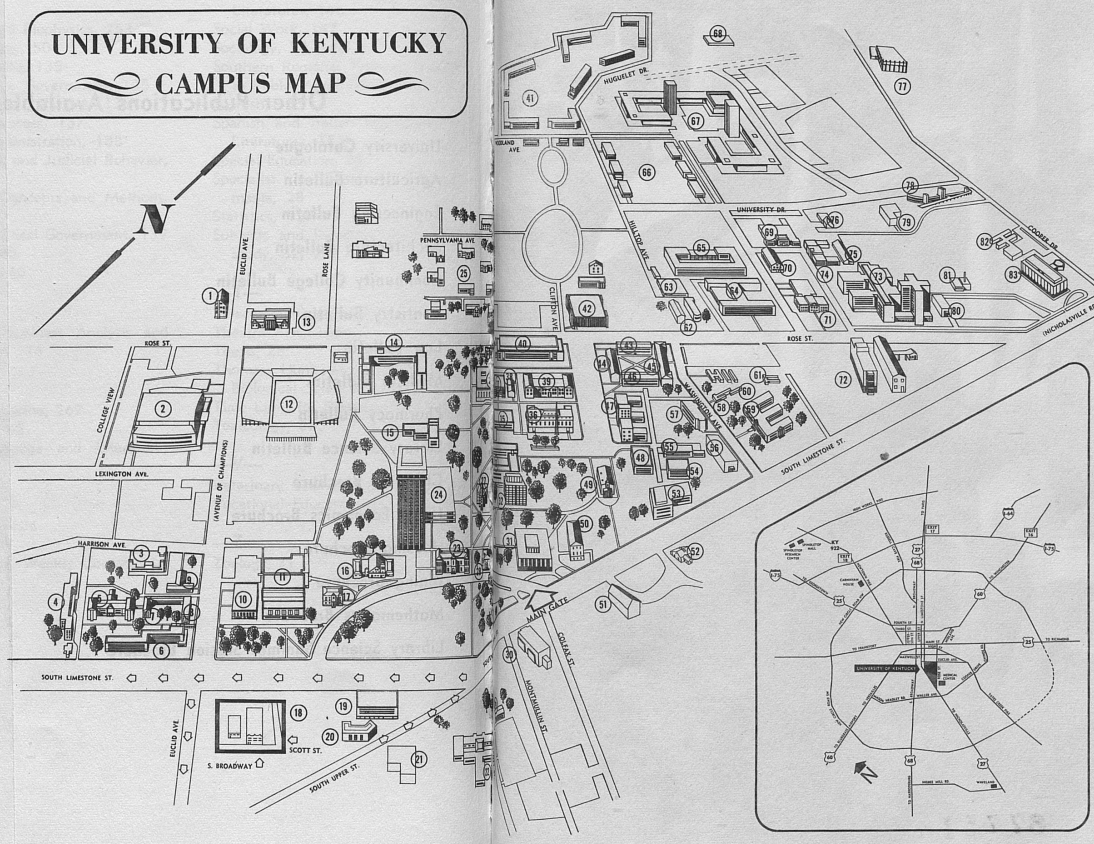
Housing Brochure

Dining Brochure

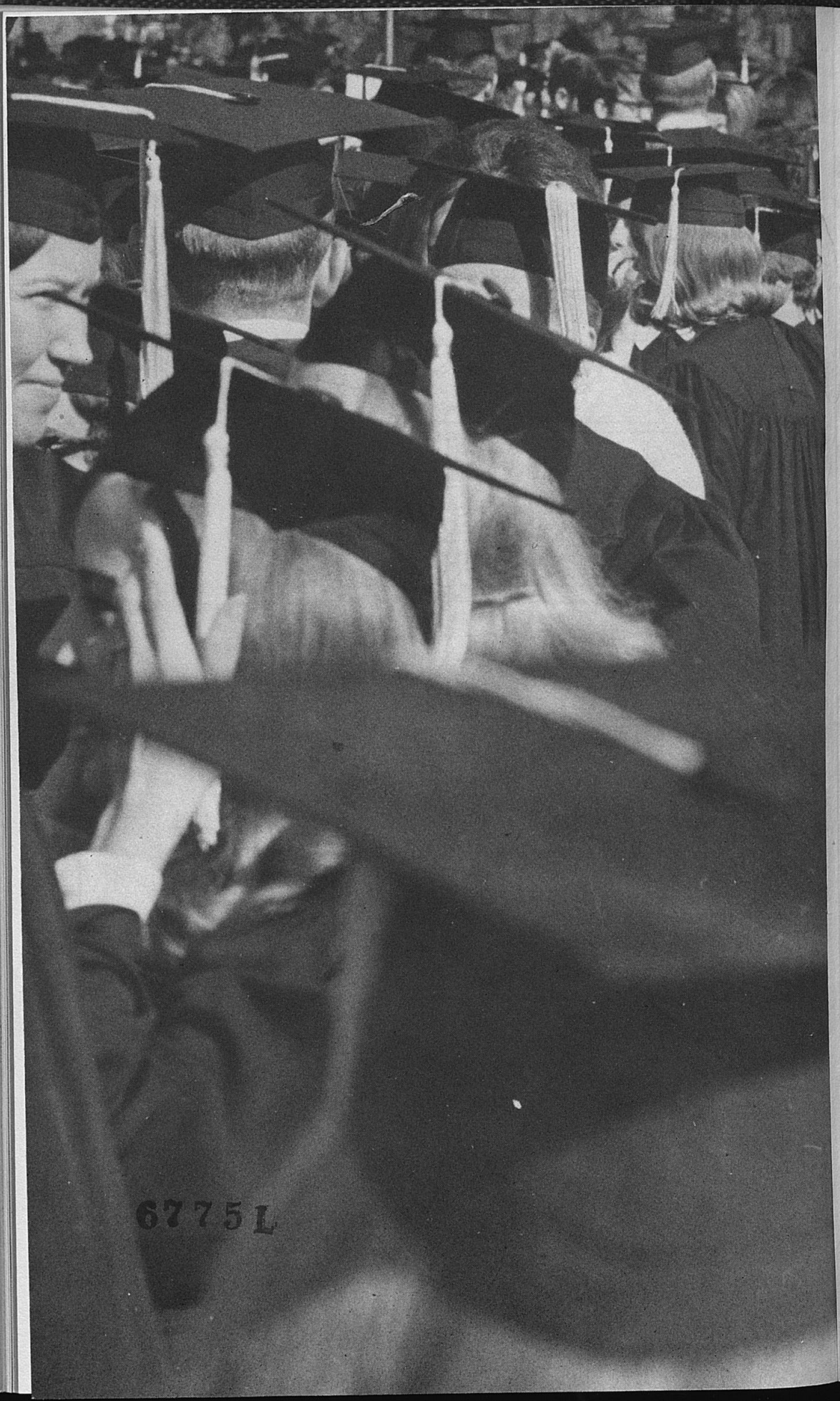
Mathematics Brochure

Library Science Summer Session Brochure

UNIVERSITY OF KENTUCKY
CAMPUS MAP



Administration Building—23
Administration Annex—28
Aeronautical Research Laboratory (Wenner-Gren)—62
Agricultural Engineering Building—69
Agricultural Science Center—83
Agriculture Building (Old Ag.)—50
Agronomy Greenhouse—60
Alumni Gym—10
Alumni House (Helen G. King)—13
Animal Pathology Building—74
Animal Pathology Hospital—75
Barker Hall (Buell Armory)—16
Biological Sciences Building (Funkhouser)—47
Blazer Hall—3
Bowman Hall—45
Boyd Hall—7
Bradley Hall—43
Breckinridge Hall—46
Central Heating Plant—19
Chemistry-Physics Building—40
Civil Engineering Research Laboratory—55
Coal Research Laboratory—20
Commerce Building—31
Community College Building—1
Cooling Plant - No. 1 Ed.—21
Cooling Plant - No. 2 Ag.—79
Cooperstown—41
Dairy Products Building—71
Donovan Hall—64
Dormitory Complex (Blanding and Kirwan Towers)—67
Education Buildings (Taylor and Dickey)—22
Educational Television Center—77
Engineering Building (Anderson)—32
Engineering Quadrangle—33
Erikson Hall (Home Economics)—48
Euclid Avenue Classroom Building—9
Experiment Station, Agricultural—59
Fine Arts Building, Guignol Theatre—14
Food Storage Building, K-Lair—63
Forestry Building—70
Fraternities—66
Frazee Hall—17
Geology Annex—38
Hoggin Hall—65
Highway Research Laboratory—30
Holmes Hall—6
Insectary and Conservatory—58
Jewell Hall—8
Journalism Building—35
Kastle Hall—39
Keeneland Hall—4
Kinkead Hall—44
Lafferty Hall—15
Law Building—53
Lexington Theological Seminary—51
Library (Margaret I. King)—26
Scott Street Building—(Post Office—Mailing Center)—29
McVey Hall—36
Meaty Laboratory—76
Medical Center (Albert B. Chandler)—73
Medical Center Annex (Formerly ——Center and Town House Motels)—72
Medical Center Heating Plant—81
Memorial Coliseum—2
Memorial Hall—49
Miller Hall—27
Mineral Industries Building—54
Mining Laboratory—34
Office—Classroom Building—24
Parking Structure No. 1—78
Parking Structure No. 2—42
Patterson Hall—5
Pence Hall—37
Pharmacy Building—57
Reynolds Building—18
Service Building—19
Small Animal Hospital—61
Sororities—25
Special Education Instructional Materials Center—52
Sports Center (Bernie A. Shively)—68
Stoll Field—12
Student Center—11
Tobacco Research Laboratory—82
University Research Facility No. 1—56
University Research Facility No. 2—80


6775L