

1970

1970-1971 Southern Illinois University Bulletin Carbondale Campus (Graduate School Catalog)

Southern Illinois University Carbondale

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Southern Illinois University

Bulletin

1970-1971 Graduate School Catalog/Carbondale



OBJECTIVES OF SOUTHERN ILLINOIS UNIVERSITY

TO EXALT BEAUTY

*In God,
in nature, and
in art;
Teaching how to love the best
but to keep the human touch;*

TO ADVANCE LEARNING

*In all lines of truth
wherever they may lead,
Showing how to think
rather than what to think,
Assisting the powers
of the mind
In their self-development;*

TO FORWARD IDEAS AND IDEALS

*In our democracy,
Inspiring respect for others
as for ourselves,
Ever promoting freedom
with responsibility;*

TO BECOME A CENTER OF ORDER AND LIGHT

*That knowledge may lead
to understanding
And understanding
to wisdom.*

Southern Illinois University

Bulletin

1971 Graduate School Catalog/Carbondale

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This Issue

of the *Southern Illinois University Bulletin* covers in detail questions concerning the Graduate School and applies to the Carbondale Campus. It supersedes Volume 11, Number 6.

THE FOLLOWING issues of the *Southern Illinois University Bulletin* may be obtained free from Central Publications, Southern Illinois University, Carbondale, Illinois 62901.

Graduate School Catalog (Carbondale or Edwardsville).

Guidelines for Prospective Students (Carbondale or Edwardsville)
Schedule of Classes. Please specify quarter (fall, winter, spring, or summer) and *campus* (Carbondale or Edwardsville).

Undergraduate Catalog. The catalog is available for examination in high school guidance offices and libraries throughout Illinois and in some other states. Copies will be furnished free to educational institutions upon request and to new students upon matriculation. The catalog may be purchased at the University Bookstore for \$1; mail orders should be sent to Central Publications and must include remittance payable to Southern Illinois University.

Vocational-Technical Institute Catalog.

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University Calendar

<i>SPRING, 1970</i>	Quarter Begins	Monday, March 30 *
	Memorial Day Holiday	Friday, May 29
	Final Examinations	Monday–Saturday, June 8–13
	Commencement (Carbondale)	Friday, June 12
	Commencement (Edwardsville)	Saturday, June 13
<i>SUMMER, 1970</i>	Quarter Begins	Monday, June 22 *
	Independence Day Holiday	Friday, July 3
	Final Examinations	Monday–Friday, August 31–September 4
	Commencement (Edwardsville)	Friday, September 4
	Commencement (Carbondale)	Saturday, September 5
<i>FALL, 1970</i>	New Students	Sunday–Tuesday, September 20–22
	Quarter Begins	Tuesday, September 22 *
	Thanksgiving Vacation	Tuesday, 10 P.M.– Monday, 8 A.M., November 24–30
	Final Examinations	Saturday–Friday, December 12–18
	<i>WINTER, 1971</i>	Quarter Begins
Final Examinations		Saturday–Friday, March 13–19
<i>SPRING, 1971</i>	Quarter Begins	Monday, March 29 *
	Memorial Day Holiday	Monday, May 31
	Final Examinations	Saturday–Friday, June 5–11
	Commencement (Edwardsville)	Friday, June 11
	Commencement (Carbondale)	Saturday, June 12

* Classes begin with the evening classes after 5:30 P.M. on the Carbondale Campus and with the evening classes after 4:30 P.M. on the Edwardsville Campus.

Board of Trustees and Officers of Administration

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1 / The Graduate School

The Role of the Graduate School

The primary concern of the Graduate School is the basic and applied research work carried on in all sectors of the University. The Graduate School therefore plays an essential role in the development of instructional and research programs, in the acquisition of funds, and in the procurement of facilities necessary to encourage and support the research of the members of its scholarly community. In addition, the Graduate School is a major contributor to the public services provided by the University to the region, the state, the nation, and a number of other countries. In all of its programs of instruction and research, the Graduate School sets a high standard of achievement. It is in those students who have demonstrated this quality of excellence by completing advanced courses of study and by achieving significant results in their research that the Graduate School makes its contribution to the public welfare.

Research

Research is the special concern of the Graduate School because its faculty must engage in scholarly research activities to maintain its effectiveness and also because advanced instruction of graduate students consists mainly of guidance in research. For these reasons, University policies governing research are developed by the Graduate School and administered through it.

The Office of Research and Projects has been established in the Graduate School to assist in the continuing development of the research activities of the University. University support for individual research projects is available to faculty members through the special research projects program administered by this office. The Office of Research and Projects also supervises cooperative research projects and particularly assists applicants in the preparation and submission of research proposals that involve outside support from such sources as government, foundations, business, and industry.

Morris Library

Morris Library contains over 1,000,000 volumes and subscribes to more than 10,000 periodicals. An average of 80,000 volumes is added to the collection each year.

Supplementing the resources of Morris Library is the Center for Research Libraries, Chicago, in which the University holds membership. A card file on the center's some 2,000,000 volumes is available for consultation.

The Morris Library has special strength in those fields where doctoral programs are offered. Its holdings in American and British literature and

history in the 19th and 20th centuries are especially noteworthy. They include the Fred J. Kern collection of some 5,000 volumes dealing largely with materials on controversial political and social issues during the past fifty years; the Philip D. Sang collection of American and British fiction; books and manuscripts on Walt Whitman and Henry David Thoreau from the Charles E. Feinberg Library; and a rapidly expanding collection of federal, state, British, and United Nations documents.

The library's collection on American and British law provides most of the basic works for legal reference and research. Morris Library also has files of major American newspapers and selected foreign papers, a collection of more than 100,000 maps, and an extensive file of curriculum material relating to school systems in the United States.

In various forms of microtext, the library now has or is purchasing

1. The text of some 30,000 books, pamphlets, broadsides published in America from 1639 to the end of 1800 (*Evans' American Bibliography*)

2. The text of early English imprints (1475–1700) (*Short Title Catalogues*) and about sixty English literary periodicals of the 17th through 19th centuries.

3. Some 5,600 English and American plays of the 16th through 18th centuries.

4. Files of ninety-one American periodicals of the 18th century and several hundred of the 19th century.

5. Papers of the American Presidents and the American consuls abroad.

6. British sessional papers of the 19th century; French Chamber of Deputies and German Reichstag and Bundestag debates that have been issued on film.

7. The presidential and personal papers of Ulysses S. Grant.

8. Educational research documents distributed by ERIC clearinghouse.

A major source for research in the behavioral sciences is the Human Relations Area Files, consisting of copies of about 1,500,000 documents, books, articles, field reports, and unpublished manuscripts covering 170 world cultures and taken from more than 3,000 sources.

The library's Irish Renaissance holdings include books, letters, and manuscripts of James Joyce, W. B. Yeats, Lady Augusta Gregory, A. P. H. (George Russell), Lennox Robinson, Sean O'Casey, Katharine Tynan, and other literary and political figures of the late 19th and early 20th centuries.

Morris Library recently acquired most of the prose manuscripts of Robert Graves and the family papers of Richard Aldington. Some 300 American and British writers, members of the expatriate group who lived and worked in Paris between the world wars, are represented in two notable collections of books and manuscripts—the Philip Kaplan and Caresse Crosby Collections, the latter containing the files of the Black Sun Press. Besides books and little magazines, there are numerous letters and manuscripts of such writers as Kay Boyle, Hart Crane, Floyd Dell, Ernest Hemingway, Lawrence Durrell, Ford Madox Ford, D. H. Lawrence, Henry Miller, Ezra Pound, and Dylan Thomas.

Beginning with the acquisition of the 7,000 volume library of I. Jose Mogrovejo Carrion of Ecuador in 1960, Morris Library has systematically expanded its holdings in Latin American history, government literature, and anthropology. Extensive files of Latin American serial publications from Argentina, Bolivia, Paraguay, Uruguay, Cuba, and Mexico provide a rich source for graduate study and research. Many

The publications in this collection are unavailable elsewhere in the United States.

In support of graduate studies in the sciences, the library has expanded its current subscriptions and back files of journals and has been acquiring the publications of learned societies and foreign academies, including the Royal Society of London, the academies of Paris, Berlin, Munich, Leipzig, Amsterdam, Gottingen, Rome, and St. Petersburg.

The extensive scientific journal collection of the Argonne National Laboratory and the Center for Research Libraries in Chicago are available to graduate students in person or on interlibrary loan. Arrangements have also been made for the library to secure technical reports from the U.S. Defense Documentation Center, the National Aeronautics and Space Administration, and the Atomic Energy Administration, as these are needed for research.

Other major resources of Morris Library include a collection of works by and about John Dewey; the R. Buckminster Fuller archives, comprising an extensive file of papers, correspondence, manuscripts, drawings, and models of the internationally known engineer and designer; the archives of philosopher-theologian Henry Nelson Wieman, including a number of unpublished works; the theater archives of Mordecai Gorelik, John Howard Lawson, and Katherine Dunham; and a growing body of documents relating to local and regional history—family and business papers, town and county records.

Data Processing and Computing Center

The Data Processing and Computing Center at Southern Illinois University provides service to faculty and students engaged in research. The center is located in the basement of the Wham Education Building and is equipped with an IBM 7044, one IBM 1620, and two IBM 1401 computers. A variety of sorting and tabulating equipment is also available. The center also has an MRC Docutran optical scanner for processing information directly from coded sheets.

Arrangements can be made for both faculty members and graduate students to avail themselves of the services and facilities of the center at no cost.

University Placement Services

The University Placement Services assists students seeking employment after completion of their education. Its facilities are free to students, who are urged to register or up-date their papers during the fall quarter of each academic year. All inquiries concerning this service should be made to the Director of the University Placement Services.

Housing

Single graduate students will generally find it desirable to locate private housing facilities. The Housing Information Center maintains current information on rooms, apartments, houses for rent or sale, and trailer parks and can assist in locating accommodations. All arrangements for housing and all business transactions in the matter of housing are the sole responsibility of the student and the owner of the housing facility.

Current information concerning housing facilities for off-campus married students is available in the Housing Information Center. Experience has shown that satisfactory arrangements cannot be made by mail. A personal visit is usually required. Prices vary widely, ranging from \$20 per month for trailer spaces to \$150 or more per month for houses and apartments.

University housing for married students includes 304 unfurnished two- and three-bedroom apartments, 272 furnished efficiency one- and two-bedroom apartments, and a 53-space trailer court.

The University is planning for a Graduate Residence Center which in the first phase will accommodate approximately 500 single graduate students. Because the demand for University housing for married students exceeds the supply, information should be requested early from Housing Business Services.

Health Services

The University maintains an infirmary which provides limited medical care for students, including 24-hour emergency service.

Financial Assistance

Fellowships, Preceptorships, and Assistantships

Graduate fellowships are available in all areas of graduate study upon application to the appropriate chairman, and are awarded by the Graduate School upon the basis of scholarship. Recipients are permitted to carry normal graduate schedules. The award is normally made for four consecutive quarters; for master's degree students the stipend is \$255 per month, or \$3,060 for the four quarters; for doctoral degree students the stipend is \$275 per month or \$3,300 for four consecutive quarters. There is a remission of tuition but not other fees. There is no service requirement. All application materials should be submitted to the student's major department chairman before February 1 preceding the academic year for which the fellowship is desired. Inquiries may be addressed to the major chairman or to the dean of the Graduate School.

Special doctoral assistantships are available for students who hold the master's degree or its equivalent, and who have been admitted to one of the doctoral programs. Application is made to the appropriate chairman and the awards are made by the Graduate School upon the basis of scholarship. The award is normally made for four consecutive quarters and carries a stipend of \$310 per month, or \$3,720 for four quarters. There is a remission of tuition but not other fees. There is a service requirement with the specific duties to be assigned by the chairman of the department. Application deadlines and procedures are the same as for graduate fellowships.

A number of preceptorships are offered by the University to students who are excellent teachers as well as superior scholars. These positions pay a stipend which ranges from \$300 to \$375 per month for the academic year, with the exact amount depending upon the assignment, experience, and academic achievement. Remission of tuition is granted, but fees must be paid. Service of 20 hours per week, or corresponding load in teaching is required. Preceptors must carry no more than 12 hours and no less than 6 hours of credit per quarter. Inquiries should be addressed to the a

propriate chairman before February 1 preceding the academic year for which the assignment is sought.

Teaching, research, and graduate assistantships are available in a number of departments and research agencies. These positions pay stipends which range from \$225 to \$350 per month, with the exact amount depending upon the assignment, experience, and academic experience of the student. Rules applying to tuition, fees, and workloads are the same as those for preceptorships.

National Defense Education Act Title IV fellowships are available to outstanding students in some departments offering doctoral work. Awards are for three years with stipends beginning at \$2,400 and rising to \$2,600 and then \$2,800 in successive years, plus a dependency allowance. Traineeships through the National Science Foundation are also available to outstanding students in some doctoral fields in the physical, biological, and social sciences. Stipends begin at \$2,400 and rise in successive years to \$2,600 and then \$2,800, with an additional dependency allowance in each case. Inquiry for each of these should be made to the chairman concerned, or directly to the dean of the Graduate School.

Student Work and Financial Assistance Office

The University maintains an Office of Student Work and Financial Assistance through which work on and off campus, cooperative work-study programs, summer employment, the federal work-study programs, and scholarships, awards, prizes, grants-in-aid, private agency awards, and student loan funds are negotiated.

Additional information may be obtained from the director of Student Work and Financial Assistance program.

Tuition and Fees

The tuition and fees charged students are established by the Board of Trustees and are subject to change whenever conditions make changes necessary. Effective fall quarter 1970, fees per quarter for graduate students are as follows:

	Not more than 5 hrs.	More than 5, less than 11	11 or more
Tuition Fee—Illinois Resident	\$22.00	\$45.00	\$67.00
Tuition Fee—Out of State	(80.00)	(160.00)	(240.00)
Student Welfare and Recreation			
Building Trust Fund Fee	5.00	10.00	15.00
Student Activity Fee	3.50	7.00	10.50
University Center Fee	5.00	5.00	5.00
Athletic Fund Fee	3.00	6.50	10.00
<i>Total</i> —Illinois Resident	41.50	79.50	115.50
<i>Total</i> —Out of State Resident	(96.50)	(188.50)	(280.50)

The student activity fee includes the fees for limited hospitalization, entertainment, partial athletics, the student newspaper and yearbook, and such other privileges as may be provided.

Teaching, research, graduate assistants, and graduate fellows do not pay tuition and have an option on paying the student activity fee. They pay other fees.

In addition to the above fees, a student is subject to certain other charges under the conditions listed below:

1. A matriculation fee of \$5, which is assessed a graduate student the first time he registers if he is not a graduate of Southern Illinois University.

2. A late registration fee, which is \$2 for the first day and which increases \$1 each day to a maximum of \$5 when a student registers after the regular registration period has ended.

3. A \$2 program-change charge whenever a student changes his program from the one for which he originally registered, unless the change is made for the convenience of the University.

4. A graduation fee of \$17; and, for doctoral candidates, a dissertation microfilming fee of \$30-\$47, depending upon the service selected.

5. Other charges which a student may incur are those for field trips, library fines, and excess breakage. A student taking a course involving use of materials, as distinct from equipment, will ordinarily pay for such materials.

Graduate Degrees Offered

Graduate degrees are available in the following fields:

Master of Arts

Anthropology	Geology	Psychology
Art	Government	Rehabilitation
Behavior	History	Administration
Modification	Inter-American	Rehabilitation
Biological Sciences	Studies	Counseling
Botany	Journalism	Sociology
Chemistry	Mathematics	Speech
Economics	Microbiology	Speech Pathology and
English	Philosophy	Audiology
English as a Foreign	Physical Sciences	Theater
Language	Physics	Zoology
Foreign Languages	Physiology	
Geography		

Master of Business Administration

Business Administration

Master of Fine Arts

Art

Master of Music

Music

Master of Music Education

Music

Master of Science

Agricultural	Behavior	Community
Industries	Modification	Development
Animal	Biological Sciences	Computer Science
Industries	Botany	Design
Applied Science	Chemistry	Economics

Engineering	Physical Sciences	Speech
Forestry	Physics	Speech Pathology and
Geography	Physiology	Audiology
Geology	Plant Industries	Technical and
Home Economics	Psychology	Industrial
Journalism	Rehabilitation	Education
Mathematical	Administration	Theater
Sciences	Counseling	Zoology
Microbiology	Sociology	

Master of Science in Education

College Student	Psychology	Secondary Education
Personnel	Health Education	Secretarial and
Educational	Higher Education	Business Education
Administration and	Home Economics	Special Education
Foundations	Instructional	Technical and
Elementary	Materials	Industrial
Education	Physical Education	Education
Guidance and	Recreation and	
Educational	Outdoor Education	

Doctor of Philosophy

Anthropology	Historical Studies	Psychology
Botany	Journalism	Sociology
Chemistry	Mathematical	Speech-Theater
Economics	Sciences	Speech Pathology and
Education	Microbiology	Audiology
English	Molecular Science	Zoology
Geography	Philosophy	
Government	Physiology	

Admission to the Graduate School

A student should obtain application forms from the Graduate School and submit application, together with transcripts and other supporting material, directly to the Graduate Admissions Office where it will be evaluated for compliance with Graduate School admission requirements. Only if these are met and if the student seeks a degree will the application be forwarded to the faculty in which the student indicates his desired major. The admission requirements of the Graduate School and the faculty must both be met before the student is admitted either conditionally or unconditionally, and both the Graduate School and the faculty may specify conditions. Several faculties require additional materials such as test scores or letters of recommendation. The student will be informed of his admission status after this process has been completed. Admission to the Graduate School is determined almost entirely by the calibre of the applicant's previous college work.

To permit sufficient time for application to be processed, these deadlines for receipt of applications and official transcripts have been set:

1. *The second Saturday in July for admission to the fall quarter*
2. *The last Saturday in October for the winter quarter*
3. *The last Saturday in January for the spring quarter*
4. *The last Saturday in March for the summer quarter*

Applications which are incomplete on the deadline date or are received later may be granted unclassified (non-degree) admission status for the quarter for which admission was originally sought. The application papers will continue to be processed for admission to a degree program only for the quarter following the one originally applied for. If the student decides to enter as an unclassified student, this will in no way influence the decision relative to his acceptance as a degree candidate. Whether work taken by a student who is unclassified because of late application will later count toward a degree will be decided by the Graduate School and the faculties concerned.

A student who wishes to enter the Graduate School immediately after graduation may submit his application when he is within one quarter or semester of graduation. He must submit a transcript showing the work he has completed, and when his final quarter or semester of undergraduate work is completed, a transcript of that work must also be submitted.

An undergraduate student who is within 16 quarter hours of a bachelor's degree may take courses for graduate credit by applying for admission to the Graduate School in the usual way. At the time of registration he must also obtain the approval of the graduate dean to take such courses for graduate credit. He remains as undergraduate student officially until he completes his baccalaureate requirements.

A student who is applying for an assistantship or fellowship and who submits a transcript in support of that application must also submit an application for admission and transcripts directly to the Graduate School for admission processing.

Admission to Graduate Study as an Unclassified Student

A student may apply for admission to the University as an unclassified student when he does not seek a graduate degree or certificate, when he has applied too late for the quarter for which he seeks admission, or when he wishes to qualify for admission to a degree program because his scholastic record does not qualify him for conditional admission. A student who seeks admission as an unclassified graduate student must present evidence that he holds a bachelor's degree.

Qualifying work has been established in order that students whose undergraduate grade point averages are below the minimum required for admission to a master's program (3.4 on an $A = 5.0$ scale) may prove themselves capable of better academic performance and thereby qualify for consideration for admission. Once a student has made formal application for admission to the Graduate School and has officially been informed that his grade point average is below the minimum requirement, he may then apply for admission as an unclassified graduate student to pursue qualifying work.

A student whose average is between 3.2 and 3.399 may qualify for consideration by earning a 4.0 or better in not less than 12 nor more than 24 quarter hours of 300- or 400-level courses and by passing the Graduate English requirement. If he earns a 4.0 in the first 12 quarter hours, that is all he is required to take. If he does not earn a 4.0 in the first 12 quarter hours, he may continue until he has a total of 24 quarter hours in an attempt to raise the grade point average to 4.0.

A student whose average is between 3.0 and 3.199 may qualify for consideration by earning a 4.0 or better in 24 quarter hours of 300- or 400-level courses and by passing the Graduate English requirement.

No applicant with an undergraduate grade point average below 3.40 may take more than 24 quarter hours in seeking to qualify for admission, and no more than one-half of the work should be taken in a single subject area.

Successful completion of this work does *not* assure the student of admission, but only of consideration by the department of his choice. It is solely the department's decision to accept the student into their master's degree program. Therefore, it is strongly suggested that the student seek the advice of the graduate adviser in the department before and while he is doing qualifying work.

Admission of International Students

A student from abroad is subject to all requirements for admission established by the Graduate School. In addition, he must complete special forms pertaining to the admission of international students. For these admission forms and for other information concerning international students, inquiries should be sent to the Director of Foreign Admissions, Registrar's Office, Southern Illinois University, Carbondale, Illinois 62901.

International students whose native tongue is not English will be required to demonstrate proficiency in the English language through the following procedures.

1. A minimum score of 450 on the Test of English as a Foreign Language (TOEFL) will be required for consideration for admission. Information on this test and on the dates and places of testing may be obtained from the Educational Testing Service, Box 899, Princeton, New Jersey.
2. Students with a TOEFL score of 550 or more will be admitted unconditionally to the Graduate School, if other academic requirements have been met.
3. Students with a TOEFL score between 450 and 549 will be admitted to the Graduate School conditionally, pending the results of the following tests which will be taken upon the students' arrival at Southern Illinois University.
 - a. The Michigan Proficiency Test, administered by the Southern Illinois University Counseling and Testing Center.
 - b. An essay examination administered and graded by the Southern Illinois University Center for English as a Second Language (CESL).
 - c. When the results of these examinations deem it necessary, an oral examination administered by CESL.
4. Students who fail the locally-administered examinations will be required to take and pass intensive English proficiency work at CESL or its equivalent at some other institution before they will be admitted unconditionally to degree programs at the University or be allowed to take academic work counting towards a degree.

To allow ample time for visa and other departure procedures, the applicant should have his application and all supporting documents on file with the University no less than four months prior to his proposed entry date.

An international student must be enrolled in a program leading to a graduate degree. He cannot be admitted as an unclassified student.

If the above requirements are satisfactorily met and the student is ad-

mitted to a degree program, he will be required to certify to the University that he has adequate financial resources available to him to undertake and continue in a program of study.

Master's Degree Programs

Admission

In order to receive unconditional admission from the Graduate School for study at the master's level, the applicant must hold a bachelor's degree and have a grade point average of 3.70 or higher ($A=5.00$).

A student with a grade point average of 3.40, but less than 3.70, may be granted conditional admission and will remain on conditional status until he earns 24 quarter hours of credit in graduate-level courses. At that time his academic record will be checked according to the retention policy stated below, to see whether his conditional status can be changed to unconditional.

The conditionally admitted student must satisfy the Graduate English requirement before completing more than 24 quarter hours. A department, faculty, or other degree-program unit may add its own conditions for admission regardless of the grade point average.

A student with an undergraduate grade point average below 3.40 may be admitted only as an unclassified student.

Retention

Whenever a student's graduate grade point average falls below 4.0 his standing is in jeopardy. When a student has accumulated 24 quarter hours of work after admission to a degree program, and has eight or more quarter hours of C or below in 400 or 500 level courses, not balanced by A in 400- or 500-level courses, he will be dropped from the Graduate School and will not again be admissible to a degree program.

General Requirements

Forty-eight hours of acceptable graduate credit are required for a master's degree, except in the Carbondale programs in fine arts, where 60 hours are necessary, and in behavior modification, psychology, rehabilitation counseling, and college student personnel work, where 72 hours are required. At least 24 hours must be earned in courses numbered 500 or above. No more than 16 hours earned for work done at another university, or in extension, or both together, may be counted toward the degree. An evaluation of transfer credit is made in every case and may result in a reduction of the credit offered. Only in unusual circumstances will transfer credit be given for work bearing a grade below B. No credit toward the degree may be earned by correspondence.

Only credit earned within a six-year period preceding the completion requirements for the degree, whether at Southern Illinois University or elsewhere, will be counted toward the degree.

Ordinarily a graduate student is expected to select both a major and minor field, but he may be permitted by his advisory committee and the dean of the Graduate School to concentrate his efforts in one particular area of study. The graduate major, in most fields, consists of a minimum of 30 hours of credit in the chosen area of study; some fields, however, require as many as 40 hours for the major, in which case no minor is

quired. The graduate minor consists of a minimum of 15 hours. A student may have a double major recorded upon completing the necessary number (60 hours) of designated courses.

Each candidate for a master's degree shall write a thesis except where a graduate program has been approved by the Graduate Council to provide for some other arrangement. The thesis may be counted for not more than 9 nor less than 5 quarter hours of credit. The subject of the thesis is to be reported to the Graduate School by the student and is to be approved by the chairman of the advisory committee and the dean of the Graduate School at least two quarters before the date of graduation. Two copies of the approved thesis (the original and first carbon) must be presented to the Graduate School at least three weeks prior to the date of graduation, to be bound and shelved in the library. For nonthesis programs, a research paper should show evidence of the student's knowledge of research techniques and should be based on a special project or specific courses as may be recommended by the advisory committee.

Each candidate for a master's degree is required to pass a comprehensive examination covering all of his graduate work, including the thesis. This examination may be written or oral, or both, as determined by the student's advisory committee.

A reading knowledge of a foreign language is required in all cases for the Master of Arts degree. This knowledge will be tested in the Educational Testing Service's Graduate Foreign Languages Examinations, administered by the University Counseling and Testing Center once each quarter. There is a \$10.00 fee, and the admission ticket must be obtained at the Graduate School Office four weeks in advance of the examinations, which are normally administered in October, February, May, and July. The ETS examinations are available only in French, German, Russian, and Spanish; students wishing to present any other language must receive written permission from the dean of the Graduate School.

Students having an undergraduate grade point average below 3.70, must satisfy the graduate English requirement by passing the Graduate English examination. The examination is administered by the Counseling and Testing Center once each quarter. The graduate English requirement must be satisfied before the student has completed 24 quarter hours.

Candidates are expected to meet requirements in force during the year of graduation, but due consideration will be given the fact that a student may have been admitted and may have planned his work when other requirements were current. Important changes in requirements are put into effect gradually. It is especially important that the following data should be kept up to date on the student's record in the Graduate School Office: the major and minor, the degree for which the student is a candidate, the name of the chairman of the advisory committee, and the thesis adviser.

The following deadlines are stated for the guidance of the candidate for the master's degree:

1. The graduate English examination is to be taken during the first quarter in which the candidate is enrolled in a course given for residence credit.
2. Any foreign language requirement is to be met at least three months prior to graduation.
3. The thesis subject is to be approved by the chairman of the advisory committee at least twenty weeks before the date of graduation and is then to be reported by the student to the Graduate School.

4. The completed thesis should be presented to the dean of the Graduate School at least three weeks before graduation.

5. The preliminary checkup for graduation is to be made with the Graduate School at least five weeks prior to the graduation date. Application forms, which may be secured from the Registrar's Office, should be completed and returned to that office after payment of the graduation fee at the Bursar's Office.

Sixth-Year Specialist's Certificate Program

The Sixth-Year Specialist's Certificate program is for a qualified student with a master's degree or its equivalent who wishes to pursue a planned sixth-year program leading to specialization in an educational field. Certain sixth-year courses of study developed and offered in professional education areas have been approved by the Graduate Council with the following minimum requirements.

Students seeking admission to the Sixth-Year Specialist's Certificate program will follow the same procedures that apply to admission to other graduate programs. Admission requires a grade point average of 4.25 for graduate work. Departments or divisions may establish a higher scholastic requirement for admission and may use whatever selective criteria are appropriate to the field of specialization. The student's previous work shall have provided a proper base of general and special preparation for the sixth-year studies; if this is lacking, additional work must be taken to establish the base. Two years of experience relevant to the specialization field are required.

An advisory committee of three members for each candidate shall be appointed by the dean of the Graduate School upon the recommendation of the chairman or head of the respective department.

A minimum of 45 quarter hours of work beyond the master's degree or its equivalent is required. This work must be planned early by the student and his advisory committee, must clearly move the student toward the specialization he seeks, and must conform to a Sixth-Year Specialist's Certificate program approved by the Graduate Council. A minimum grade point average of 4.25 for all work in the Sixth-Year Specialist's Certificate program is required. A maximum of 20 hours at the 400 level may be taken, of which not more than 12 may be in the College of Education. A combined maximum of 9 quarter hours of graduate credit earned in extension and in other graduate schools may be counted. All such work must be approved by the student's advisory committee and must carry a grade of *B* or better. No credit earned through correspondence or used in attaining another degree or certificate may be counted.

No credit earned while the student was on unclassified status will count except credit earned while the application for admission was being processed, and then only with the recommendation of the advisory committee. All credit must have been earned within seven years prior to the completion of the program.

Full-time, full-load residence of one quarter (or two summer sessions of at least eight weeks each) is required. Students who are employed full time may not carry more than one course per quarter.

With the prior approval of the student's advisory committee, credit toward the Sixth-Year Specialist's Certificate program may be earned at both campuses of the University in programs approved on both campuses by the Graduate Council.

Doctor of Philosophy Degree Programs

Admission

Admission to a Ph.D. program in the Graduate School requires a master's degree or its equivalent, a grade point average in graduate work of 4.25 or above, and acceptance by the academic unit offering the Ph.D. program. The dean of the Graduate School informs each student of any conditions or admission imposed by the Graduate School or by the academic unit.

For the Ph.D. program in education admission is to a functional area, after which a program is designed for a specialty within that functional area. Students seeking admission to a doctoral program in education must contact the coordinator of one of the three functional areas: Administration and Social and Philosophical Foundations, Curriculum and Instruction, or Educational Psychology.

General Requirements

The Ph.D. degree is awarded for high accomplishment in a particular discipline or a recognized interdisciplinary area, as measured by the student's ability to pass the preliminary examination for admission to candidacy, meet the research tool requirement of the program, perform a piece of original research, present the results in proper form in a dissertation, and defend the dissertation before a faculty committee.

Preliminary Examination

The student will generally prepare himself for this examination through independent study and course work, as advised by the faculty of his Ph.D. program. The examination is given to determine the breadth and depth of the student's knowledge within his discipline. The particular form and content of the examination are determined by the faculty of each of the doctoral programs. Usually the student will be permitted to take the examination after he has completed two years of study beyond the baccalaureate and has successfully completed his research tool requirement.

Research Tool Requirement

The Ph.D. at Southern Illinois University is a research-oriented degree. The research tool requirement, as one means of ascertaining that a Ph.D. candidate has the necessary skills for doing research in a given discipline, is intended to be an integral part of the student's program. Since research materials, problems, and techniques vary from discipline to discipline, the particularities of the research tool requirement are determined by the faculty of each of the doctoral programs.

Admission to Candidacy

Each student accepted for study into a doctoral program is admitted on a provisional basis and remains so until he has been admitted to candidacy for the degree. Admission to candidacy is granted by the dean of the Graduate School, upon recommendation of the faculty responsible for the student's program, after the student has passed his preliminary examination and met the research tool requirement of the program. The Ph.D. degree may not be conferred less than six months, nor more than five years, after admission to candidacy, except upon approval of the dean of the Graduate School. If completion of requirements is delayed beyond

five years, a student may be required to take another preliminary examination and be admitted to candidacy a second time.

Dissertation

After being admitted to candidacy, the student must complete a dissertation showing that he is capable of independent research or other creative effort. The dissertation shall be supervised by a faculty committee which has been approved by the dean of the Graduate School. This committee shall consist of five faculty members, one of whom shall be from a discipline outside the student's major field of study. The topic of the dissertation must be approved by the chairman of the committee, the director of graduate studies of the Ph.D. program, and the dean of the Graduate School.

While the student is working on his dissertation he must register for the course numbered 600. The student is encouraged to devote at least one academic year of full-time work to complete the dissertation; normally he will register for 36 quarter hours of dissertation credit, that is, 12 hours for each of three terms. If he requires less time, his registration will be reduced accordingly, when approved by the dean of the Graduate School. If a student does not complete his dissertation after he has taken 36 quarter hours of dissertation credit, he must register for a minimum of three quarter hours for each of the three terms of the academic year until he completes his degree, and he must register whether he is in residence or off the campus. *Only the dean of the Graduate School is authorized to waive this rule.*

The student must submit two copies of the dissertation acceptable to the Graduate School, along with an abstract of 600 words or less. All dissertations will be microfilmed. There is a fee of \$25.00 to cover the cost of publication of the abstract and microfilming of the dissertation. If copyright is desired, an additional fee of \$15.00 will be required. The cost of reprints of abstracts must be billed directly to the student by University Microfilms, Ann Arbor, Michigan.

Final Examination

There will be a final examination administered by the student's doctoral dissertation committee. It will be oral and will cover the subject of the dissertation and other matters related to the discipline.

Residency

In order to earn the Ph.D. one must be a full-time student on campus for a minimum of three consecutive quarters. During this period the student must pursue a full-time academic program, which may include service as a half-time teaching or research assistant. The intent is that the student should actually be on the campus for an extended period of time so that the faculty can become well-acquainted with him. The faculty will therefore be in a better position to make recommendations concerning his degree program and the conferring of his degree, as well as recommendations pertaining to his future career.

Interdisciplinary Doctoral Programs

These guidelines provide for interdisciplinary doctoral programs for a limited number of students whose educational requirements can be met by existing resources but not by any one of the University's constituent units.

interdisciplinary programs will be instituted in response to the particular academic interest of individual students, not as programs of a permanent nature. The procedures and criteria given below govern the authorization and control of interdisciplinary doctoral programs.

1. After completion of one year of full-time academic study in an established graduate program and upon the recommendation of the chairman or adviser of that program, a student may apply for an interdisciplinary program to the dean of the Graduate School.
2. The dean of the Graduate School will apply the following criteria in deciding whether a program committee should be established to consider the proposed interdisciplinary program.
 - a. The requisite staff must be available.
 - b. The library holdings must be adequate without unreasonable additions.
 - c. The program must lie within recognized disciplines or fields of study, at least one of which offers the doctoral program.
3. If the dean of the Graduate School is satisfied that the proposed program satisfies these criteria, he shall form a special program committee of five members, three of whom shall be from units offering the doctorate.
4. If the committee approves the proposed program, a plan of study shall be developed that includes the following elements:
 - a. Fields or areas of study
 - b. Required courses
 - c. Languages or other research tool requirements
 - d. Dissertation subject
5. The program as approved by the committee shall be submitted to the dean of the Graduate School. Upon his final approval, the student's program shall have the same binding effect upon the Graduate School as programs printed in the Graduate School Catalog.
6. When the committee has certified all the required performances, including the results of examinations, the committee shall be dissolved.

Advisement

Each student admitted to the Graduate School is expected to consult a graduate adviser in the department or faculty of his major for assistance in planning his total program and in choosing courses each quarter. As soon as the student gains approval for a thesis topic and a thesis director, the latter is designated as chairman of the advisory committee. This committee advises the student in the preparation of the thesis or dissertation, evaluates its quality when completed, and supervises the final examination, written or oral, when one is required.

Maximum course work for graduate students is 16 hours each quarter; 12 hours is considered a normal load. The maximum load for teaching, research, and graduate assistants who are employed half-time is 12 hours and the minimum is 6 hours; for assistants who are employed more than half-time the maximum is 8 hours. For persons attending the 8 weeks summer session, the maximum is 12 hours. These maxima may be exceeded only with the written permission of the dean of the Graduate School.

A graduate student is expected to plan his work carefully. Program changes after registration must be approved by the student's adviser and the dean of the Graduate School. They may involve payment of a pro-

gram-change fee. Program change forms may be obtained from the Graduate Office.

The graduate student must assume responsibility for his progress by keeping an up-to-date record of the courses he has taken and by consulting periodically with his adviser. Responsibility for errors in program or interpretation of regulations of the Graduate School and the University rests entirely upon the student. Advice is always available on request.

Since graduate work is carried on at both the Carbondale and Edwardsville Campuses, it is the student's responsibility to see that his records at the Graduate School, Registrar's Office, and with his major adviser are brought together on the campus where he wishes to graduate, well in advance of the time of graduation. Student records cannot be processed at the student approved for graduation unless these records are available at the campus where graduation is to occur at least *six weeks in advance of the time of graduation*.

Graduate Advisers

Following is the list of advisers to graduate students pursuing a master's degree.

- | | |
|---|--|
| Accounting—Floyd Patrick | Higher Education—Donald Tolle |
| Agricultural Industries—William Herr | History—Henry S. Vyverberg |
| Animal Industries—G. B. Marion | Home and Family—Betty Jane Johnston |
| Anthropology—Charles Lange | Home Economics Education—Dorothy Keenan |
| Applied Science—Thomas B. Jefferson | Instructional Materials—Paul Wendt |
| Art—Tom Walsh | Inter-American Studies—Albert Bork |
| Art Education—Roy Abrahamson | Journalism—Bryce W. Rucker |
| Behavior Modification—Guy Renzaglia | Linguistics—Charles Parish |
| Biological Sciences—Edwin Galbreath | Management—Floyd Patrick |
| Botany—William D. Gray | Marketing—Floyd Patrick |
| Business Administration—Floyd Patrick | Mathematics—Charles Maxwell |
| Chemistry—C. D. Schmulbach | Microbiology—Hassan Rouhandeh |
| Clothing and Textiles—Rose Padgett | Molecular Science—John Zimmerman |
| College Student Personnel—Jack Graham | Music—Roderick Gordon |
| Community Development—Paul Denise | Philosophy—Lewis E. Hahn |
| Computer Science—A. M. Mark | Physical Education (Men)—Edward J. Shea |
| Design—Patrick Ogle | Physical Education (Women)—Anne Thorpe |
| Economics—George Hand | Physical Sciences—(Chairmen of the Faculties Involved) |
| Educational Administration and Foundations—Ed Sasse | Physics—John Zimmerman |
| Elementary Education—Luther Bradford | Physiology—Harold M. Kaplan |
| Engineering—Thomas B. Jefferson | Plant Industries—John K. Leasure |
| English—Robert Griffin | Psychology—Vincent Harren |
| English as a Foreign Language—Charles Parish | Recreation and Outdoor Education—Loren Taylor |
| Finance—Floyd Patrick | Rehabilitation Administration—Guy Renzaglia |
| Food and Nutrition—Krank Konishi | Rehabilitation Counseling—Guy Renzaglia |
| Foreign Languages—Hellmut Hartwig | Secondary Education—R. J. Fligoff |
| Forestry—John Andresen | Secretarial and Business Education—Harves Rahe |
| Geography—Theodore Schmulde | Social Studies—Howard Allen |
| Geology—William C. Hood | Sociology—Herman Lantz |
| Government—Horace Jacobini | Special Education—Elizabeth McLean |
| Guidance and Educational Psychology—John Cody | |
| Health Education—C. E. Richardson | |

Speech—Earl E. Bradley
 Speech Pathology and Audiology—I.
 P. Brackett

Technical and Industrial Education—
 Ronald W. Stadt
 Theater—Archibald McLeod
 Zoology—Harvey I. Fisher

Grading System

grades are recorded by the letters *A*, *B*, *C*, *D*, and *E* ($A = 5.00$). *A* is for outstanding work, *B* for good or average performance, *C* for conditional or not fully satisfactory work, *D* for unsatisfactory work, and *E* for failure.

Other grades may be:

W—Authorized withdrawal made through a program change where no basis for evaluation has been established. Work may not be completed. This grade is not included in grade point computation for retention purposes.

WP—Authorized withdrawal made after first four weeks through a program change with a passing grade. Work may not be completed.

WE—Authorized withdrawal made through a program change after the first four weeks with failing grade. Work may not be completed, but grade is included in calculation of average.

Inc.—Incomplete. Has permission of instructor to be completed within a time period designated by instructor, but not to exceed one year from the close of quarter in which course was taken. If Inc. remains, it is not included in grade point computation. To complete the work, a student should not register for the course again but should complete the work from the original registration.

Def.—Deferred. Used only for graduate courses of an individual, continuing nature such as thesis or research. When the work is completed, grade is changed to a letter grade.

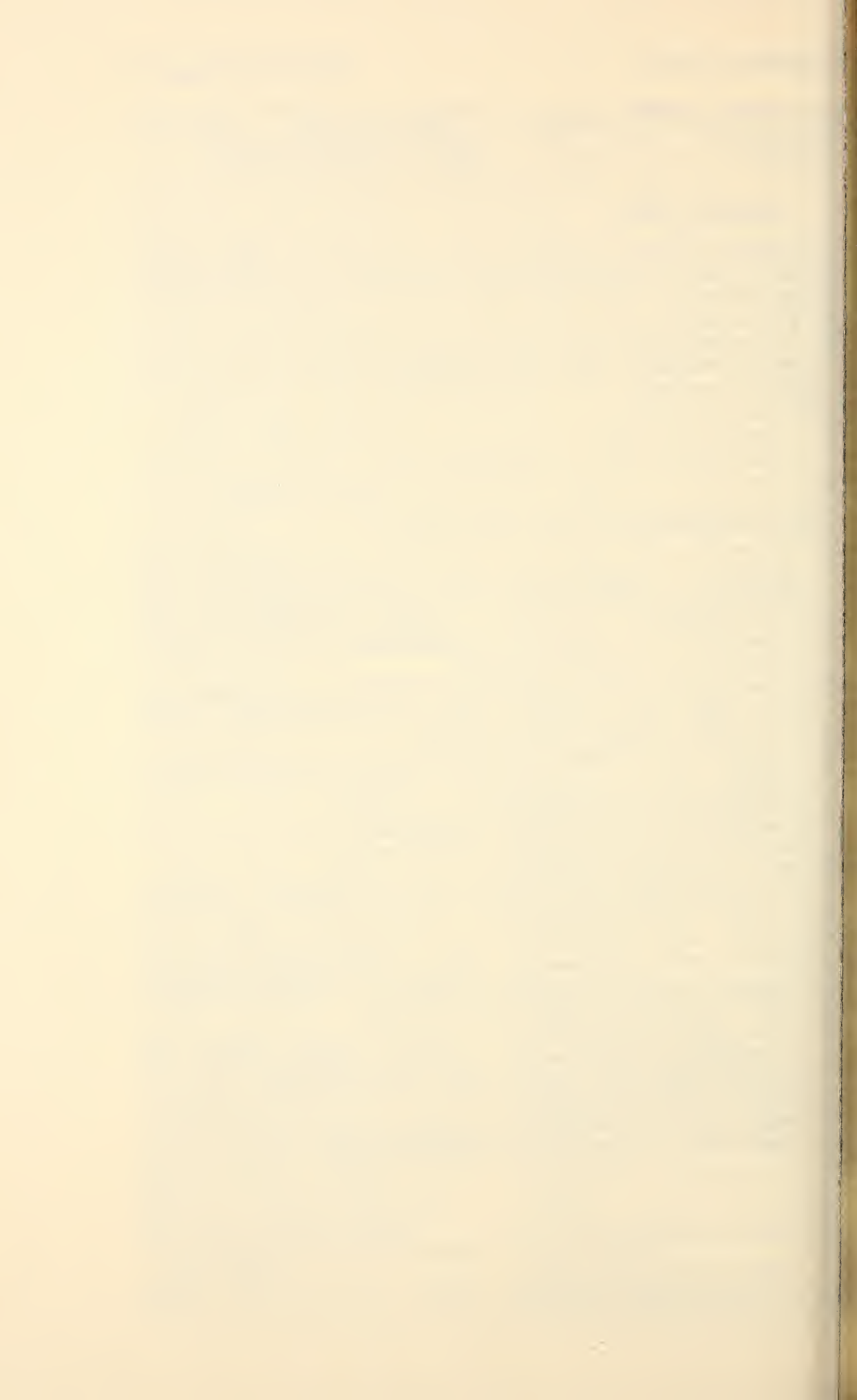
ABS—Unauthorized withdrawal. Used when student fails to continue in attendance, but does not withdraw through a program change. Counted as an *E* in calculating grade point average.

S—Satisfactory. Used only for noncredit courses.

U—Unsatisfactory. Used only for noncredit courses.

Au—Audit. A student registering for a course on an “audit” basis receives no letter grade and no credit hours. An auditor’s registration card must be marked accordingly and he pays the same fees as though he were registering for credit. A student registering for a course for audit may change to a credit status or vice versa through the official program change method during the first four weeks of a quarter. Thereafter the change may not be made.

Note: Letter grades *A*, *B*, *C*, *D*, and *E* as well as the grades **WE** and **ABS** are included in grade point averages for academic retention. Authorized withdrawals made through a program change during the first four weeks of the quarter do not carry a grade. After four weeks it is at the discretion of the instructor whether or not a letter grade will be given for an authorized withdrawal.



2 / Instructional Units

Agricultural Industries

The Department of Agricultural Industries offers graduate work leading to the Master of Science degree in agricultural economics, agricultural education, and agricultural services. Students interested in the Doctor of Philosophy degree in agricultural economics should consult with the Department of Economics. Students interested in the Specialist Certificate in agricultural education should consult with the Department of Secondary Education.

The three programs in the Department of Agricultural Industries leading to the Master of Science degree require at least 48 hours of graduate courses, including a thesis or research paper. Students normally take 12 hours of credit per quarter making it possible to complete the M.S. degree in one year. A committee composed of at least three professors guides the candidate in his course work and research. All candidates must satisfactorily pass an oral examination.

The M.S. degree in agricultural economics requires 20 hours of courses in agricultural economics and economics, 8 hours of statistics or advanced accounting, a thesis, and other courses normally selected in the School of Business. The program is designed for the professional agricultural economist and for those desiring to continue their education by obtaining a Ph.D.

The M.S. in agricultural education requires 26 hours of courses in agriculture and education, 8 hours of statistics, a research paper or thesis, and other courses. The program is designed for preparing teachers for secondary schools, junior colleges, and for those desiring to continue their education by obtaining a Ph.D.

The M.S. in agricultural services requires 18 hours of courses in agriculture, a research paper, and other courses. The program is designed to permit students who are working in agriculture in such areas as extension work and soil conservation employees, to expand their educational experiences in light of prospective employment goals and opportunities.

Application forms for admission into any of these programs may be obtained from the Graduate School. Inquiries for financial assistance should be addressed to the chairman of the department. Approval for graduate study in the department, with any necessary qualifications, is made after review of the student's transcript and other supportive data. Additional information may be obtained from the Department of Agricultural Industries, Southern Illinois University, Carbondale, Illinois 62901.

Animal Industries

The Department of Animal Industries offers programs of study leading to the Master of Science degree. Programs may be designed to meet the desires of candidates in the various disciplines of animal behavior, breed-

ing, nutrition, and physiology. A minimum of 24 hours in animal industry courses, including a thesis is required. Research leading to a thesis can be conducted with any of the following species: beef, dairy, horses, poultry, sheep, or swine. The candidate will select supporting courses in related departments such as Applied Science, Chemistry, Mathematics, Microbiology, Physiology, and Zoology. Students selecting supporting courses in the basic sciences might do so with an interest in continuing work towards the Ph.D. degree.

Students who wish to emphasize the study of animal production in a program leading to the master of science degree might select a majority of their supporting courses from the Departments of Agricultural Industries or Plant Industries.

Students interested in animal science at the doctoral level can be admitted to a program of study leading to the Ph.D. degree in physiology. The program which is administered by the graduate school through the Department of Physiology is adequately flexible to allow candidates to emphasize such areas as behavioral science, endocrinology, meat science, metabolism, microbiology, physiological genetics, or reproductive physiology.

Minimum requirements have been established for students entering the Ph.D. program. These include undergraduate training in biology, inorganic and organic chemistry, and one year of both mathematics and physics. Deficiencies in these areas must be resolved prior to entry into the program.

Information concerning admission policies, requisites for graduation, and availability of financial assistance for graduate study in any specific program can be obtained from the Department of Animal Industries, Southern Illinois University, Carbondale, Illinois 62901.

Anthropology

General Requirements

Acceptance for graduate study in anthropology and subsequent continuation in the graduate program are at the discretion of the Department of Anthropology.

Application forms for admission to the Graduate School may be obtained from the Graduate School. When submitting the completed application to the Graduate School, the student must send official transcripts of undergraduate and graduate work; three letters of recommendation and a personal statement of aims and interests addressed to the chairman of the department must also be submitted.

The Graduate Record Examination (Aptitude section and advanced test in anthropology) must be taken by all students. If they are known, the scores should be reported with the application. If a student has done so previously, he must take the Graduate Record Examination at the first opportunity after his entry into the department.

No special program of previous work is required, and applicants with academic degrees in fields other than anthropology are accepted. However, in consultation with the Department, a plan for remedying undergraduate deficiencies in anthropology will be arranged.

The department does not require that every student take a master's degree on his way to the doctorate. Whether he does or not is a matter for decision by the student and the department. (For those who do not have the Master of Arts degree in anthropology, formal admission to

the doctoral program is dependent on the degree of success of the student in the general examination.)

The program of study for each student will be worked out by the student and his advisers. The normal course of study leads a student to present himself for the general examination after two years of full-time course work. Students with M.A.'s in anthropology are required to take the general examination at the end of the first year of residence. All others are required to take this examination at the end of the second year. Any student may petition for examination before the deadline. For those prepared to take the general examination at the earliest opportunity (Fall, or Spring Quarter), the prior passing of the first foreign language examination will be suspended. Candidates for the Doctor of Philosophy degree should plan an additional year of full-time study before presenting themselves for the special examination.

A student's overall progress in his studies is reviewed at the end of each year, or as may be necessary, in order to see that the requirements of the department are being met and that the student's best interests are being served.

Departmental Requirements

Normally, all graduate students in anthropology working for a higher degree must:

1. Complete the course-hour requirements as established by the Graduate School: completion with a passing grade (*B* average) of a minimum of 48 hours of course work plus the thesis for the master's degree and a minimum of 96 hours plus the dissertation for the doctorate.
2. Complete the equivalent of one or two academic years (3 or 6 quarters) of course work with not less than a *B* average before presenting themselves for their general examination. As noted above, previous graduate or professional work in anthropology may lead to the three-quarter qualification to take the general examination. The normal course load per quarter is 4 courses or approximately 12 hours. With assistantships this load will be reduced.
3. Pass one foreign language examination before presenting themselves for their general examination, except for those taking the general examination at the first opportunity. Students are urged to investigate ETS foreign language examinations which may be taken prior to arrival at SU, or at least be prepared to take this test in the first quarter of residence. The regulations concerned with foreign language requirements are outlined in this catalog; they may be discussed with the chairman of the department. The student is urged to acquire this language competence at the earliest opportunity so that he is equipped with a useful tool while pursuing his graduate studies.
4. Complete the following required course: Anthropology 415.
5. Pass with not less than a *B* average the general examination (below) given in the fall and spring quarters. At the option of the department an oral examination may be required following the written examination.
6. Satisfy all general University and Graduate School requirements as outlined in this catalog.

The General Examination

The coverage expected of the student presenting himself for the general examination is stated in syllabi on the topics listed below. The

length of the written examination is three hours for each part. Student may elect four of the six parts, satisfying the other two by an A or grade in a graduate seminar in each of the parts omitted.

1. Physical Anthropology
2. Archaeology
3. Linguistics
4. Social Anthropology
5. History of Anthropological Thought
6. Ethnology

The Special Examination

The field of study for the special examination is directed towards particular and concentrated study of a particular geographical area or either two major topics or one major topic and a special topic. The field of study is determined after consultation with the department; study is currently invited or encouraged in the following topics and areas (modifications will be considered as changes in faculty personnel and competencies warrant).

<i>Areas</i>	<i>Major Topics</i>
North America:	Archaeology
Greater Southwest	Ethnology
Eastern U.S. (East of Rockies)	Linguistics
Arctic and sub-Arctic	Social Anthropology
Middle America:	<i>Special Topics</i>
Meso-America	Applied Anthropology
Caribbean and Circum-Caribbean	Art
South America:	Ecology
Andean	Ethnohistory
Tropics	Folklore
Pacific	
Asia:	
S.E. Asia	
Africa:	
West Africa	
Europe:	
Western Europe	
Mediterranean Basin	

The nature of the special field of study, its scope and limits, are determined in consultation with the department and delimited at the student's colloquium.

The normal expectancy is that the student's dissertation topic will be derived from his special field of concentration; however, in consultation with the department, exceptions may be made.

Master's Degree

Students who wish to take a master's degree will be advanced to candidacy, if they have met the requirements under departmental requirements (above). Completion of the degree requires the presentation of a satisfactory thesis. A principal adviser on the topic chosen for the thesis will be appointed by the department. A student may petition for substitution of a significant publication for the thesis.

Doctor of Philosophy Degree

Students who wish to take a Doctor of Philosophy degree and who have met the departmental requirements (above) will consult the department in order to select a special field of study.

This selection will be made in consultation with a special field adviser and committee designated to guide the student's preparation for the Special Examination. The student's plan of special study will be presented at a colloquium for approval by this committee.

The student should plan not less than one academic year, or its equivalent, in residence after the successful completion of his general examination before presenting himself for his special examination. However, the student cannot present himself for the special examination sooner than six months after completing his second foreign language requirement, or his alternative requirements in statistics or computers.

Field Research

A student cannot be recommended for the award of the Doctor of Philosophy degree unless he has had the experience of field research acceptable to the department.

Thesis and Dissertation Credit

Candidates for the Master of Arts degree must register for 5 hours of thesis credit under Anthropology 599. Candidates for the Doctor of Philosophy degree must register for 36 hours of dissertation credit under Anthropology 600; not more than 18 hours' credit can be earned in any one quarter.

Dissertation

After successful completion of the special examination, a candidate for the Doctor of Philosophy degree will consult with the department in order to select the topic for his dissertation. The chairman of his dissertation committee will then be appointed and, together with the committee, will advise the student accordingly.

Applied Science

Students may pursue a Master of Science Degree with a major in applied science. Typical areas of study in applied science are materials science and nuclear science.

Acceptance for a degree program is made by the dean of the School of Technology and subject to the admission requirements of the Graduate School. An applicant must have received a bachelor's degree with a major in engineering, engineering technology, physics, chemistry, or mathematics or with an emphasis in these fields.

Degree requirements are consistent with the general requirements of the Graduate School with a minimum of 48 hours of graduate credit required, including a thesis. A program of study will be developed by the advisory committee and the student. When the student has chosen a thesis topic and a staff member has consented to direct the project, the thesis director will become the student's advisor and will function as chairman of the advisory committee.

One-half or one-quarter time instructorships, teaching or research as-

sistantships, and fellowships are available for qualified applicants. Additional information about programs, courses, instructorships, assistantships, and fellowships may be obtained from the dean of the School of Technology.

Art

Graduate Programs in art lead to the Master of Fine Arts degree in studio art and to the Master of Science degree in art education. The candidate is expected to select an area of specialization (studio or art education) around which his program will be planned in consultation with the major professor in that area.

Requirements for the Master of Fine Arts degree in studio (painting, sculpture, printmaking and drawing, ceramics, metalsmithing, and weaving) total 60 quarter hours. These hours are distributed as follows: 30 in major field, 12 in art history, 5 to 9 in thesis or terminal project work, and the remainder in electives. The candidate for the Master of Fine Arts degree must in addition to the completion of course work, present a terminal project, and participate in an oral examination. Residency requirement for this degree is at least two academic years, or six academic quarters. The University also asserts the right to retain an example of the candidate's creative work, and this selection will be made from the work presented in the graduate exhibition.

Requirements for the Master of Science degree in art education total a minimum of 48 quarter hours. These hours are distributed as follows: 16 in education, 32 to be elected from the areas of art education, art history and studio, 5 to 9 quarter hours are to be devoted to either thesis work or research work. Such work will result in the writing of a thesis or a research paper. The candidate must participate in an oral examination of the above mentioned thesis or research paper.

Undergraduate requirement for admission to the Master of Fine Arts program is a degree in art or art education; for admission to the Master of Science in Education, a degree in art education. Any exception to these requirements must be with the approval of the faculty in the special degree program, and with the consent of the chairman of the Department of Art.

Asian Studies

A graduate minor is offered in Asian Studies which may be made up by selecting from the following courses which are listed by department: Agricultural Industries 417; Anthropology 401, 483, 585, Art 451a, 571, 572; Economics 460, 461, 462; Geography 466, 522; Government 458a,b,c, 480, 521, 595; History 448, 449, 455, 510, 514; Philosophy 591. Thesis and dissertations on Asian topics may also be written by students in any of several majors.

Interested graduate students may write to or consult with the chairman of the Committee on Asian Studies.

Biological Sciences

Requirements for Admission

1. Bachelor's degree with a major in a natural science department

2. Admission to the Graduate School.
3. Approval of the chairman of the Biological Sciences Committee or his designated representative.

Requirements for the Degree

Complete 60 hours of graduate courses in the biological sciences. The specific courses required of any student are to be determined by consultation between the student and the program committee, with the following provisions:

1. No more than 35 hours of credit in any one department may be used for the degree.
2. No minor area is required.
3. Have at least 24 hours of credit in 500-level courses. These may not include more than 4 hours for "special problems," 4 hours for "seminars," and 4 hours for "readings."
4. Complete at least one 400- or 500-level laboratory course in three of the departments of the biological sciences. (No special credit, such as indicated in 3 above, will satisfy this requirement.)
5. Submit a research paper.
6. Attend, for credit, at least one quarter of seminar in three of the departments of the biological sciences.

Advisement

Guidance of students shall be by a program committee of three members, one from each of the biological science departments involved, or other departments at the discretion of the program committee. The program director will serve as an *ex-officio* member.

Graduate work may be taken in the Departments of Botany, Microbiology, Physiology, and Zoology to obtain a Master of Science degree in biological science in the College of Liberal Arts and Science.

Botany

Graduate work may be taken in the Department of Botany as a major or minor leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees and as a part of the program in biological sciences leading to the Master of Science or the Master of Science in Education degree.

Applicants for the advanced degrees must be approved by the department. Queries concerning graduate work in botany should be made to the graduate adviser in botany. To be eligible for graduate work in botany, the student must have an equivalent to an undergraduate minor in botany. Certain deficiencies may be made up concurrently with graduate work.

In accordance with the general requirements of the Graduate School, a candidate for the Master of Arts or Master of Science degree must complete 48 hours of graduate credit and a thesis. The Master of Arts candidate must demonstrate a competence in a foreign language.

The Doctor of Philosophy degree requires, in addition to a dissertation, a reading knowledge of two foreign languages or one foreign language and statistics, if recommended by the candidate's committee.

Business Administration

The graduate faculty in business administration, consisting of members of the Departments of Accounting, Management, Marketing, and the Faculty of Finance of the School of Business at Carbondale, offer the Master of Business Administration degree. The M.B.A. program has as its objective the development of professional managers and executives to serve the needs of business and government and to prepare interested graduates for doctoral study. The program has been structured with flexibility so as to serve holders of baccalaureate degrees in business administration as well as those who hold degrees in other disciplines.

M.B.A. Admission Requirements

1. Complete all admission requirements set forth by the Graduate School of Southern Illinois University.
2. Complete the Admission Test for Graduate Study in Business (Princeton Test) and have the results of the test mailed directly to the director of graduate programs in Business Administration. Information regarding this test is available by writing to: Admission Test for Graduate Study in Business, Educational Testing Service, Box 966, Princeton, New Jersey 08540.
3. Complete an interview with the director of graduate programs in Business Administration. This interview may be delayed in individual cases where a special trip to the campus would require travel in excess of one hundred miles to reach the Carbondale campus.
4. An undergraduate cumulative grade point average of 4.00 is preferred, and less than a 3.75 grade point average is accepted with rare exception.

M.B.A. Degree Requirements

A minimum of 48 quarter hours of course work plus a terminal examination (oral, written, or both) are required. Candidates who receive permission to write a thesis must complete a minimum of 44 quarter hours of course work plus an acceptable thesis for which 8 quarter hours of credit are assigned.

Candidates who lack the necessary prerequisites may be required to complete as much as 80 quarter hours of acceptable course work. Those who enter the Master of Business Administration program with deficiencies in any of the core areas of business administration or in mathematics must eliminate the deficiencies in a satisfactory manner prior to starting the program course work. The seven core areas as stipulated by the American Association of Collegiate Schools of Business include: accounting, business law or legal environment of business, economics, finance, management, marketing, and statistics.

The Master of Business Administration program course work to be taken beyond that needed to eliminate deficiencies is determined on an individual basis in conference with the director of graduate programs in business administration. Candidates must satisfy requirements in the following areas: quantitative methods, accounting, economics, behavioral sciences, legal environment of business, finance, marketing, management, communication, and business policy.

The candidate may select a concentration, not to exceed 15 quarter

hours of credit, from one of the following: accounting, finance, management (personnel or production), marketing, or transportation. The candidate may also choose courses in a wide variety of areas of graduate study throughout Southern Illinois University.

Chemistry

Graduate courses of study leading to the Doctor of Philosophy and Master of Science degrees are offered by the Department of Chemistry. Interested students should consult the chairman of the Department of Chemistry for a complete statement of the requirements for each degree. The following is a summary of these requirements.

Master of Science Degree

In addition to meeting the general requirements of the Graduate School, a candidate for the Master of Science degree in chemistry is required to:

1. Pass field examinations in 3 of the 5 fields (analytical, inorganic, organic, physical, and biochemistry) of chemistry or complete their equivalent in course work with a grade of *B* within the first six quarters of residence.
2. Earn 9 credit hours at the 500 level in one of the five basic fields of chemistry (Chemistry 451a,b,c may be taken in place of two 500 level biochemistry courses) and earn credit in one chemistry course at the 500 level in each of two other fields.
3. Earn 40 hours credit in chemistry courses or 30 hours if an outside minor is elected.
4. Maintain a 3.75 grade point average in formal lecture courses.
5. Attend weekly seminars and earn one hour credit (Chemistry 595) by presentation of a seminar.
6. Earn a minimum of 12 hours in research and thesis (Chemistry 596 and 597).
7. Demonstrate by satisfactory performance in a departmentally-administered examination a reading competency in scientific German, Russian, or French.
8. Pass a final oral examination.

Doctor of Philosophy Degree

A candidate for the Doctor of Philosophy degree must meet all of the requirements of the Graduate School and all of the requirements of the Department of Chemistry for the master's degree (except for the thesis requirement which may be omitted with departmental consent). In addition the candidate must:

1. Pass field examinations in physical chemistry and three of the other four fields (analytical, inorganic, organic and biochemistry) of chemistry or complete their equivalent in course work with a minimum grade of *B* within the first nine months of residence.
2. Complete a course of study as determined by his graduate committee.
3. Earn one hour credit in seminar (Chemistry 595) beyond the Master of Science degree requirement and attend weekly seminars.
4. Earn a minimum of 48 hours in research and dissertation (Chemistry 598 and 600).
5. Pass cumulative examinations in the major field of study.
6. Maintain a 4.00 grade point average in formal lecture courses.

7. Pass preliminary oral and final oral examinations.
8. Demonstrate by satisfactory performance in a departmentally administered examination a reading competency in scientific German, Russian, or French.

Community Development

The program is interdisciplinary. A candidate for the Master of Science degree in community development will take a portion of his work in related academic fields. Depending upon his professional plans, it will be possible for him to minor in a field such as agriculture, anthropology, economics, education, geography, government, history, psychology, or sociology. Undergraduate work in more than one of these fields is a desirable background for graduate study in community development. Students with inadequate backgrounds may be required to take certain courses to strengthen their preparation.

The period of study and training is planned to encompass one and one-half to two academic years. Included must be a minimum of 4 hours of graduate credit, plus a one year internship in community development, field consultation, leadership training or applied research. Only a limited number of students can be enrolled in any one year.

The requirements for the Master of Science degree in community development include the following:

1. Courses specifically designed or approved by the Community Development Institute, including a thesis, totaling 28 to 32 hours.
2. Work in one or more allied fields, such as anthropology, education, psychology, sociology totaling 16 to 20 hours.
3. One year of part-time noncredit graduate internship. (This may be reduced or waived for exceptional students with one or more years of acceptable professional experience in community development work.)
4. Fulfillment of the requirements of the Graduate School.

Design

The Department of Design attempts a generalized rather than a specialized design education. Through his undergraduate years the student is led to treat of man and his environmental transactions in terms of whole systems rather than of isolated aspects or component parts. Emphasis is placed on the overall solutions to human problems which may be encompassed through design procedures.

The graduate program of the department continues this broad integrative approach but assumes that, at this level, the student should concentrate his studies in a more closely defined area within which he should work in depth.

It is recognized, however, within the present massive accelerations in the design possibilities of man's control over his environment, that the format of such graduate study should offer the utmost flexibility and capacity for change. The entire graduate program should be viewed as experimental in nature and one whose content and approach will be adjusted according to experience and field developments.

Students with an undergraduate background in various areas of design specialization may qualify for the master's degree program. In addition, on the premise that the association of diverse disciplines participating

In the design process may often yield productive and enriching interactions, students with an undergraduate background in fields other than design will be accommodated. Special arrangements should be developed in consultation with the chairman of the department.

A two-year graduate course of study, leading to the Master of Science degree in design, is offered in the areas listed below. The program requires at least 34 hours of graduate study in the Department of Design; at least 18 hours of study outside the department, selected with the adviser; and 9 thesis hours. Specialized areas are: (1) design in education, (2) communications in design, (3) industrial design, (4) environmental planning, and (5) generalized design science, directly oriented toward the design philosophy of R. Buckminster Fuller.

Within the structure of this program, graduates will work in an operational research and workteam organization rather than a formal classroom situation. There will also be the opportunity to participate in seminars and lectures given by distinguished visiting professors to the department and of conducting research under their guidance.

Economics

Graduate courses in economics may be taken as a major or minor leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees.

A student may complete requirements for the master's degree through the successful completion of: (1) 48 hours of graduate work, including the master's thesis; or (2) successful completion of the preliminary doctoral examination. Each master's degree candidate is required to complete at least 33 hours in economics, including certain required courses. Graduate students with no undergraduate deficiencies, with no language handicaps, and with no outside demands upon their time may find it possible, by taking the heavy graduate load of 16 hours each quarter, to complete the master's degree in three quarters, roughly nine months. Most such graduate students require four quarters. Students with undergraduate deficiencies, language difficulties (especially foreign students), or outside demands upon their time should expect to take five quarters.

The Graduate Record Examination is required of all applicants for admission.

If a student wishes to combine his study of economics with the fields represented in the College of Liberal Arts and Sciences, he should apply for a Master of Arts degree. If he wishes to combine his study of economics with fields represented in the School of Business, the School of Agriculture, or similar schools, he should apply for a Master of Science degree.

The Doctor of Philosophy degree is awarded for high accomplishment evidenced by successful completion of these steps.

1. Demonstrating proficiency in two research tools chosen from the three possible choices for foreign language, statistics, and computer programming. If a student chooses computer programming, he must obtain special permission from the Economic Department's computer committee.

2. Passing a written examination covering the core areas of economic statistics, history of economic thought, mathematical economics, comparative economic systems, and macro and micro economic theory.

3. Passing written and oral preliminary examinations in economic theory plus three specialized areas chosen from a list that includes: international economics, human resources, public finance, comparative economic systems, political economy, quantitative economics, money and banking, economic development, economic history, agricultural economics, or any graduate level field having a reasonable connection with economics. A student may choose only one of the last two of these specialized fields.

4. Presenting the results of original research in a dissertation which must be defended in an oral examination before a faculty committee.

After a student has been granted admission to a graduate program of the Department of Economics, he must consult the departmental graduate student adviser who will aid him in the selection of courses and in fulfilling the various steps toward the degree. Once a master's thesis or doctoral dissertation topic has been chosen and a graduate faculty member has consented to direct the project, the faculty member becomes the student's adviser for the purposes of the thesis or dissertation. A thesis or dissertation topic may not be registered with the Graduate School until it has been approved by a committee of three graduate faculty members including the thesis or dissertation director.

Information on graduate and research assistantships may be obtained from the director of graduate studies of the Department of Economics. More detailed descriptions of the Master of Arts, Master of Science, and Doctor of Philosophy degree programs are also obtainable from the director.

Education

One may pursue a program of study leading to the Doctor of Philosophy degree in education through any one of three functional areas: curriculum and instruction; educational psychology; educational administration and social and philosophical foundations. Specialties are available within the functional areas depending upon the student's interests. For example, in educational psychology he may choose a specialty in human learning resources, special education or counseling and guidance. In all programs, students must satisfy the general requirements of the Graduate School in addition to the special requirements for the Doctor of Philosophy degree in education.

Application

An applicant must submit, to the coordinator of the functional area in which he wishes to do his work, his scores from the Graduate Record Examination and the Miller Analogy test, and other pertinent data. Following review by the area's screening committee, the coordinator will inform him of the committee's decision.

Advisement

For each student, the coordinator of his functional area appoints a program committee consisting of a chairman, who is in the student's functional area and who is authorized to direct doctoral dissertations, and two other members, at least one of whom must be from outside the student's functional area. His program, planned to include all of his graduate study beyond the master's degree, should be approved at a meeting of the student with his committee. Copies of the approved program

filed with the members of the committee, the student, the area coordinator, and the assistant dean for graduate studies. Appropriate program changes must be approved and filed in the same manner.

Program Requirements

Full-time residence of one quarter (or two summer sessions of at least eight weeks each) is required for the Master of Science in Education degree.

Each doctoral student in education must successfully complete a prescribed core of 12 credits in psychological foundations of education and social and philosophical foundations of education combined. In a functional area certain basic courses may be required beyond the common core. Specialties within the functional areas are supported by specific courses and other experiences agreed upon by the student and his program committee.

Research Tool Requirements

ADMINISTRATION AND SOCIAL AND PHILOSOPHICAL FOUNDATIONS

The faculty of the Functional Area of Administration and Social and Philosophical Foundations recognizes the research orientation for the Doctor of Philosophy degree. It further recognizes that the multiplicity of educational programs in the Functional Area demands varying competencies in research. For this reason, no common research tool will be required of all students. Specific research tool competencies and procedures for evaluation shall be determined by the program committee of which applicant congruent with the professional preparation and goal expectations of the student and the requirements of the student's concentration.

CURRICULUM AND INSTRUCTION

Each candidate for the Doctor of Philosophy degree shall be required to demonstrate competence in a minimum of one research tool chosen by his program committee from a list approved by the area of Curriculum and Instruction. The tool or tools shall embody skills needed in understanding materials in the fields, or in the conduct of research for the dissertation, or in continuing research contributions in the field of socialization. Approved research tools include foreign languages (one language is one research tool), statistics, and computer programming. Proficiency examinations are required for languages and computer programming, and may be used for statistics. If courses are taken to satisfy any research tool requirement, those courses will not count toward the minimum credit requirement for the degree. A student whose native language is other than English may not offer English as one language, and will demonstrate his proficiency in his course work. The student's native language is not acceptable as a research tool. The research tool requirement must be satisfied before the student may take the preliminary examination.

Proficiency in foreign languages will be determined by means of the Educational Testing Service's graduate foreign language examinations, administered by the Counseling and Testing Center once each quarter. The ETS examinations are available only in French, German, Russian, and Spanish. A student who wishes to present any other language must

have his program committee recommend to the Dean of the Graduate School this particular language as necessary in dissertation research. The dean must approve the recommendation before arrangements for testing in that language can be made with the Department of Foreign Language or any other testing service.

If a student fails an examination in a particular language twice, he will be required to take the course 161 in that language before taking the examination again. After a third failure of the doctoral examination in the same language, the student must successfully petition the dean of the Graduate School before taking the examination a fourth time.

A student whose advisory committee chooses statistics as a research tool may demonstrate proficiency by passing a sequence of courses in statistics (Guidance 505, 506, 507; Mathematics 410a,b,c or d; 480a,b, or 483a,b,c) with a grade of *B* or better in each of the three courses. If the student has some background in statistics and the approval of his advisory committee, he may meet this requirement by skipping the first course and taking the second and third, in which he must earn a *B* or better. Or, if his background is thought adequate by his committee, he may take a proficiency examination equivalent to the final examination in any three courses of a given sequence, with that exam to be administered by the instructor of that sequence, and on which the student must make a grade of *B* or better.

The student for whom the computer programming option is chosen will demonstrate that he can competently use two programming languages, ALGOL and FORTRAN. He will be required to pass a written examination, and then to demonstrate that he has developed some sophisticated skill in the use of the computer languages by writing programs to accomplish specified tasks. Any courses taken to help achieve the necessary skills cannot be used for credit toward a Ph.D. degree.

C. EDUCATIONAL PSYCHOLOGY

A research degree in the educational psychology functional area requires the competencies of all students in statistics, learning and personality, and development. These competencies are attested by examination.

No specific research tool will be required for all students. Competencies which facilitate specific research skills will be determined by the candidate's program and dissertation committee.

Preliminary Examinations

When a student has passed the research-tools requirement and completed at least 36 hours beyond a master's degree or its equivalent, he may apply to the College of Education for permission to take the preliminary examination. The preliminary examination will assess the student's competencies in his field of specialization, including the research findings and techniques necessary for scholarship and productive work in his field.

Dissertation

The dissertation committee consists of a chairman who is authorized to direct doctoral dissertations and at least three others who are authorized to serve on dissertation committees. The committee is appointed by the dean of the Graduate School on the recommendation of the area's coordinator through the assistant dean. At least one member of the committee must be from a functional area other than that of the student.

and at least one must be from a related area other than professional education.

Satisfactory completion of the dissertation requirement includes the passing of an oral examination which covers the dissertation and related areas.

Educational Administration and Foundations

This department carries extensive graduate offerings in educational administration, instructional supervision, and educational foundations in support of the Master of Science in Education degree, the Sixth-Year Specialist's Certificate, and the Doctor of Philosophy degree in education. The department administers its programs leading to the master's degree and the Sixth-Year Specialist's certificate, and provides programs and personnel for doctoral students who wish to specialize in educational administration, general instructional supervision, and educational foundations.

Master of Science in Education

At the master's level, majors are offered in educational administration and in instructional supervision. Graduate courses taken in the department must follow the pattern of prerequisites for admission to courses. Admission to master's degree work in the department must be approved by the department's admissions committee. The department's admissions requirements are available upon request to the chairman. Degree candidates' programs of courses must be approved by the appropriate adviser in the department. Transfer from unclassified status will conform to Graduate School and departmental requirements for such transfer. The program for the Master of Science in Education degree, with a major in educational administration includes a basic core, and educational foundations sequence, research and tool subjects, and selected specialized courses. A research paper and a comprehensive oral examination are also required. The department stresses the advantage of an academic field teaching major for all educational administration students. An applicant for the degree is expected to have two years of successful teaching experience and must be able to meet the general administrative certification requirements of his respective state before the master's degree is conferred. The regulations for the master's degree, with a major in instructional supervision, parallel those for the degree in educational administration. Students in this area normally select specialized courses in supervision and curriculum appropriate to their goals as supervisors, (i.e. elementary, secondary or both). The department encourages a cross-departmental approach in the selection of appropriate courses for individual programs.

Sixth-Year Specialist's Certificate

Admission standards for the Sixth-Year Specialist's certificate program parallel the admission requirements for the Doctor of Philosophy degree program. All candidates must have the master's degree or its equivalent. Prerequisites to this program include the required courses for the Master of Science in Education degree in educational administration which are included in the student's master's degree program. At least 16 hours in graduate courses will be taken in foundation fields of educational administration, at least 16 hours in the area of adminis-

trative specialization, at least 8 hours either in an internship or practicum and five hours in a field study.

The Sixth-Year Specialist's certificate program will be designed by the candidate and his adviser subject to the approval of the advisory committee to the department. Specific courses and the sequence in which they are to be taken must be approved by the advisory committee. The department requires a comprehensive written examination as the final step toward the sixth-year program.

Doctor of Philosophy

Educational administration and foundations participates in the doctoral program in education in the functional area of educational administration and social and philosophical foundations. Students interested in educational administration and in social and philosophical foundations may pursue an equivalent of a major within the area program. For additional information on the Ph.D. in Education see the preceding section above. Inquiries should be addressed to the coordinator for the area of educational administration and social and philosophical foundations in the College of Education.

Elementary Education

Graduate programs in the Department of Elementary Education lead to the Master of Science in Education degree and the specialist's certificate, and contribute to the Doctor of Philosophy degree program in education.

Each graduate major in elementary education and in early childhood education for the Master of Science in Education degree consists of a total of 48 hours. Programs have been developed to serve a variety of specialties in the field of elementary education such as: language arts, reading, social studies, elementary mathematics, elementary science, supervision of elementary subject areas. Courses are also offered which support the program in elementary administration, although students seeking certification or a degree in this field major in the Department of Educational Administration and Foundations.

Each graduate program includes certain required courses, guided electives, and related courses in liberal arts. All programs must be planned with and approved by the graduate advisers in elementary education or in early childhood education. Specific course requirements for a given program may be obtained upon request from the Department of Elementary Education.

Students in early childhood education who have not had psychology or Guidance 412, or Sociology 427, or Health Education 312, or an equivalent of one of these, are required to take four hours in psychology or guidance. Educational Administration 554 or 555 or the equivalent is required.

Elementary Education participates in the doctoral program in education in the functional area of curriculum and instruction. Students interested in elementary education may pursue an equivalent of a major within the area program. For additional information on the Ph.D. in education, see the preceding section entitled education. Inquiries should be addressed to the coordinator for the area of curriculum and instruction in the College of Education.

The Master's Degree

In lieu of a thesis, students are required to write a research paper and take Guidance 422a or its equivalent and Educational Administration 500.

A total of from 8 to 12 hours should be selected from departments outside of the College of Education.

At least 24 hours must be on the 500 level.

Those who have undergraduate degrees in other fields, regardless of teaching experience, are required to complete, without graduate credit, at least four hours of elementary methods (314 or equivalent) and eight hours of elementary student teaching. The teaching must be done in residence at a university or college approved by the National Council for Accreditation of Teacher Education.

Any student taking graduate courses without first being approved by his adviser risks having work not accepted for the degree.

The Sixth-Year Specialist's Certificate

The Sixth-Year Specialist's Certificate Program requires 45 quarter hours of work. The program is individually planned to meet the student's professional objectives. Part of the program includes a project which shows the ability to conduct individual investigation.

The Doctor's Degree

The Department of Elementary Education participates in the Doctor of Philosophy degree in education with a major in curriculum and instruction with emphasis in elementary education. The applicant is approved only after admission to the curriculum and instruction functional area. Research requirements of the area must be met. Required also are completion of the preliminary examination in the field of specialization and the dissertation. The program has certain core requirements but is individually planned to meet the professional needs of the student. Opportunities are available for a strong subject-matter minor if one is interested, for instance in a special subject-matter field in the elementary school. Write to the chairman of the Department of Elementary Education for detailed requirements.

Engineering

Graduate study programs leading to a Master of Science degree with a major in engineering are available in the following functional areas of engineering:

Electrical sciences—circuits, electronics, fields, controls

Fluid mechanics—viscous and inviscid flow, compressible flow, turbulence, wave motion

Solid mechanics and structures—continuum mechanics, dynamics and vibrations, experimental stress analysis, stability, structural analysis and design

Transfer processes and environmental engineering—heat transfer, mass transfer, chemical processes, water resources development, air and water pollution control

Systems engineering—bio-engineering, hybrid computation, control and instrumentation, computer applications, operations research and mathematical model formulation

Course work is also offered in such areas as energy conversion and engineering design. Students may take course work in one of the other branches of engineering or other areas of science such as physics, chemistry, mathematics, or geology with the approval of the Graduate Committee.

Students who are interested in advanced study in engineering must be admitted to the Graduate School and accepted in the degree program by the School of Technology. In order to be admitted to candidacy for a graduate degree in engineering, the student must have had the equivalent of the coursework required for the Bachelor of Science degree in Engineering. Students whose undergraduate training is deficient may be required to take additional course work without graduate credit. Degree requirements are consistent with the general requirements of the Graduate School with a minimum of 48 hours of graduate credit required, including a thesis.

One-half or one-quarter time instructorships, teaching or research assistantships, and fellowships are available for qualified applicants. Additional information about programs, courses, instructorships, assistantships, and fellowships may be obtained from the School of Technology.

English

Graduate courses in English may be taken for major or minor in the Master of Arts program, for a major in the English as a Foreign Language program leading to the Master of Arts degree, for the subject-matter major in the Master of Science in Education program, and for the Doctor of Philosophy degree. Inquiries about admission to graduate study in English should be sent to the director of graduate studies in English, Department of English, Southern Illinois University, Carbondale, Illinois 62901.

For the Master of Arts degree in English, the student must satisfy the following requirements:

1. Complete at least 48 hours of satisfactory graduate work.
2. Take English 500 in the first term it is available to him.
3. Take a course in the English Language or in linguistics.
4. Take English 585 (required only of teaching assistants).
5. Pass the Educational Testing Service examination for one foreign language, normally either French or German.
6. Submit to the director a clean copy of that research paper which best represents his abilities and accomplishments.
7. Pass the master's comprehensive examination.

For the Doctor of Philosophy degree in English, the student must satisfy the following requirements:

1. If he has not already taken such courses on the graduate level, take at least one course in each of the following fields: English literature 1500, 1500-1660, 1660-1800, 1790-1900, 1885 to date, and American literature.
2. If he has never had courses, graduate or undergraduate, in Chaucer, Shakespeare, and Milton, remedy this deficiency.
3. Present evidence of competence in English language and linguistics normally by completing the appropriate courses with a grade not lower than B.

4. Satisfy two research-tool requirements. (See below.)
5. Pass preliminary examinations in English and American literature, the preparation for which is prescribed by his advisory committee.
6. Submit a satisfactory dissertation.
7. Pass a final oral examination.

Research tool options

A student may satisfy the research tool requirements by fulfilling one of the three options listed below. The choice of option and languages selected must be approved by the student's advisory committee.

1. A reading knowledge, demonstrated by examination, of two languages in addition to English, selected from any language in which there is substantial literature for research and which is germane to the student's field. Foreign students may specify their native language as one of the foreign languages, provided it is one which meets the above requirements. Foreign students choosing this option will be required to demonstrate fluency in oral and written English.

2. A command of one foreign language and its literature demonstrated by examination or by at least three courses numbered 400 or above, with an average grade not lower than 4.0. Preparation for this examination normally would require the equivalent of three years of study at the college level with grades of *B* or better. Foreign students may use their native language, provided it is one which is germane to the particular field of major concentration. Foreign students choosing this option will be required to demonstrate fluency in oral and written English.

3. A student may elect to offer a single foreign language, and a special research technique or collateral field of knowledge. A special research technique should represent the acquisition of any special skill that will effectively contribute to the research proficiency of the student (provided that such a skill is not an assumed or traditional part of the major). The collateral field of knowledge is expected to broaden the student's scholarly background by permitting exploration of knowledge in a field related to the major.

To satisfy the research technique or collateral field requirement, the student may complete a total of three courses numbered 400 or above, with an average grade not lower than 4.0.

English as a Foreign Language

Graduate courses in theoretical and applied linguistics are offered leading to the Master of Arts degree in English as a foreign language. Courses, both undergraduate and graduate, are also offered for a minor in linguistics; only graduate courses are offered for a minor in English as a foreign language. Applicants for admission should send inquiries to the rector, Linguistics/MAEFL, Department of English, Southern Illinois University, Carbondale, Illinois 62901.

Master of Arts Degree in English as a Foreign Language

Applicants to the program in English as a foreign language, besides meeting the general conditions for admission to the Graduate School, must have an undergraduate average of at least 3.8. An undergraduate background in any of the following fields is desirable: English, anthropology, foreign languages, education, philosophy, psychology, mathematics. Those applicants who have less than a 3.8 average or who have an under-

graduate background other than those specified may be admitted only after consultation with the director of the program. Applicants who are not native speakers of English must meet the following additional requirements: undergraduate concentration, or the equivalent, in English language or literature; TOEFL examination score of at least 550; satisfactory English language proficiency in the language examinations administered on arrival at the University. Deficiencies will be made up as necessary.

The curriculum is designed to give systematic work in both theoretical linguistics and applied linguistics (methodology for the teaching of English as a foreign language). For the major, students are expected to take 32 hours of theoretical linguistics—English 400, 450a,b, 407a, 504a, 505a Anthropology 401, 413, 13 hours of applied linguistics—English 588a,b,c 569, and 3 hours of a related elective at the 500 level. Students must maintain an average of *B* for the first 26 hours of graduate work in order to qualify to take the written comprehensive examination required for the M.A. in English as a foreign language. This examination may not be taken more than twice. If the candidate fails this examination both times, he will receive a certificate of attendance and achievement. The candidate must submit to the chairman of the EFL program a clear copy of a research paper (approved in one of his courses) which best represents his abilities and accomplishments.

Foreign Languages

For the Master of Arts and Master of Science in Education degrees major and minor are offered in French, German, and Spanish. A minor may be taken in Russian.

For the Master of Science in Education degree, Romance Philology 410 is required for students in French and Spanish, and for those in German, German 413 is required. For the Master of Arts degree in French and Spanish, Romance Philology 410 and three hours of either French or Spanish 515 are required. All romance philology courses may be counted toward either French or Spanish specializations. For the Master of Arts in German, German 413 and 533 are required.

Normally the bachelor's degree and a minimum of 27 hours in course on the junior-senior level, or the equivalent, constitute the prerequisite for registration in graduate courses. However, students who do not meet this requirement may register for specific graduate courses with the consent of the instructor and the authorization of either the chairman of the department or the chairman of the graduate committee of the department.

Forestry

The Department of Forestry offers advanced courses for the Master of Science degree. Collateral course work in other departments of the University is recommended but varies with a student's specific program. The major forestry disciplines emphasized are: forest recreation and park management; forest resource economics; wood science and forest products; silviculture; tree breeding and improvement; forest biometrics; and forest watershed management. Also at the master's level a more diverse program in outdoor recreation resource management is offered to students with or without forestry undergraduate training. This program includes

a basic core composed of Management 540; Recreation 500; Forestry 450; Forestry 451a,b; Forestry 575. The remainder of the course work consists of selected electives which enable the student to combine his earlier academic experiences with a concentration in economic, natural, or social resources at the outdoor recreation resources management level.

In addition, cooperative curricula are available which permit graduate forestry students to enroll in Doctor of Philosophy programs with other departments. Syllabi are arranged on an individual student basis, emphasize an interdisciplinary approach, and orient within the biological, physical, or social sciences.

All candidates for the Master of Science degree will be expected to complete original research in some field related to forestry or outdoor recreation resources. For those concentrating in forestry this research shall lead to the completion of a thesis which will be governed by the rules of the Graduate School. Students in the outdoor recreation resource management program may elect either a thesis problem or a research problem. Competence in a foreign language is desirable but not required. The same number of minimum hours required by the Graduate School are acceptable to the Department of Forestry. Three letters of recommendation are requested in support of each candidate before he is accepted for graduate study. Submission of a 1,000-word theme prior to acceptance is required in addition to the completion of the aptitude test of the Graduate Record Examination. Additional details can be obtained by writing the Department of Forestry.

Geography

The Department of Geography offers programs leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. It also offers a concentration in geography as part of the Master of Science in Education program in secondary education.

The department offers particularly strong programs at both the master's and doctor's levels in several fields. Most important of these programs at present are in urban geography, regional economic development, industrial and transport geography; historical geography; cultural geography; climatology; resource management; and the geography of Africa and Latin America.

Master's Degree

Although there are several programs at the master's level, the basic objectives in each of these programs are the same.

- A. Students are expected to develop and demonstrate a basic breadth of knowledge apropos of a professional geographer. Demonstration of breadth is achieved by satisfactory completion of pro-seminars in physical, cultural, and economic geography.
- B. Students are expected to identify a specific professional goal and develop with their adviser a satisfactory schedule of courses to achieve penetration in depth in a specialization accordant with their professional goal. Penetration in depth is demonstrated by a satisfactory qualifying examination and preparation of an acceptable thesis or its equivalent.

Candidates for the Master of Arts or Master of Science degree may or may not present a minor. Candidates for the Master of Science in Education degree must work out a program acceptable to the College of Ed-

ucation. For any graduate degree, students without a minor may receive credit toward their degrees in geography for courses in other departments approved by their advisers.

The normal load ranges from 8 to 12 hours per quarter. Although the 48 hours required for graduation can be accomplished in four quarters, the department suggests that students who have assistantships think of six quarters as the time normally required to complete the master's degree. This longer time allows the student to complete a richer program and to spend adequate time in writing the thesis or its equivalent.

Doctor of Philosophy Degree

The objective of the Doctor of Philosophy degree program in geography is to develop scholars who can effectively carry on and present original research within the field of geography. To achieve this objective a general program has been designed to permit individual students maximum flexibility and penetration of geographic research in depth.

In addition to the general requirements of the Graduate School, the department has five prerequisites for admission to the departmental program:

All entering students will select a program adviser during their first quarter in residence.

During spring term of the student's first year in the program, he will take a qualifying examination, the objective of which is to examine the concepts, method, and reasoning power within the framework of the student's specialization. This examination and the student's overall performance during the first year will be evaluated to determine whether the student is to continue or discontinue in the program. Upon favorable recommendation, the student must then present a preliminary thesis proposal for discussion before his advisory committee. A thesis proposal is considered part of the qualifying examination and must be completed before the student can proceed into the second year of the master's program. During the second year, students should expect a comprehensive examination over the field of geography.

Proficiency in a language and one elementary course in statistics (M.A.) or quantitative techniques (statistics) (M.S.) is required in addition to the 48 hours of coursework for the Master's degree. This requirement should be met by examination or course completion prior to commencing thesis work. M.S. students can meet the requirement of competence in quantitative techniques by taking two courses (Guidance 505, and Geography 410a or b). If the student's training elsewhere includes statistics, this requirement may be waived upon consultation with his faculty adviser.

1. One personal and professional data form provided by the department must be completed and returned.

2. A statement of individual immediate and long range professional goals must be prepared by the student and submitted to the department along with the completed personal and professional data forms.

3. Four confidential letters of recommendation or recommendation forms provided by the department must be sent to the department chairman from faculty of schools the student has previously attended. It is the responsibility of the student to contact the four faculty members and request that the letters or forms be sent. In the case of foreign students, the four letters of evaluation are to be submitted to the departmental chairman rather than to the Foreign Admissions Office.

4. Evidence of attainment of a master's degree or its equivalent must be provided in the form of appropriate official transcripts.

5. Scores from GRE must be sent to the department prior to the beginning of the program.

The doctoral program is composed of four chronological stages culminating in the final acceptance of the dissertation. The first stage is a program of courses worked out between the student and his advisory committee to take advantage of the student's previous professional preparation, interests, and abilities, and to remedy any weaknesses in his background. Courses comprising this stage will be built from the following major elements implemented by specific courses approved by the student's advisory committee: (a) a core of courses in geographic methodology, (b) a series of courses, seminars, and independent research courses in his field of specialization, course work in cognate fields to supplement his specialized training, and (c) training in the skills of scholarly research. Specific courses will be recommended only in those areas where a student lacks a demonstrated competency.

The Department of Geography has neither a minimum number of requirements nor will it specify any preferred skills for research; instead, the determination of requirements shall be arranged by the graduate student's advisory committee upon consideration of his program.

The second stage is the qualifying examination which is taken at the completion of formal course requirements and upon the recommendation of the student's advisory committee. This is followed by admission to candidacy upon satisfactory performance on the qualifying examination. Finally, there is the dissertation which must be approved by the student's advisory committee and orally defended before an examining committee appointed by the dean of the Graduate School.

Geology

The Department of Geology offers programs leading to the Master of Arts and Master of Science degrees. All students entering these programs are required to take a placement examination administered a day or two before the start of the Fall and Spring terms each year.

The objective of the master's program is to develop the student's competence in the basic fields of geology and provide for specialization in line with individual capability and interest. Facilities and staff are available for studies involving surface and subsurface mapping, petrology, paleontology, micropaleontology, stratigraphy, crystallography-mineralogy, ore deposits, petroleum geology, environmental geology, groundwater, and exploration geophysics. Interdisciplinary research with other departments is encouraged. Preparation for teaching earth science at the high school and junior college level may also be undertaken in cooperation with the College of Education and other science departments.

All students are expected to be familiar with the Department of Geology policies and requirements. Master's candidates must pass a written comprehensive examination at least six months prior to completion of a thesis. A final oral examination, primarily concerned with defense of the thesis, is administered as the last step before graduation.

All students are expected to give evidence of competence in the basic sciences, including one full year of undergraduate physics. Forty-eight hours of graduate credit constitute the minimum that will be acceptable toward graduation. A reading knowledge of a foreign language, equivalent

to one year of college-level study, is required of all students seeking the Master of Arts degree.

Southern Illinois and the adjacent area offers a wide variety of geological conditions ideal for individual study as well as research. Experienced staff members work closely with students and provide individual assistance when necessary. Graduate teaching, research, and field assistantships are available to qualified students. The Illinois State Geological Survey and several major companies in the petroleum industry actively support geological work in this area.

Government

The Department of Government has a well-balanced graduate program in political science. Graduate courses in government may be taken as a major or cognate leading to the Master of Arts degree, as a part of a social studies major toward the Master of Science in Education degree and as a major leading toward the Doctor of Philosophy degree.

The subject-matter fields in which graduate students concentrate their study are:

1. American Government and Policy
 - National
 - State
 - Local (city and county)
 - Law and Judiciary
 - Crime and Correction
 - Intergovernmental Relations
 - Legislative Process
2. Public Administration and Organizational Behavior
3. Political Process
 - Parties
 - Interest Groups (Labor) and Public Opinion
 - Voting Behavior
 - Legislative Behavior
 - Political Sociology
 - Psychology and Politics
4. International Affairs
 - International Politics
 - International Organization
 - International Law
 - American Foreign Policy
5. Comparative Politics
 - Comparative Government
 - Latin America
 - Western Europe
 - Russian and Eastern Europe
 - Middle East
 - South Asia
 - Southeast Asia
 - Far East
6. Political Theory & Methodology
 - History of Political Philosophy
 - American Political Thought
 - Methodology and Empirical Theory

All candidates for graduate degrees will be expected to select one of these areas as their major field and to demonstrate special competence both in that field and in a limited number of other areas of concentration. Application for admission to graduate study in government should be directed to the Graduate School. This application should be accompanied by: 1) a vita encompassing the student's academic and practical experience to date, 2) a broad statement of his purpose in undertaking studies for the M.A. or Ph.D., 3) three letters of recommendation from former teachers or supervisors. In the case of a Ph.D. applicant, at least two letters should be from former graduate professors including the director of previous graduate work, 4) three copies of a complete transcript of all undergraduate and graduate work, and 5) scores of the Graduate Record Examination (Verbal, Quantitative, and Field). The GRE will be waived temporarily only on the condition that it is physically impractical for the student to take the examination, as in the case of a foreign student; and that event, the student will be required to take the examination at the first opportunity after arrival on campus. Applications and supporting materials should be submitted at least eight weeks prior to the beginning of the quarter in which the student expects to take up residence. Departmental processing of applications for acceptance as a graduate student in government is the joint responsibility of the department's director of graduate studies and its graduate studies committee. The director of graduate studies serves as adviser for all graduate students until such time as an adviser is named for the individual student, which will normally be done not later than the end of the first quarter in residence.

Master of Arts Degree

Requirements for admission imposed by the department are in addition to those of the Graduate School. The department will ordinarily accept as candidates for the master's degree only those applicants who: 1) have graduated from an accredited four year college or university; 2) have completed a minimum of 24 quarter or 16 semester hours in the field of government or political science; 3) have a 3.7 (5-point scale) over-all grade point average, or alternatively, 3.9 over-all for the last two years of undergraduate work; and 4) have a 4.0 over-all average in government or political science. Applicants who do not meet these minimal requirements or their equivalent, but who do meet the minimum standards of the Graduate School, can be considered for acceptance only on petition to the department's graduate studies committee which, if granted will be accompanied by a statement specifying the course work that must be completed without credit toward the M.A. degree.

A minimum of 48 quarter hours of credit, no more than 9 of which may be for the thesis, constitutes the basic course requirements for the Master of Arts degree. At least 24 of these hours must be at the 500 level. The course work must be so planned as to include at least 8 hours of work in each of two areas other than the one in which the thesis is to be written. A student who completes only the minimum of 48 hours of course work may devote no more than 8 of those hours to courses outside the department unless the work is in a cognate field which has been approved as a replacement for one of the areas of concentration within the department. In the latter event, as many as 16 hours in outside fields may be counted within the 48 hour minimum.

Each candidate for a Master of Arts degree must include in his studies

the departmental course in the scope and method of political science Government 499.

A student must maintain an overall 4.0 (5 point scale) grade point average in order to be eligible for the Master of Arts degree, and no more than 9 hours of work with a grade of *C* may be counted toward the Master of Arts. A student whose work at any time falls significantly below this average may be dropped from the graduate program after consultation between his advisor and the director of graduate studies.

Proficiency in one modern foreign language is one of the University requirements for the Master of Arts degree. This proficiency must be demonstrated by passing the national Educational Testing Service foreign language examination in that language, or an equivalent examination approved by the department.

An adviser *must* be chosen and topic for thesis approved no later than the end of the second quarter of work. A thesis of the usual form and scope is required for the Master of Arts degree by the Department of Government. This requirement may be satisfied by an authorized internship report, of the same type and quality as a thesis. Additional course work will not be accepted in lieu of a thesis.

The final oral examination will cover the thesis and the major areas in which it was written, and it may also test the candidate's general competence in the field of government.

Doctor of Philosophy

Requirements for this degree imposed by the department are in addition to those of the Graduate School. The department will ordinarily consider only applicants who have successfully completed the work for a Master of Arts degree or its equivalent in government or political science, at an accredited college or university, with a 4.5 (5 point scale) grade point average in all courses that have been taken for graduate credit. Applicants whose previous graduate work was not primarily in government or whose academic record is not up to the standard indicated but who do meet the minimum standards of the Graduate School (4.25) may be considered for admission only on a petition to the department's graduate studies committee which, if granted, will be accompanied by a statement specifying the course work that must be completed without credit toward the Doctor of Philosophy degree before the applicant has unconditional standing.

At least one year (3 academic quarters) in residence is required prior to the administration of the comprehensive preliminary examination preceding admission to candidacy. The course work must be so distributed among the various areas of study as to satisfy departmental requirements and prepare the candidate for the preliminary examination.

At least one half of the course work must be at the 500 level. Government 500a is required. The student must also complete 8 hours of history of political theory. This requirement may be satisfied by previous undergraduate or graduate work. The student must also have completed at least one course in each of the six areas of concentration at some point in his academic studies, undergraduate or graduate.

The plan of studies approved for the student may include cognate work outside the Department of Government. Approval for a cognate field must be secured from his doctoral advisory committee.

Proficiency in two foreign languages, one language and statistics, one language and computer programming, or statistics and computer programming, is required of each candidate for the Doctor of Philosophy degree. The choice will be determined by the student in consultation with his advisory committee, and should be relevant to the student's graduate program. This requirement must be satisfied before the preliminary examination for admission to candidacy is administered.

Language proficiency must be demonstrated by passing the national Educational Testing Service foreign language examination in that language, or an equivalent examination approved by the department. Proficiency in computer programming must be demonstrated by satisfactory completion of the computer programming examination prescribed by the department. The statistics requirement may be satisfied by completion, with a minimum grade of *B*, of one of the following statistics courses or an approved equivalent: Guidance 505, 506, and 507; or Mathematics 410a,b, and c or d; or 480a,b, and c. The statistics requirement may also be satisfied by satisfactory completion of the statistics examination prescribed by the department.

The comprehensive preliminary examination is given only when the applicant has completed all required courses, has completed the required period of residence and has satisfied the language or equivalent requirement. The examination will be both oral and written, and must be completed within a two-week period. The student will be tested by his preliminary examination committee in four of the six areas of graduate study. Among the four, American government and policy and either comparative politics or international relations are required. Special emphasis in the broader areas may be permitted, but general competency is essential. Substitution of cognate areas is permitted, if approved by the student's advisory committee.

A dissertation showing high attainment in independent, original scholarship and creative effort must be completed in meeting the final requirements of the degree of Doctor of Philosophy. The final examination is oral and devoted primarily to a defense of the dissertation.

Guidance and Educational Psychology

The Department of Guidance and Educational Psychology offers programs at three levels. The Master of Science in Education degree, Sixth-Year Specialist's certificate program and Doctor of Philosophy degree in Education are awarded after completing an appropriate series of learning experiences in approved curriculum.

Admission and Advisement

Admission to the programs is in accord with requirements of the Graduate School. Persons seeking admission for the master's and specialist's degrees should make application to the Graduate School through forms which may be obtained from the department. Completed forms together with test scores constitute an admission dossier which is reviewed by a selecting committee. Admission is generally granted six weeks before the beginning of a quarter and applicants should file materials well in advance of a term in which they desire admission. Advisement for all programs of the department is decentralized and students are assigned to advisors of the faculty at the time of admission.

Master's Degree in Guidance

The master's degree program offers two 48-hour curricula. One in elementary guidance and one in secondary guidance. Both curricula are designed for persons seeking Illinois teacher certification and presume either prior completion of Illinois teacher certification curricula or current completion.

Master's Degree in Educational Psychology

A 48-hour curriculum in educational psychology is available for persons seeking preparation in the analysis of learning and child study. It is not related to teacher certification but is intended to provide a basis for advanced work in educational psychology at the doctoral level.

Sixth-Year Specialist's Certificate

Sixth-Year Specialist's certificates are offered in guidance (elementary or secondary school emphasis) and school psychology. The programs in guidance are offered through the department and are intended to provide school counselors with additional background and training to qualify for administrative or special counseling positions in school guidance programs. The School Psychology program is offered in conjunction with the Psychology Department in the College of Liberal Arts and Sciences. This program is intended to prepare students to qualify for school psychology internships and as certifiable school psychologists.

Admission to the guidance program is through the Guidance and Educational Psychology Department. Admission to the school psychology program is through either the Psychology Department or the Guidance and Educational Psychology Department. A master's degree or its equivalent is required for admission to each program.

Doctor of Philosophy

Guidance and Educational Psychology participates in the doctoral program in education in the functional area of educational psychology. Students interested in counseling, educational measurement and statistics, and human learning may pursue an equivalent of a major concentration within the area program. For additional information on the Ph.D. in education, see the preceding section entitled Education. Inquiries should be addressed to the coordinator for the area of educational psychology in the College of Education.

Health Education

Master of Science in Education

Master of Science in Education degree programs are offered in health education. The candidate may select from three areas: school health education, community health education, and safety education. A core of 20 quarter hours in health education is required of all master's degree candidates.

SCHOOL HEALTH AND SAFETY EDUCATION

In school health and safety education, two programs may be followed: (1) a minimum of 24 hours in health education, a minimum of 16 hours in a minor field, and 8 hours, with departmental approval, from the

graduate courses in the University; or (2) a maximum of 40 hours in health education and 8 hours from offerings in the field of education having departmental approval.

COMMUNITY HEALTH EDUCATION

The program in community health education extends over four quarters of study with 60 quarter hours required for the degree. In addition to the common core of 20 hours in health education required of all master's candidates, the community health education concentration requires Health Education 488, 489, and 500; a minimum of 4 quarter hours in foods and nutrition; 4 quarter hours in communications or group work methods; a minimum of 1 quarter as a field intern (Health Education 590); and, electives to complete 60 quarter hours.

Doctor of Philosophy Degree

The Doctor of Philosophy degree in education with concentration in health education is provided through the functional areas of (1) curriculum and instruction and (2) educational administration and social and philosophical foundations. Students wishing to pursue the advanced degree will receive individual guidance from the graduate adviser in health education appointed through the appropriate functional area.

Higher Education

The Department of Higher Education offers programs leading to the Master of Science in Education degree and courses contributing to the Doctor of Philosophy degree in education.

Specialties within the Doctor of Philosophy degree program include: academic administration, college student personnel administration, business affairs administration, and institutional and coordinating agency activities. For further details, including information on the work and financial assistance available through administrative internships for doctoral students, write the department chairman.

Highly qualified students enrolled in any program in the department are eligible for fellowships granted through the Graduate School. For further details write the chairman, Department of Higher Education.

Master of Science in Education degree programs in higher education include concentrations in college and university administration, college and university business administration, community college and post secondary school, technical institute teaching, and college student personnel work.

All masters degree programs require 48 quarter hours of study with the exception of the college student personnel program which requires 72 quarter hours extending over two academic years. Two programs, community college and technical institute teaching, and college student personnel work, require that the student serve an on-the-job-internship. In the case of the community college and technical institute teaching program this internship is served in the junior college district of St. Louis, St. Louis county, Missouri, as part of a cooperative program. It is also expected that students in this program will also serve as teaching assistants in a cooperating department of the University while in residence. Students in the student personnel program serve as half-time paid positions in the division of student personnel for each of two academic years.

History

The Master's Degree

History may be chosen as a major or minor for the Master of Arts degree and as the subject-matter major for the Master of Science in Education degree. Four major areas of historical study are offered: American, Latin American, European, and Asian. Candidates for the M.A. degree must consult with the graduate adviser in the Department of History before registering for courses. Candidates for the M.S. in Education degree must consult with the appropriate adviser in the Department of Secondary Education before registering for courses.

For the Master of Arts degree in history, 48 quarter hours of satisfactory graduate work are required; at least 24 of these 48 hours must be on the 500 level. Within this general requirement, at least 32 quarter hours must be in appropriate history courses, with at least 16 of the hours on the 500 level. The remainder of the hours may be taken in courses on the 400 level. The Department of History strongly recommends that each candidate be enrolled in at least one 500-level course each quarter during his first three quarters in the program. A candidate for the Master of Arts degree must pass a reading examination in a modern foreign language. He may elect to fulfill the research requirement through either the thesis or the non-thesis program.

A candidate in the thesis program should, with the approval of the chairman, select a thesis adviser and a thesis topic by the end of his second full-time quarter in the program. As many as nine quarter hours may be in thesis research. The candidate must submit an acceptable thesis, and pass a comprehensive oral examination covering his fields of specialization and his thesis.

A candidate in the non-thesis program must receive an *A* or *B* in two separate research seminars, and copies of his research paper from each of these seminars must be filed with the department and the Graduate School. Each candidate is required to pass a comprehensive written examination in two fields of history selected from the ten fields available for master's candidates under the four major areas.

The Doctor of Philosophy Degree

Candidates in history for the Doctor of Philosophy degree must complete at least two years of full-time graduate work beyond the bachelor's degree or one year beyond the master's degree (or its equivalent), and submit a satisfactory dissertation. The courses and hours of credit necessary for a doctoral student to prepare for preliminary examinations will be determined by the student's advisory committee. The goal is to develop competence in the five selected fields in which he will be examined.

The department requires all candidates to pass a reading examination in two foreign languages. With the approval of the department, statistics or computer programming may be substituted for one language. The language requirement must be satisfied prior to the preliminary examination.

The department offers advanced study in fifteen fields of history which are grouped in four major divisions.

Division I—American History

Colonial

United States, 1776–1865

United States, 1865–1919

United States, 1919 to present

Mississippi Valley and Illinois

Division II—Latin American History

Colonial

Middle America

South America

Division III—European History

Ancient

Medieval

England since 1600

Europe, 1450–1815

Europe, 1789 to present

Division IV—Asian History

East Asia

South Asia and Southeast Asia

For his preliminary examinations, the student will present five fields; either all five in history or four in history and one in a minor. Not more than three of these fields may fall within any one of the above divisions. The preliminary examinations will consist of a three-hour written examination in each of his five fields and a two-hour oral examination covering all fields.

After completing his course work, fulfilling the foreign language requirements, and passing the preliminary examinations, the student will be admitted to Ph.D. candidacy and devote his time to the dissertation. Dissertation subjects must be chosen from either American history or Latin American history. Subjects in American history may fall within any field listed in division I above. Subjects in Latin American history should come from the following areas: regions of special concern to the United States (e.g. the Caribbean), rapidly developing regions (e.g. Mexico), and underdeveloped areas (e.g. the Andean states), with major attention being given within the nineteenth and twentieth centuries. The final oral examination will cover the field of the dissertation and related matters.

Assistantships and Fellowships

Fellowships and teaching assistantships are available to qualified graduate students. All carry stipends, and remission of tuition. Applications for these awards should be submitted by February 1.

Additional information concerning the graduate program in history may be obtained by writing to the chairman, Department of History.

Home Economics

The Master of Science and Master of Science in Education degrees with a major in home economics are available with specializations in:

- . Clothing and Textiles (including interior design)
- . Food and Nutrition
- . Home and Family
- . Home Economics Education

Work toward the Doctor of Philosophy degree is available in home economics with specialization in home economics education. The Letitia Walsh award-loan of \$5,000 is available for Doctor of Philosophy candidates in home economics.

Prerequisites for Admission to Graduate Study

1. Admission to the Graduate School.
2. Completion of a curriculum in home economics or in a field related to the area of specialization, such as biological, physical, and social sciences, art, business, and/or communications. When necessary, deficiencies may be made up concurrently.
3. Satisfactory scores on the Graduate Record Examination.
4. An undergraduate grade point average equivalent to 3.70 or above. Conditional admission may be granted where the grade point average is above 3.40 but below 3.70.
5. A scholastic record that indicates ability to pursue advanced study in the chosen major field.
6. Demonstrated ability to write effectively as indicated by scores on English composition. In the case of foreign students an official statement showing sufficient proficiency in English is required.
7. The student attains full graduate standing in home economics when he has met the above requirements and has made satisfactory scores on the Ohio State Psychological Examination.

Requirements for the Master of Science in Home Economics

In addition to the general requirements of the Graduate School, requirements for the master's degree in home economics are:

1. Thirty to thirty-two quarter hours in the field of specialization plus 16-18 quarter hours in approved related fields with a minimum total of 48 quarter hours, 24 of which must be in courses at the 500 level.
2. The required courses for all master's degrees in home economics are: Home Economics Education 415-1 or equivalent for transfer graduate students, Guidance 505 or equivalent, and Home Economics Education 500-4 or equivalent. A thesis or research paper is required.

Additional requirements may be specified for each major. It is expected that the individual program will be planned by the student and the adviser to supplement the student's previous training and experience, with due consideration given to the student's objectives.

Requirements for the Master of Science in Education

Thirty-two hours in the field of home economics are required for a major, with a 16-hour minor in education. The student's graduate committee may require a program including additional credit. Required courses are Guidance 505 or equivalent, Home Economics Education 415, 500, 506, 599 (Thesis). As an alternative to writing a thesis, specific courses at the graduate level as recommended by the student's advisory committee and approved by the dean of the Graduate School may be taken; a student who does not write a thesis must submit to the Graduate School for its permanent records, a copy of a research paper as evidence of knowledge of formal research techniques.

Prerequisites for Admission to Advanced Graduate Study

1. Prerequisites 1, 2, 3, 5, and 6 as listed above under Admission to Graduate Study.
2. Recommendations from three or four former teachers or supervisors whose names the student has submitted.
3. Admission is granted to a student whose grade point average is 3.70 or above and whose scholastic record in the chosen major field indicates ability to pursue advanced study.

Requirements for the Doctor of Philosophy

In addition to the general requirements of the Graduate School, requirements for the Doctor of Philosophy degree in Home Economics with specialization in home economics education are:

1. A minimum of 144 quarter hours, including the dissertation, beyond the Bachelor of Science degree is required; this may include all or part of the 48 hours earned while working for the master's degree. A minimum of 48 hours is required from related fields outside of home economics.
 2. Qualifying interview—the student shall request a meeting of the temporary advisory committee during the first or second quarter in residence, depending on whether he is carrying a full-time or a part-time program.
 3. Competence in at least one foreign language and in statistics. The candidate is expected to satisfy these requirements before taking the examination preliminary to starting dissertation research.
 4. The preliminary (comprehensive) examinations—a candidate for the Doctor of Philosophy degree shall make application for the oral and written examinations after he has completed the above requirements and approximately two-thirds of the advanced course work.
 5. Admission to candidacy—after successfully passing the preliminary examinations and receiving provisional approval of the tentative plans for the dissertation, the student will be admitted to candidacy for the Doctor of Philosophy degree. This should be done before the third quarter preceding the anticipated date of graduation, and no student will be approved to graduate unless six months have elapsed between admission to candidacy and graduation.
 6. Satisfactory completion of a final examination at which the student will defend the dissertation.
- The time between the comprehensive and final examination for any student cannot exceed five years.

Instructional Materials

The Department of Instructional Materials offers courses of study leading to the Masters of Science in Education degree. Concentration of study may be in any of the three areas: instructional materials, audiovisual, or library service. The concentration of instructional materials is recommended for most students, for it gives a broader base of study and the public schools are moving toward instructional materials centers rather than toward the separate areas of audiovisual and library service.

The graduate major concentration in instructional materials, toward the Master of Science in Education degree, involves professional training in both audio-visual education and school library service. It meets the state and national certification standards for full-time school librarians and the standards recommended by the Department of Audio-Visual Instruction of the National Education Association. In Illinois every school librarian is also required to have a teaching certificate.

Fifty-two hours are required for the major. No minor is required. At least 26 hours must be in courses numbered 500 or above. The following courses are required: 413, 417, 510, and 514.

The minor in school library service is offered for students taking a major in another area. This, consisting of a minimum of 16 hours, is intended primarily for teachers who wish to obtain an appreciation of litera-

ture for children and adolescents. It is not intended for the preparation of professional school librarians. The following courses are required: 406, 514, and at least 4 hours from 420, 510, 530, or 576.

The Doctor of Philosophy degree in education with a concentration in learning resources may be taken either in the functional area of educational psychology or curriculum and instruction. The procedures and qualifications are those established by the functional areas and information can be obtained by writing to the coordinator of the educational psychology or curriculum and instruction functional area, College of Education.

The doctoral program in learning resources is designed for those individuals who wish to become directors of instructional materials in a large school system, a college, a university, or industry where the scope of the program will require, under the director, separate specialists in the audio-visual and library fields. The graduate of this program would be able to plan long range activities for his unit, work with curriculum committee with administrators, and with specialists such as psychologists, research directors, and directors of reading centers.

For further information concerning major and minor programs, work experiences, job opportunities, or other related matters, consult the chairman, Department of Instructional Materials.

Inter-American Studies

Course work in the inter-American studies field is offered by the Departments of Anthropology, Economics, Foreign Languages, Geography, Government, and History.

Prerequisites for the Master of Arts degree include a command of the Spanish language adequate to meet the student's needs for research and communication within the area of his program. The director of the Latin American Institute and the supervisory committee will determine the student's linguistic competence on registration and, where necessary, specify what the student must do to improve his proficiency in Spanish. Whenever the student's program involves the need for Portuguese or French, he will also need to demonstrate or attain satisfactory proficiency in that language. In addition, a satisfactory basic preparation in inter-American studies is required.

Requirements for the Master of Arts Degree

1. The completion of at least 30 hours of courses acceptable for graduate credit in one of the above listed departments.
2. The completion of a minimum of 18 hours of related studies as approved by the student's supervisory committee which will meet the requirement for a minor in the Latin American Institute. A maximum of three areas is permitted in the field.
3. The completion of a satisfactory thesis on a Latin American topic in the major for which 5 to 9 hours of credit are given.

A minor in inter-American studies for those students with a major in a department outside of the institute will consist of a minimum of 18 hours to be taken in two of the participating departments. Specific course programs will be worked out by the director of the institute in consultation with the chairmen of the departments involved.

In every case the student's final program must be approved by the

graduate supervisory committee, acting under policies established by the Latin American Institute and the Graduate School.

Journalism

Course programs in journalism leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees are offered by the Department of Journalism. Each graduate student's total program will be designed specifically for that student by the student in consultation with his academic adviser. Although the mere accumulation of credit hours should not be the objective of any student, minimum course requirements are set forth for both the master's and Ph.D. degrees.

Master's Degree

Candidates for the master's degree must complete a minimum of 48 quarter hours of graduate work, including the thesis. Approximately half of the course hours must be earned in journalism and half in non-journalism disciplines. Each student will be challenged to demonstrate a capacity for investigation and independent thought in his thesis.

Doctor of Philosophy Degree

Minimum course requirements for the Ph.D. degree will include 96 quarter hours beyond the bachelor's degree. Students generally will include a minimum of 36 quarter hours in journalism, 24 quarter hours in each of two non-journalism areas of study, and 12 quarter hours of electives. The student will complete at least 48 quarter hours of course work beyond the master's degree. These course requirements do not include credits earned in dissertation, Journalism 600.

Each student will propose to his academic adviser before registering for his third quarter a listing of courses to be included in his study program with a statement of justification for these courses. Revisions may be made in his course of study only with the written approval of his academic adviser. In preparing a course proposal, the student is encouraged to deviate from the 36-24-24-12 hour course requirements outlined herein when to do so enables him to devise a rigorous program which best meets his academic and professional needs.

The Ph.D. student, in consultation with his academic adviser, will select two from among these five research tool combinations:

Journalism 432, 433a

Journalism 590, History 451, Government 499

Guidance 505, 506, 507 or Mathematics 410a,b,c

Computer Programming

Modern foreign languages (one or two from among those approved by the Graduate School)

A student may propose other research tools for the consideration of his academic adviser who, in consultation with the department's graduate faculty executive committee, may approve, modify, or reject the proposal. Courses taken to satisfy research tool requirements may not be counted for Ph.D. degree course credits.

Doctoral students who enroll, either for course credit or for research tool requirement, in one of two major research areas within the department (behavioral and historical) will be encouraged to take at least the basic course in the other research area.

In addition, each student will be required to undergo written and oral preliminary examinations in both his journalism and non-journalism areas of study; prepare a dissertation based on original, scholarly research; star oral examination over the dissertation; and fulfill all Graduate School requirements.

Mathematics and Mathematical Sciences

Graduate work in mathematics is offered leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Major or minor work for the Master of Science in Education degree and minor work for graduate degrees in other fields are also offered. In addition to the general rules, regulations, and requirements of the Graduate School, the following specific requirements pertain to the various degrees available with a major in mathematics. The department should be consulted for complete details.

Master of Arts Degree

1. Course work must include: Mathematics 501a,b; 520a,b; 530a,b; and 555a,b. Graduate credit must total at least 48 hours.
2. Successful completion of the ETS Graduate Foreign Language Examination in French, German, or Russian.
3. A thesis carrying 5 to 9 hours credit in Mathematics 599.
4. Satisfactory performance on a written examination (usually given in the spring quarter) in three of the following areas, including (1) and (2) in any case: (1) Real Analysis (452a,b,c; 501a,b,c); (2) Algebra (421a,b; 520a,b,c); (3) Topology (530a,b); (4) Probability and Statistics (480a,b,c or 483a,b,c); (5) Complex Variables (555a,b,c).
5. Satisfactory performance in an oral examination over the thesis and such other material as the examining committee may deem appropriate.

Master of Science Degree

1. Course work must include the following: Math 419a,b; 421a,b; 433a; 452a,b,c; one sequence from Math 426a,b; 475a,b; 480a,b; 483a,b; at least three 500-level sequences, one of which includes the c course. Graduate credit in mathematics must total at least 48 hours.
2. Demonstrated reading competence in mathematics in one of the following languages: French, German, or Russian; by an examination for the Master of Arts as described above or by an examination administered by the Department of Mathematics.
3. A research paper carrying 3 hours credit in Mathematics 595 or the successful completion of a three-quarter graduate seminar, carrying a total of 4 hours credit.
4. Satisfactory performance on a written examination in 419a,b; 421a; 433a,b; 452a,b,c; and in one 500 level a,b,c sequence.
5. Satisfactory performance in an oral examination over the research paper and such other material as the examining committee may deem appropriate.

Master of Science in Education Degree

This degree is given in cooperation with the Department of Secondary Education, with the Department of Mathematics administering the major in subject matter.

1. A minimum of 32 hours of mathematics is required, including Mat-

atics 547 and 592. Courses must be taken that will provide competence algebra, analysis, geometry, and probability. Specific courses are chosen fit the background and needs of individual students.

2. A research paper in mathematics education is required and may be written in connection with course 592.

3. A comprehensive written examination over mathematics and education must be passed satisfactorily.

Doctor of Philosophy Degree

1. A master's degree in mathematics indicating performance acceptable to the department at the level of graduate work described under 4 for the Master of Arts degree or satisfactory performance on a qualifying examination comparable to that degree.

2. Demonstrated reading competence in mathematics in two of the languages: French, German, or Russian. This will ordinarily be done as under item 2 for the Master of Arts degree.

3. At least 48 hours of course work beyond that required for the master's degree; at least 24 hours of the 48 must be at the 500 level. At least 18 hours of the 48 must be in one of the fields listed below, and 9 hours of the 48 must be in each of two other fields.

Algebra, Analysis, Applied Mathematics, Differential Equations, Geometry, Logic, Number Theory, Probability and Statistics, Topology.

4. Satisfactory performance on a preliminary examination (generally consisting of both written and oral parts). The material of the examination will be determined by the student's advisory committee.

5. A dissertation (representing at least 36 hours of credit in Mathematics 600) demonstrating the candidate's capacity for original and independent research in an area of concentration chosen from the nine listed in item 3 above. The candidate will also be examined orally on his dissertation.

Microbiology

Graduate courses in microbiology may be taken as a major or minor leading to the Master of Arts and Master of Science degrees, or as a part of a biological sciences program leading to the Master of Arts, Master of Science, and Master of Science in Education degrees.

The Doctor of Philosophy degree in microbiology will be awarded to a candidate in recognition of achievement in independent research and in advanced studies. His original contribution to knowledge, evidenced in dissertation, together with a superior comprehensive scholarship record and satisfactory completion of prescribed examinations are the criteria for the degree. Emphasis will be placed on his critical evaluation and familiarity with, the existent developments in microbiology and related areas of study.

The Department of Microbiology and the Biological Research Laboratory offer facilities for research in microbial genetics, cytology, radiobiology, physiology and biochemistry of microorganisms, medical microbiology, immunology, and virology. In addition to the library facilities, reprint collections covering many topics in microbiology are available for student use.

To be eligible for the Doctor of Philosophy degree, the student must satisfy the following requirements: (1) He must complete at least 144

hours of graduate work and research. Credit for research may not exceed 60 of the 144 hours; (2) He must demonstrate his proficiency in statistics and his ability to read, with reasonable facility, scientific literature in two modern languages; (3) He must pass the qualifying examination and a final oral examination; and (4) He must submit an approved dissertation based on his research.

A minor may be elected as part of a doctoral program in microbiology, subject to approval of the department, from courses in any program which constitute a major for the master's degree. A minor in microbiology for the doctorate in another biological science consists of general microbiology and 20 hours selected from courses offered and approved by the department.

Molecular Science

Graduate work in molecular science may be taken as a major or minor leading to the Doctor of Philosophy degree. This program, an interdisciplinary program with a core in theoretical and applied physics, presently includes research in the areas of atomic-molecular physics, biophysics, crystallography, geochemistry, materials science, mathematical physics, molecular genetics, nuclear physics, and solid-state physics. It affords the student a unique opportunity to work with the research faculty and facilities in related areas throughout the University and to specialize, if he chooses, in problems embracing several academic disciplines. A molecular science committee appointed by the dean of the Graduate School from eligible graduate faculty members of the various interdisciplinary areas is a continuing body for overseeing and evaluating the program. The chairman of the Department of Physics administers the program, subject to the policies set forth by the molecular science committee, the Graduate Council, and the dean of the Graduate School.

In addition to the general rules, regulations, and requirements of the Graduate School, the following specific requirements pertain to the Doctor of Philosophy degree in molecular science:

Admission to the Program

1. A master's degree or equivalent from any area of the physical and life sciences, engineering, or mathematics is required for admission to the program.
2. Competence in French, German, or Russian, as demonstrated by passing the ETS Graduate Foreign Language examination is required for admission to the program. Another language, highly pertinent to a particular research area, may be substituted if a formal petition is approved by the molecular science committee. Passing scores on the ETS exams are determined by the Graduate School.

Admission to Candidacy

1. Passage of a preliminary examination, both written and oral in the four core areas of theoretical and applied mechanics, theoretical and applied electrodynamics, quantum theory, and statistical physics, and in one speciality area selected by the student.
2. Demonstrated competence in a second research tool. This may be accomplished through an ETS examination in a foreign language, or satisfactory completion of the certification procedures for statistical computer programming as administered by the Graduate School.

Dissertation

1. A dissertation and its defense with distinction before a committee. The Administrator of the molecular science program should be consulted for complete details.

Music

The master's degree in music consists normally of a total of 48 hours of work in an area of specialty outlined below. Further work may be required in certain cases. Candidates for the Master of Music, Master of Music Education degree, or the Doctor of Philosophy degree in education who wish to choose applied music courses as electives will take the 400-series course in their major instrument or voice. Applied music majors in the Master of Music curriculum will take the 500-series course in their major instrument or voice for 4 hours per quarter. These are artist-level courses, and admission to them and to the degree program must be obtained from the chairman of the department after passing a jury examination.

Proficiency examinations will be given to all entering students and comprehensive examinations will be administered during the terminal quarter. Please consult the *Handbook for Graduate Study in Music* for more detailed information.

Master of Music Degree

Requirements include 18 hours in the major area for history-literature and theory-composition, and 12 hours for applied major concentration; Music 501-3, 502-6, 599-3 to 9 (thesis), and electives in music to make a total of 48 hours.

Thesis credit for the applied major may be met by presenting a full ritual for 6 hours credit and a research document for 3 hours credit.

Master of Music Education Degree

A minimum of 12 hours must be in music education courses. A maximum of 8 hours may be elected in fields outside music after consultation with the adviser. Other requirements include Music 501-3, 503-3, and 599-9 (thesis, or 9 hours of course work as approved by the director of graduate studies), and electives in music to make a total of 48 not less than hours, of which 9 hours must be in the areas of graduate theory and/or music literature. At least two quarters of ensemble experience are required and can be counted as part of the major.

Doctor of Philosophy Degree

This doctoral program, in education, consists basically of 96 hours, including 30 in general education, 30 in music education and general music courses, and 36 in dissertation. Specific courses depend upon individual needs and will be determined through consultation with the student's program committee. The dissertation may be in the field of music education but should demonstrate general educational research techniques. To be admitted to this program, a candidate must have earned a 4.50 grade point average at the master's level in music and must score 50 per cent or above on the Miller Analogy test. Application for admittance to this program may be made through either the College of Education or the Department of Music.

For specific repertoire requirements in each course see the Applied Music Appendix of the Department of Music.

Philosophy

The Department of Philosophy offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Graduate courses in philosophy may be used also as a minor in programs leading to the Master of Arts or Master of Science in Education degrees. Students who do not plan to continue work in philosophy beyond the master's level are encouraged to elect a graduate minor or to combine philosophy with another subject in a 60-hour double major.

The department expects an applicant for admission to its graduate program to have had at least 24 hours' work in philosophy or closely related theoretical subjects, including at least one quarter in ethics, one in logic, and a year in the history of philosophy. The department may waive a portion of this credit requirement in favor of maturity and of quality and breadth of academic experience. The applicant will be required to make up serious background deficiencies by taking appropriate undergraduate philosophy courses without credit.

The Department of Philosophy requires the candidate for a master's degree to present a thesis, for which 9 hours of credit are allowed. The candidate must pass two examinations: a written examination covering the nature and proffered solutions to the persistent problems of philosophy as dealt with by major philosophers from Thales to the present and an oral examination devoted chiefly to the thesis. In the written examination emphasis will be placed on such classical figures as Plato, Aristotle, Descartes, Spinoza, and Kant, but the student will be expected to answer questions involving at least two recent philosophers, one of whom must be an American.

A reading knowledge of one foreign language, usually French or German must be demonstrated by passing the Doctor of Philosophy proficiency examination in that language.

Applicants for the Doctor of Philosophy degree in philosophy should submit with their application forms scores for the Graduate Record Examination. The department may, where other evidence of competence seems so to warrant, accept a candidate upon the condition that he later submit acceptable scores.

At the time of his acceptance in the program the student will be assigned an advisory committee who will help him plan a program of study designed to prepare him for admission to candidacy. After the student has accumulated at least 36 hours of credit beyond the master's degree, and before he begins work on the dissertation, he must take a written preliminary examination on the thought of one major figure in the history of philosophy and in the following four areas: history of philosophy; logic, methodology, and philosophy of science; metaphysics and theory of knowledge; and value studies.

Before he is allowed to take the preliminary examination the student must have demonstrated reading proficiency in two foreign languages.

After he has passed his language examinations and the preliminary examination and has completed 48 hours of work beyond the master's degree, the student is admitted to candidacy and assigned a doctoral dissertation committee which will supervise the research and writing.

ading to the dissertation. After the dissertation has been accepted by the committee, the student is given an oral examination on the dissertation and related topics.

The department has available each year a number of assistantships for qualified graduate students. Applications for these assistantships should be sent to the department before February 15 of the academic year preceding that for which the application is made. An effort is made to give every candidate for the doctor's degree supervised experience in teaching elementary work in the field of philosophy.

Physical Education

Graduate courses in physical education may be taken as a major or minor toward the Master of Science in Education degree or the Doctor of Philosophy degree in education.

Master's Degree

The departmental requirements for unconditional admission as a master's degree candidate are:

1. Fulfillment of the requirements for admission to the Graduate School.
2. Presentation of at least an undergraduate minor (preferably a major) in physical education.
3. Presentation of at least one undergraduate course in anatomy, physiology, or kinesiology and at least one in educational psychology or psychology of the particular field of the student's specialty.
4. Possession of the ability to teach and demonstrate an acceptable variety of skills and techniques in physical education activity.

A student may be conditionally admitted to the program and may be permitted to do graduate course work while he removes deficiencies.

Requests for transfer of credits from other institutions will be considered only before admittance into this program.

Minor

Students with a major in a related area may take a minor in physical education. This consists of 16 hours chosen from one of the areas of concentration in consultation with a physical education adviser.

Core Courses

The Department of Physical Education offers programs in several areas. Core courses common to all specialties are P.E. 500, 503, and either 504 or 599. The courses are designed to provide common experiences to all students regardless of their specialization.

Area of Specializations

The Experimental Physical Education Program

This program is intended to prepare students to enter advanced study and to perform scholarly research which emphasizes depth in a selected science. A student, in conference with his adviser, designs a program which satisfies his special interest.

The Professional Physical Education Program

This program is designed to develop a high level of competency in teaching physical education in colleges, secondary, and elementary schools.

The student, in conference with his adviser, designs a program which satisfies his special interest.

3. The Applied Physical Education Program

The purpose of this program is to prepare coaches of athletic teams (1) increase their knowledge of fundamental principles which are basic to the coaching and administration of athletics and (2) to develop a broad perspective of the role of athletics in the total educational environment.

Doctor of Philosophy Degree

One may pursue a program of study leading to a Doctor of Philosophy degree in education through the functional area of curriculum and instruction.

The department qualifications for admission to advanced graduate study are:

1. Fulfillment of the requirements of the Graduate School and the College of Education.

2. Presentation of professional course work equivalent to the University's undergraduate and master's programs in physical education.

A student may be permitted to start advanced graduate work while making up deficiencies.

Three years of full-time graduate study after obtaining a bachelor's degree or two years of full-time graduate study after a master's degree (or its equivalent) constitute the minimum requirement for the doctorate. The student and his adviser will determine a pattern of course work which will equip the student in physical education and its allied fields, foundations of education, cultural courses outside the area of education, and independent research.

The program of studies beyond the master's degree must contain a majority of course work at the 500 level or above, as well as a required departmental core of 12 hours. Included in his study are all general requirements of the functional area.

Competence in research tools as required by the Graduate School must be demonstrated.

The procedure for beginning a program of study leading to a Doctor of Philosophy degree is as follows:

1. Submit an application for admission, with transcript or transcripts, to the Graduate School.

2. Apply for admission to the Department of Physical Education as well as to the appropriate functional area.

3. If admitted, the coordinator of the functional area will arrange for proper counseling and programming in the field of specialization.

Physics

Graduate work in physics may be taken leading to the Master of Science, the Master of Science, and the Doctor of Philosophy degrees. Graduate courses in physics may also be taken as part of a physical sciences program toward the Master of Science in Education degree.

In addition to the general requirements of the Graduate School, there are other specific requirements for the master's degree in physics as follows:

1. A reading knowledge of French, German, or Russian
2. 511 (or mathematics equivalent), 510a,b, and 530
3. A thesis based on research of 9 additional hours of course work in physics at the 500 level and a research paper, in lieu of the thesis.

The doctoral program is within a University-wide framework of molecular science with a core in theoretical and applied physics. See molecular science description for specific details. The physics program is a flexible one, designed to give the student a background in depth in the general principles and techniques of modern physical theory and at the same time to satisfy his individual interests and needs. Properly qualified graduate students from the areas of the physical sciences, life sciences, engineering and mathematics are invited to apply for advanced study wherever the student's interests may be interdisciplinary with physics; i.e., biophysics, chemical physics, geophysics, materials science, and mathematical physics. One research emphasis in the department is in the general field of molecular physics; dissertation topics in this field include studies of motional, structural, electrical and magnetic properties encountered in liquid, surface and large molecule physics. Theoretical research in such areas as electromagnetic theory, thermodynamics, statistical mechanics and quantum mechanics is being tempered to a considerable degree by the directions taken in the experimental aspects of the molecular science program.

Physiology

Graduate courses in physiology may be taken leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Graduate courses in physiology also may contribute to a major in biological sciences toward the Master of Science degree, and to one in biological sciences toward the Master of Science in Education degree.

The Graduate Record Examination must be taken before admission to the graduate program for doctoral students, and it is prerequisite to graduation for master's students.

The graduate prerequisites at the master's level include the equivalent of an undergraduate major in biological sciences plus inorganic, analytic, and organic chemistry and a minimum of one full year each of physics and mathematics. Qualified students are also encouraged if they have training in chemistry, physics, mathematics, psychology, or engineering.

For a master's degree in physiology, a student must ordinarily work two years, demonstrate competence in one foreign language, and present an acceptable thesis based upon original investigation. Equivalent work completed elsewhere can be accepted in part. The language is waived for the M.S. degree, and the thesis is waived for the M.S. in Education.

Graduate courses should be elected from other departments such that a major of about 32 hours and a minor of about 16 hours are attained. Because of the importance of biochemical and biophysical knowledge to physiology, students are urged to select their minors in those areas. Other biological sciences may also be acceptable, after consultation with the chairman of the department.

Training is provided in cellular, comparative, and mammalian physiology. Training is also available in human anatomy, electron microscopy, and biophysics. Entering students are urged first to obtain a basic knowl-

edge of the whole field and then to specialize after being advised by the chairman of the department or departmental graduate adviser.

Students entering the doctoral program should ordinarily have at least the same prerequisites as those entering a master's program, except that courses in calculus and physical chemistry are highly recommended. Students with prior major concentrations in chemistry, physics, or engineering, but little training in biological sciences, are equally eligible for admission to the program.

A competence in two of the prevailing research tools plus a written qualifying examination are necessary for admission to doctoral candidates. The program is formulated upon entrance in consultation with the department chairman or his designated adviser. The dissertation adviser and advisory committee guide the student and periodically evaluate the program thereafter.

The total program must be provisionally formulated upon entrance, and evaluated periodically thereafter, in consultation with the chairman of the department or the major adviser.

Three years of full-time graduate study after obtaining the bachelor's degree, or two years after the master's degree (or its equivalent) usually constitute the minimum requirements for the doctorate. A dissertation is required and also a final oral examination.

Plant Industries

The Master of Science degree can be earned in the Department of Plant Industries in the general fields of soils, field crops, and horticulture. Graduate courses in plant industries may also be taken for a Master of Science degree minor.

It is customary to require supporting courses in botany, microbiology, chemistry, statistics, and other areas essential to a problem in the student's chosen field and to prepare him for acceptance for the Doctor of Philosophy degree if he has that potential. Once the general field has been selected, the research and thesis may be completed in any one of the many divisions of that field. In horticulture, for example, the research and thesis may be in vegetables, tree-fruits, small-fruits, ornamental plants, or turf management; in soils, the problem may relate to fertility, soil physics, soil microbiology, soil chemistry, or soil and water conservation; in field crops, the problem may be directed toward crop production and management, weeds and pest control, or plant breeding and genetics. Often two of these more restricted divisions can be combined for study on one problem.

Important research facilities are available in the department through three cooperative experimental farms. Within the Department of Plant Industries there are adequate greenhouse facilities adjacent to the agriculture building for experimental work. In addition, approximately eighty-three miles north of Carbondale the department operates the Southwestern Farms as an agronomy research center. The cooperative units include, the Illinois Horticulture Experiment Station, and the Agronomy Research Center which are operated cooperatively with the University of Illinois; and the Small Fruits Research Station which is operated cooperatively with the United States Department of Agriculture, Agriculture Research Service, Crops Research Division.

The purpose of the Horticulture Experiment Station is to provide facilities for research and demonstration with fruit, vegetable, and ornamental plants.

mental crops. Specific projects undertaken include the testing, breeding, and developing of fruit, vegetable, and ornamental varieties adapted to southern Illinois; studying fundamental problems related to cultural methods and to rootstock-variety combinations; and providing demonstration areas for students and growers.

The purpose of the Agronomy Research Center is to provide facilities for soils and crops research and demonstrations. Projects are conducted on a cooperative basis by personnel of the University of Illinois and Southern Illinois University, or independently by personnel of either institution. Studies are conducted to develop acceptable varieties of field and forage crops, emphasizing their adaptability to southern Illinois; and to seek answers to fundamental problems in the management of soils and the culture of crops. Demonstrations are developed for observation by students and other interested persons.

The purpose of the Small Fruits Research Station is to provide facilities for research investigations on breeding, production, and disease control of strawberries, blueberries, brambles, and other small fruits.

The purpose of the Southwestern Farms Experiment Station is similar to that of the Agronomy Research Center with respect to soils and demonstration but includes forestry research and demonstration as well. Because of the diversity of areas of interest in the Department of Plant Industries, no general curriculum is applicable for all graduate students. Each graduate student's background is studied carefully by a committee chosen for his specific area of interest, and his approval for admission to study in the department is made upon the condition that weaknesses in his background be satisfied. When the student is on campus he is invited to attend the committee's discussion so that he understands fully why every requirement is made.

The Department of Plant Industries requires for approval to do graduate work that a student have not less than a 3.50 grade point average in the last 50% of his work, which must include 20 hours in his major undergraduate field. The undergraduate major may be in any area, but the undergraduate area has much to do with the preparatory courses required by his advisory committee.

An oral examination and the submission of a thesis are required. A thesis option may be elected with the permission of the student's committee.

For additional information concerning programs and assistantships write to the chairman, Department of Plant Industries, Southern Illinois University, Carbondale, Illinois 62901.

Psychology

The Department of Psychology offers graduate work leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees in the following areas: general-experimental psychology, counseling and clinical, and industrial psychology. The primary emphasis is on doctoral training, for which the master's degree is a prerequisite. The minimum number of graduate hours required for the Doctor of Philosophy degree is 44. At least 24 of these are dissertation hours. The master's program requires two years of full-time residence and a thesis.

In addition to academic requirements, doctoral students in the clinical and counseling areas must complete the equivalent of a full-time academic year of internship in an agency approved by the department.

Separate application forms for both the Department of Psychology and the Graduate School must be submitted. Students will be accepted for graduate work in psychology only upon approval by the department's admissions committee as well as at the Graduate School office. Departmental application forms may be obtained from the chairman, Department of Psychology. Graduate School application forms may be obtained from the Graduate School.

It is apparent that psychologists are faced with demands to deal with an ever-increasing range of problems, basic as well as applied. As a consequence, the goal of graduate study at Southern Illinois University is to develop psychologists who will have a broad perspective and scientific sophistication, as well as the requisite skills to advance the field of psychology and meet changing needs. To accomplish this aim, a program composed of four integral parts has been developed: the core curriculum, specialization, research and practicum opportunities, and training assignments. The steps toward the Ph.D. in chronological order are: 1) Core curriculum; 2) Master's degree; 3) Graduate research tools requirements (any two of the following: foreign languages, statistics, computer language); 4) Preliminary examination consisting of one major and two minors; 5) Dissertation.

Core Curriculum

The core curriculum is designed to give systematic work in both theoretical and substantive material of general psychology, and yet allow for flexibility in individual program planning. During the first year all students are required to take a three course sequence in quantitative methods and research design. In addition, by the end of the second year through a series of elective options six additional courses in areas other than the major are required to provide breadth as well as some degree of depth in the total field of psychology.

Areas of Specialization

GENERAL-EXPERIMENTAL PSYCHOLOGY

The general-experimental program is planned for the student who wishes to have a broad academic course of advanced study in psychology together with intensive specialization in one area of experimental psychology. It is primarily intended for students working towards careers in teaching and research. While considerable flexibility is permitted so that the student may select courses from several areas, he is expected to concentrate in at least one area of general-experimental psychology: learning, sensory processes, Social, developmental, physiological, personality, or quantitative. The following courses are required: 510, 526, and 509. In addition, the student is required to take research credit during all the first three quarters of residence.

CLINICAL PSYCHOLOGY

The clinical psychology program, approved by the Education and Training Board of the American Psychological Association, provides training such that the student may prepare for a career in clinical activities, research, or teaching. Students are expected to have experience in at least two of these activities by graduation. Two types of programs are available: (a) general clinical in which 39-41 hours are required for a major (b)

95 [all but the first quarter of residence], 541, 537, 531, 543a and b, 93e-9, 598 and electives); and (b) experimental clinical for those who plan careers primarily in research in which 39-41 hours are required for the major (523, 595 [all but the first quarter of residence], 541, 537, 531, 93e-3, 509, 598 and electives).

COUNSELING PSYCHOLOGY

The counseling psychology program, approved by the Education and Training Board of the American Psychological Association, is designed to prepare students for college and university positions, hospital positions, or positions in social agencies. Students are expected to develop competencies in research and teaching as well as in counseling and other psychological services. The required courses are 523, 536, 537, 541, 547, 93f-9, and 598. In addition, the following electives are recommended: 30, 531, 538, 539, and 543.

INDUSTRIAL PSYCHOLOGY

The industrial program is designed to provide the student with an opportunity to acquire the basic skills and information necessary to do applied and theoretical research in a wide variety of work settings. Students must take courses designed to provide depth in the classical areas of industrial psychology; with special emphasis on experimental design, multivariate analysis, and applied experimental methods. In addition, the program provides breadth in sampling of advanced courses from different areas. Required courses are 581, 576, 524, 525, 526, 593h (1-6), 571, 572, 573, 574, 595. One minor may be taken outside of the department if it is considered by the industrial committee to be a valuable adjunct to the student's program.

Research and Practicum

Because of our commitment to the importance of broadening the scientific use of psychology and to the development of skills in the application and teaching of psychological principles, a variety of research and practicum experiences is considered an integral part of the student's training. Therefore, with the exception of the first quarter, the student is expected to participate in research or practicum each quarter of residence. Research may be of the student's own design or may be in conjunction with various studies being conducted by staff members. Research competence in original individual research is required of all students in either case.

Training Assignments

As a vital part of our graduate training program, each student must be engaged in a training assignment each term. These assignments vary according to the needs and professional aspirations of the student. They are designed to supplement the formal course work by a variety of professional activities such as assisting in research, teaching, etc., under staff supervision. The training assignment increases in responsibility as the student progresses. The amount of time required of the student varies from 10 to 20 hours a week, depending upon his level of progress, the type of assignment, etc. The purpose of these assignments is to expose the student to some of the types of activities that he will ultimately be engaged in after he receives his degree.

Recreation and Outdoor Education

The Department of Recreation offers a broad interdisciplinary, interdepartmental program of study leading to the Master of Science in Education degree. The curriculum is designed to prepare professional leadership for the supervision, management and administration of recreation wherever it is needed.

All students admitted to the Masters Program are expected to complete 1) The core of professional courses: Recreation 500, 520, 530, 540, 550, Education Administration and Foundations 500, Sociology 487, and Marketing 440; 2) Sixteen quarter hours in their chosen option; and A thesis, or internship of one year and a research paper.

Community Recreation Management

The greatest need for recreation leadership is in the local community. It is here that recreation under governmental, voluntary, industrial, educational, religious, and private auspices takes its roots. This area of specialization prepares the student for administrative and supervisory positions in municipal recreation and park commissions, park districts, public schools, private agencies, military and industrial complexes, and student unions.

Recreation for Special Populations

Organized recreation programs for special groups are becoming increasingly important to hospitals, nursing homes, schools for the retarded, golden age clubs, prisons, and other institutions. Community recreation departments are offering programs for special populations for those who remain in the community.

Commercial Recreation Management

Commercial recreation is mushrooming throughout the country, bringing an unprecedented demand for leadership in the management of such establishments as resorts, country clubs, marinas, tourist attractions, and public and private assembly facilities such as convention halls, civic and community centers, auditoriums, and arenas.

Outdoor Recreation Management

There is an increasing need for professional recreation personnel who can manage and administer recreation activities and programs under natural conditions. Camp executives, counselors, conservationists, naturalists, and leaders are needed for an increasing number of programs related to outdoor recreation. Students interested in Outdoor Recreation Resource Management should contact the Forestry Department for admission requirements and further information regarding this program.

Rehabilitation

In response to pressing human and social needs, the applied field of rehabilitation has solidly entrenched itself as a professional discipline over the past twenty years. Multi-disciplinary courses of study have been drawn together from the behavioral, social, and medical sciences appropriate to the development of competent practitioners and programs.

rehabilitation and welfare agencies. The overall program is left purposely broad and flexible to permit the inclusion of training innovations and emerging career patterns.

The Rehabilitation Institute offers graduate programs leading to a Master of Arts or a Master of Science degree in behavior modification and rehabilitation counseling. Each degree requires a minimum of 72 quarter hours of course work and field experience. An M.S. degree in rehabilitation administration may be obtained by the successful completion of a minimum of 48 credit hours of course work and field experience. These concentrations are sufficiently open to permit a student to emphasize work with a particular population such as the emotionally disturbed, correctional wards, mentally retarded, physically handicapped, economically deprived, or others. The graduate may work in such settings as state-federal vocational rehabilitation programs, clinics, hospitals, workshops, correctional centers, youth camps, or employment service offices. In addition to the approved course of study, students may complete three to six-month paid internship in an approved agency or institution. Application forms for both the Graduate School and the Rehabilitation Institute must be separately submitted. Forms for the former may be obtained from the Graduate School, and institute forms may be obtained from the director, Rehabilitation Institute. Acceptance in the program is contingent on the final approval of the admissions committee of the Rehabilitation Institute after processing by the Graduate School.

Rehabilitation Counseling

This is a six-quarter graduate program leading to either the Master of Arts or Master of Science degree. The trained professional counselor must demonstrate competence in establishing a counseling relationship, case evaluation, assessment procedures, program planning and coordination, and vocational placement, as well as have an awareness of professional and community resources that can be utilized in the rehabilitation process. Required courses: 480, 551, 532, 541, 556, 511, 561, 519, and Guidance 505. The student will also be given quarterly field work assignments (585c) and must complete a full quarter internship in a rehabilitation setting.

There is sufficient flexibility in the curriculum so that special interests and needs of students can be pursued by careful selection of electives. Some suggested electives include personality dynamics, social psychology, community development, group processes, educational psychology, economic deprivation, and processes in social work. A special plan of study and field experience is available for students emphasizing rehabilitation in the area of crime and corrections or the mentally retarded.

Behavior Modification

The behavior modification major is designed to train students in the application and evaluation of techniques which have demonstrable utility in the modification and development of human behavior. Empirical principles derived from functionally established relationships in human behavior are translated into practical technological tools.

Within this framework, students may specialize in environmental programming and direct service with such broad groups as the mentally retarded, mentally disordered, slow learners and problem children, and in specific problem areas such as incentive programs for job training,

learning disabilities, stuttering, cigarette smoking, sexual behavior, and language development.

Candidates in the behavior modification program generally work towards the Master of Arts degree which requires a total of 72 hours of credit. Course programs are tailored to fit the needs and interests of individual students. Most students will enroll in a first-year course sequence which includes Rehabilitation 420, 485, 520, 533, and 526. Further course work may include substantive areas such as sexual behavior, child behavior, schedules of reinforcement, aversive control, and programmed instruction. All students participate in a one-quarter full-time internship at an affiliated training center.

Rehabilitation Administration

The design of this major is to prepare generalists to serve as administrators, coordinators, supervisors, and programmers in such rehabilitation settings as workshops, clinics, special schools, youth centers, and state agencies. Requirements for the M.S. degree are a minimum of 48 quarter hours of course work and field experience, at least one quarter of full-time internship and a research paper. The internship may be waived for the candidate who already has a wide range of experiences in rehabilitation or welfare agencies.

Candidates will develop competencies in program planning and development, organization and administration of service/training units, and in staff development and supervision. Specific course requirements are Rehabilitation 480, 481, 501, 503, 551, 541, and 585a. Select courses in the Departments of Management and Marketing are also strongly recommended.

Secondary Education

The Department of Secondary Education offers programs leading to the Master of Science in Education degree and the Sixth-Year Specialist Certificate. In addition, the department offers courses that are applicable to the Doctor of Philosophy degree in curriculum and instruction.

The master's degree in secondary education is planned jointly by the Department of Secondary Education and the department of the student teaching field. Required for unconditional admission to the master's program are a 3.7 overall undergraduate average, the successful completion of at least eight quarter hours of student teaching, enough professional education hours to meet requirements for a secondary school teaching certificate, and a major in the teaching field. A program of 48 quarter hours will be planned to include a research requirement and at least two graduate level courses in Secondary Education. The student will take 20 to 32 hours of graduate work in his teaching field and 16 to 24 hours of graduate work in education. During the period the student is taking his last twelve hours of work, a comprehensive oral or written examination will be administered by the department.

The department offers a Sixth-Year Specialist program for experienced teachers and other personnel in the secondary school. The specialist program is regarded as terminal in nature and not as a step toward the doctorate. Applicants for admission to the Sixth-Year Specialist program should possess a master's degree, two years of successful teaching experience, and an acceptable score on the Cooperative English test. To obtain

For the Sixth-Year Certificate the student must complete 96 hours of graduate work beyond the bachelor's degree. At least half of the minimum hours required shall be in secondary education and supporting professional areas. Forty hours of the 96 shall be from disciplines outside of education. A field study or internship is a required part of the program.

Secondary education participates in the doctoral program in education in the functional area of curriculum and instruction. Students interested in secondary education may pursue an equivalent of a major concentration within the area program. For additional information on the Ph.D. see the preceding section entitled Education. Inquiries regarding the Ph.D. with emphasis in secondary education should be addressed to the coordinator of the area of curriculum and instruction in the College of Education.

Secretarial and Business Education

Graduate courses in business teacher education may be taken as a major or minor in the Department of Secretarial and Business Education leading to the Master of Science in Education degree. The program in business teacher education consists of a minimum of 48 hours of course work distributed as follows: (1) 18–24 hours in business teacher education courses; (2) 12–18 hours in other School of Business courses; (3) 12–18 hours in College of Education courses; and (4) 0–12 hours of approved electives.

The graduate program is planned for those students who have an adequate subject-matter and professional-education background in at least one of the following business teaching areas: (1) secretarial, (2) general business, (3) bookkeeping and accounting, or (4) distributive education. Deficiencies in background must be eliminated by taking appropriate courses.

The graduate program is aimed at upgrading and making more proficient those individuals who have already met or surpassed the minimum requirements for teaching business subjects in the high schools and junior colleges of Illinois. The dual purpose of the program is to provide advanced professional education in business teaching fields and to develop competence in utilizing research findings in the field. In keeping with the general requirements of the Graduate School, each student is required to write a research paper. Those who have special interest and ability in research or who expect to go on to advanced graduate study are encouraged to write a thesis.

Two advanced graduate programs for business teachers who hold the master's degree or its equivalent, each providing for a concentration of study in business education, are offered. They are specialist programs in secondary education and doctoral program in the functional areas of curriculum and instruction. Both programs are operated under the jurisdiction and within the organization of the Graduate School and the College of Education.

Sociology

The Department of Sociology offers programs of graduate study leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Several areas of major or minor concentration are provided for advanced work beyond the general master's program. These areas are: social dis-

organization, deviance, and control; social organization, with particular reference to complex organization and the community; social psychology; the sociology of the family; sociological theory. In addition, a special program in sociology and corrections, leading to the master's degree in sociology, is offered in cooperation with the Center for the Study of Crime, Delinquency, and Corrections.

Close ties are also maintained with the Community Development Institute, the Public Affairs Research Bureau, Clinical Services, and the Computer Center which may offer special opportunities for graduate student training and research.

Applicants for admission to graduate study in sociology should apply by writing to the chairman of the department. Detailed statements of departmental requirements for the Master of Arts and the Doctor of Philosophy degrees are available upon request.

Special Education

Several programs leading to a Master of Science in Education degree are offered by the Department of Special Education. Courses which lead to certification as a teacher of exceptional children may be included in the master's degree program. This training is specifically designed for individuals who have had successful teaching experience in regular classrooms and who wish to qualify as teachers of mentally retarded, emotionally disturbed, or acoustically handicapped children.

For persons holding certification in some area of teaching exceptional children, a program designed to meet the requirements for special education administrative positions is offered. This is a program which is flexible enough to meet the needs of persons with a background in any one of a variety of special education areas.

A Sixth-Year Specialist's certificate program in special education with emphasis on one or more areas, including special education supervision, is available.

Finally, building on the core requirements of the functional area of Educational Psychology, a Doctor of Philosophy degree in education with an emphasis in special education is offered. This program has its base in the requirements indicated in the functional area of educational psychology. Specific course requirements for the emphasis in special education include extensive seminar experiences in the study of all types of exceptional children.

A number of graduate fellowships under Public Law 85-926 (as amended by Public Law 88-164) are available to qualified persons seeking careers in special education through study in this department.

Speech

Courses are offered in speech leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. The Master of Arts and the Master of Science degrees are offered with specialization in public address, interpretation, and general speech. Courses in speech may be taken as a part of the program leading to the Master of Science in Education degree.

Master's Degree Programs

The student should submit the equivalent of an undergraduate major

a speech in order to be admitted unconditionally as a full-time graduate student for the master's degree.

The program of course work leading to the master's degree includes areas and techniques of research and a seminar in the area of emphasis. A total of 48 hours is required for the degree. Competence in one foreign language is required for the Master of Arts degree.

The research requirement for the master's degree may be met by either of the following plans:

Plan 1

1. Submit a thesis demonstrating ability to do research on a topic approved by the graduate committee of the Department of Speech.
2. Take a minimum of 39 hours of course work.
3. Pass an oral examination over the thesis and course work.

Plan 2

1. Submit a research paper as evidence of a knowledge of formal research techniques, a copy of which will be submitted to the Graduate School for its permanent records.
2. Take a minimum of 48 hours of course work.
3. Take a comprehensive written examination over the course work taken for the degree.

The student will be given a choice as to which of the above plans he wishes to take; however, the graduate committee of the Department of Speech will make the final determination as to which requirement the student must meet.

Doctor of Philosophy Degree

Each student shall demonstrate competence in at least two of five areas: interpersonal communication, interpretation, rhetoric and public address, speech education, and theater. Special competence is to be demonstrated in one of the two chosen areas. The student's academic adviser shall be from the area of the student's special interest. The student, after consultation with his adviser and a professor from the second area, will formulate the program he intends to pursue prior to taking the preliminary examination. The program should include at least 32 hours in the special area of competence and 16 hours in the second area of competence. Course work in the Departments of Speech and Theater but outside his two areas of competence may be included where it seems appropriate. Course work outside the departments may also be included in this program. However, the proposed program must meet the Graduate School requirements for residence, and shall exclude course work designed to meet the research tool requirement. Any change in the program must have prior approval of the student's advisers. After completing 24 quarter hours of his program each student shall be examined by a review committee made up of the doctoral graduate faculty. This committee will recommend continuation, change or termination of the program. The adviser for each student shall be responsible for assembling the necessary information (grades, recommendations, progress in tool requirements, etc.) for consideration in reaching the above decision.

Before admission to candidacy the student must demonstrate competence in one research tool. This shall embody skills needed in understanding materials in the field, or in the conduct of research for the dis-

sertation, or in continuing research contributions in his field of specialization. Competence may be achieved in a language, statistics, computer programming, or in another area as determined by a committee made up of one professor from each area of emphasis. Proficiency will be determined for language and computer programming, and in some cases for statistics, through examinations. Twelve hours of work in statistics with a grade of *B* or better shall be considered a demonstration of proficiency in statistics. In some cases, a student may satisfy the research tool requirement through the completion of twelve hours of additional course work outside the Department of Speech, the courses to be determined after the student has selected his research area. A grade of *B* or better will be required in these courses. It is evident that in certain research project requirements beyond the foregoing might be clearly indicated, and if so the student's adviser will specify.

Speech Pathology and Audiology

The Department of Speech Pathology and Audiology has as its objective the training of personnel for communication science research, for college and university teaching, and for the diagnosis and treatment of persons with speech and hearing impairments. Course work leads to certification as a speech pathologist or audiologist in public schools and rehabilitation centers by meeting certification requirements of the American Speech and Hearing Association. Its program in clinical training is approved and registered with the Education and Training Board of the American Board of Examiners in Speech Pathology.

Professional experiences for graduate students are provided in the following settings: the University's Clinical Center; a summer residential camping program for persons with organic speech problems, in cooperation with the University of Illinois Division of Services for Cripple Children; the V.A. Hospital in Marion; A. L. Bowen Center for Retarded Children; and the Anna State Hospital. Cooperative programming is maintained with other public and private agencies such as the Division of Vocational Rehabilitation, the Easter Seal Society, and the National Association of Speech and Hearing Agencies. Students participate in traveling speech and hearing clinics which serve schools and communities through the media of surveys, diagnostic examinations, and therapy. The department has available R.S.A. traineeships, Office of Education fellowships, N.D.E.A. fellowships for support of graduate education in addition to graduate and research assistantships. Students can also apply for the special doctoral assistantships and graduate fellowships available from the Graduate School through the department.

Specialized experiences with orthodontists, prosthodontists, plastic surgeons, otologists, and others of the medical and dental professions are available in the St. Louis and Chicago areas. Emphasis is on the interdisciplinary relationships with other professions throughout the training process.

The department maintains active research facilities which provide laboratories and specialized equipment for the study of both the normal and impaired functions of the speech and hearing processes and the relationship to language formulation. The speech science laboratory is equipped for electromyographic study of the speech musculature, radiotelemetry, electrophysiology of hearing, and spectrographic analysis of

speech signals. The experimental audiology laboratory, which includes an anechoic chamber, is equipped for investigation in air and bone conduction sensitivity, localization, and speech discrimination. It also has facilities for automatic audiometry, PGSR, middle ear impedance, and aural reflex experimentation. Facilities are also available for the use of palmar sweat measurements as a physiological index of emotion, for the study of pathoanatomy and pathophysiology of cleft lip and cleft palate through roentgenocephalometrics and cinefluoroscopy, and for the experimental analysis of behavior and behavior modification.

Graduate courses in the Department of Speech Pathology and Audiology may be taken for a major leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Requirements for the various degrees are determined through advisement commensurate with professional growth of the student.

Additional information regarding financial aid, programs, and application procedures can be secured by writing to the chairman, Department of Speech Pathology and Audiology, Southern Illinois University, Carbondale, Illinois, 62901.

Technical and Industrial Education

Students may pursue the Master of Science in Education degree—48 quarter hours of course work or the Master of Science degree with a major in Technical and Industrial Education—48 quarter hours, including 5 to 9 hours of thesis.

Programs of study are developed by the student and his adviser depending upon deficiencies, interests, and career goals. Programs are flexible, and course work may be done in other units of the University. The student is advised to prepare for one major area of concentration and one minor professional area. Some of these areas are: teacher of industrial arts (called Enterprise: Man and Technology), of trades and industries, of technical teaching, or of health occupations; coordinator of cooperative occupational education programs; and supervisor, director, administrator of secondary, area vocational, community junior college, or other vocational-technical or occupational educational programs.

Students with a bachelor's degree in science, technology, or engineering may qualify for advanced study which may involve technical subjects, study in work situations and educational institutions, and internship in teaching or other professional assignments.

Students may pursue the Doctor of Philosophy Degree in Education under the functional area of curriculum and instruction with advanced course work in technical and industrial education as determined by their program committee.

One-half or one-quarter time instructorships, teaching or research assistantships, and fellowships are available for qualified applicants. Additional information about programs, courses, instructorships, assistantships, and fellowships may be obtained from the chairman of Technical and Industrial Education.

Theater

The Department of Theater offers courses leading to the Master of Arts and Master of Science degrees and to the Doctor of Philosophy degree

in speech with a concentration in theater. An M.F.A. degree program offering a specialization in one of three areas (acting/directing, design and playwriting) has been initially approved and will be effected in the near future.

Candidates for the master's degrees must complete 48 hours of graduate credit; the Master of Arts candidate must demonstrate competence in a foreign language. Each candidate for the master's degree will produce a thesis or its equivalent (creative work in play direction, costume or scene design, or playwriting). The chairman appoints a director for each candidate's program. The Doctor of Philosophy degree program in speech with a specialization in theater is open to students holding a master's degree. Doctor of Philosophy degree candidates are required (1) to complete a minimum of 32 hours in theater and 16 hours in speech; and (2) to complete a theater dissertation. Qualified candidates may offer a creative equivalent in producing, playwriting, or design, under the supervision of an advisory committee. Candidates for the Doctor of Philosophy degree with a major concentration in theater must demonstrate competence in one research tool (refer to speech for description) relevant to skills needed for understanding materials in the field, or in the conduct of research for the dissertation, or in continuing research contributions in the field of specialization. Competence may be achieved in a language, statistics, computer programming, or in another area as determined by a committee composed of one professor from each area of emphasis. Candidates must also satisfy the graduate staff that they are qualified for candidacy by passing a comprehensive preliminary examination. Graduate courses in theater may also be taken as a secondary concentration leading to the Doctor of Philosophy degree in speech.

Candidates for the Doctor of Philosophy degree who have a special interest in dramatic literature may earn the degree by substituting dramatic literature courses as offered in the Department of English for theater courses.

An undergraduate major in theater is not essential for admission to candidacy for a graduate degree. A student with an undergraduate major in speech or English, for instance, may audit undergraduate courses in theater to make up any deficiencies.

Graduate students are urged to supplement their class work with practical experiences in acting and production. Membership in the Southern Players is open to graduate students, and they may also earn graduate credit as members of the Southern Touring Company and the Summer Stock Company.

Zoology

Graduate work in zoology may be taken as a major or a minor toward the Master of Arts, Master of Science, and Doctor of Philosophy degrees and as a part of a program in biological sciences toward the Master of Science and the Master of Science in Education degrees.

Candidates for the Master of Science and Master of Arts degrees must have the consent of the department and at least 35 hours of undergraduate credit in zoology equivalent to 102, 103, 202, 300, 310, and 400. Further required undergraduate work includes introductory college chemistry with laboratory (equivalent to Chemistry 121a,b) and one year college mathematics including algebra and trigonometry (equivalent

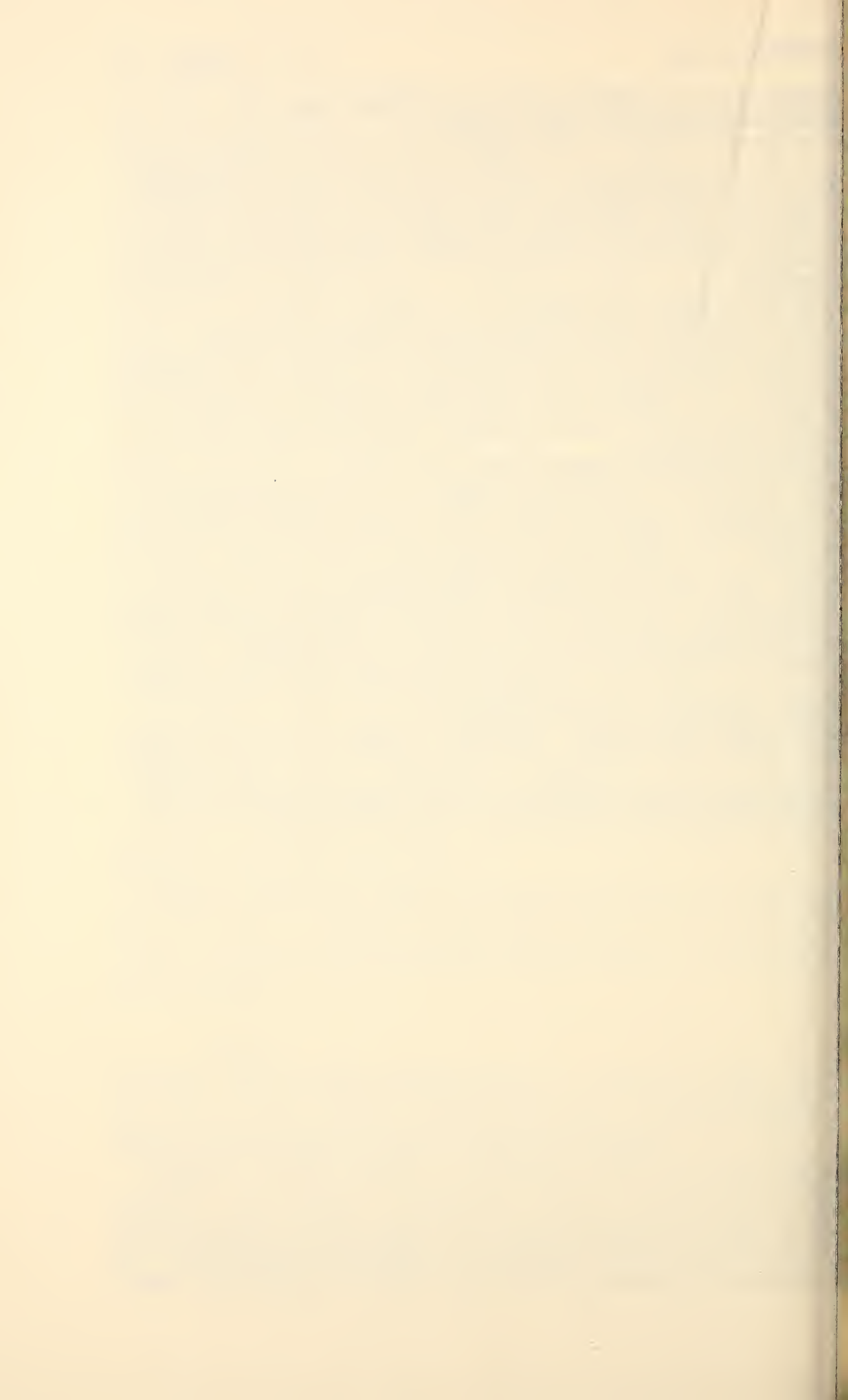
Mathematics 111). Deficiencies in undergraduate preparation may be removed concurrently with graduate work.

Completion of work for the Master of Arts degree requires, in addition to the general requirements of the Graduate School, a reading knowledge of one foreign language, calculus (equivalent to Mathematics 150), an approved thesis, Zoology 581, and continuous registration in Zoology 582, or, in the instance of approved conflict, registration for the seminar in another biological science department. A minor outside the department is required.

The requirements for completion of the Master of Science degree are the same as for the Master of Arts with the following exceptions: (1) a reading knowledge of a foreign language is not required; (2) a research paper may be offered in lieu of a thesis; (3) introductory statistics (equivalent to Guidance 422b), rather than calculus, is required; and (4) the student must complete 54 quarter hours of formal courses, including 36 in zoology.

The doctoral degree at Southern Illinois University is a research oriented degree awarded for high accomplishment in a particular discipline or interdisciplinary area. Admission to the doctoral degree program in zoology ordinarily requires previous training in animal science. A good background in all life sciences, chemistry, mathematics, and physics is desirable. Each student's program of study is based upon the results of an advisory examination, the student's overall background, the requirements of the preliminary examination, and the proposed specialization. The student's adviser aids in the selection of a minor and establishes the program requirement. A dissertation demonstrating scholarly merit and the ability to perform independent research are required.

Areas of specialization possible within zoology include developmental zoology, invertebrate zoology, systematics, wildlife management, ornithology, genetics, fish management, cytochemistry, ecology, parasitology, cytology, limnology, herpetology, vertebrate morphology, mammalogy, invertebrate paleontology, animal behavior, and endocrinology.



3 / Course Descriptions

Here are described all of the courses offered by the University on the Carbondale campus for graduate credit. Courses are listed numerically within each subject-matter area. Areas are listed below in the order of their appearance on the following pages.

Accounting	French	Music
Agricultural Industries	German	Philosophy
Animal Industries	Russian	Physical Education
Anthropology	Spanish	Physics
Applied Science	Forestry	Physiology
Art	Geography	Plant Industries
Botany	Geology	Psychology
Business Administration	Government	Recreation and Outdoor Education
Chemistry	Guidance and Educational Psychology	Rehabilitation
Clothing and Textiles	Health Education	Secondary Education
Design	Higher Education	Secretarial and Business Education
Economics	History	Sociology
Educational Administration and Foundations	Home and Family Education	Special Education
Elementary Education	Home Economics Education	Speech
Engineering	Instructional Materials	Speech Pathology and Audiology
Engineering Technology	Journalism	Technical and Industrial Education
English	Management	Theater
Finance	Marketing	Zoology
Food and Nutrition	Mathematics	
Foreign Languages	Microbiology	

The first entry for each course is a three-digit numeral which serves to identify the course. Courses numbered 400-499 are open to both seniors and graduate students. Courses numbered above 499 are for graduate students only.

Following the course identification number is another number, which indicates the maximum credit allowed for the course. The maximum may vary, and specific quarter hours may be assigned for each quarter a course is given.

Following the course description there may be prerequisites which must be satisfied before a student is permitted to enroll.

To learn in which quarter a course is offered, the student should consult the Schedule of Classes published for both campuses by Central Publications, Southern Illinois University, Carbondale, Illinois 62901.

Accounting

4-4 **Accounting Concepts.** Interpretation and critical analysis of reports, statements, and other accounting data from the viewpoint of users of financial information. Restricted to Master of Business Administration students.

4-4 **Electronic Data Processing in Business.** An introduction to computers and their uses in business applications; computer components, programming, and analysis of business systems; exploration of effects of computers upon business organization and society. Prerequisite: 251c.

4-4 **Advanced Cost Accounting.** Managerial control and profit planning

- through capital budgeting, inventory planning, subject probabilities, statistic methods, and operations research; direct and relevant costing; nonmanufacturing costs; differential and comparative cost analysis. Prerequisite: 341.
- 453-4 Advanced Accounting.** Advanced study of accounting principles and procedures relating to specialized topics, including partnership equity installment and consignment sales, insurance, compound interest, and preparation and use of consolidated statements. Prerequisite: 351b.
- 455-4 Accounting for Public Organizations.** Financial and managerial accounting concepts peculiar to the planning and administration of public and quasi-public organizations, such as governmental units, institutions, and charitable organizations. Includes the conventional budgetary-appropriation process, well as some of the more recent accounting developments related to public decision making. Prerequisite: 261.
- 456-4 Auditing.** Objectives, standards, and procedures involved in examining and reporting on financial statements of business organizations. Prerequisite: 341 and 351b.
- 458-4 Accounting Systems.** Accounting systems, design, and installation. Examination of existing systems and practice in systems design. Designing reports for management. Prerequisite: 341, 351b.
- 459-4 Internship in Accounting.** Supervised work experience in professional accounting. Prerequisite: consent of department.
- 461-4 C.P.A. and Advanced Accounting Problems.** A course using problems from the American Institute of Certified Public Accountants' examinations given in recent years and supplementary problems from selected sources. Prerequisite: 341 and 351b.
- 475-4 Budgeting and Systems.** Study of concepts, methods, and tools used in the design of management information systems. Budget program is developed to identify problems in coordinating and controlling business activities. Prerequisite: 261.

Agricultural Industries

- 410-2 to 4 Problems in Agricultural Services.** Discussion, assignments, special workshops on problems related to inservice training programs in agriculturally related fields. Development of more effective programs in working with farm people. Prerequisite: graduate student in agricultural service or consent of instructor.
- 411-3 Agricultural Extension.** A study of the history, organization, objectives, programs, and methods of agricultural extension work. Prerequisite: judgment.
- 412-4 Principles of Agricultural Mechanization.** Theory and use of recording controls, electric motors, survey kits, and other devices adaptable to the needs and interests of educators involved in agricultural mechanization laboratories. Prerequisite: Secondary Education 310.
- 417-4 Agricultural Development in Emerging Countries.** Principles and practices in improving agriculture in areas with limited capital and low level technology. Special emphasis on developments in Asia, Africa, and South America. Prerequisites: 204 or GSB 211a.
- 418-3 Marketing Practices and Problems in Developing Countries.** Typical markets, assembly of products, storage, transportation, quality determination and pricing practices which are peculiar to the developing countries. Marketing organization and practices for the major export products and the principal domestic foods and fibers in such countries. Methods of progressively improving such markets. Prerequisite: 354 or Economics 215.
- 450-4 Advanced Farm Management.** Methods of analyzing farm enterprises, comparing farm enterprises, comparing farm businesses, allocating farm resources, combinations of enterprises, and production factors. Field trip estimated cost \$5.00.
- 456-11 (3,2,2,2,2) Agricultural Marketing Problems and Practices.** (a) Cooperatives. Development of the agricultural cooperative movement, agricultural cooperative organization, legal requirements, principles and practices of agricultural cooperative associations. (b) Livestock. Problems and their solutions in marketing livestock. (c) Field Crops. Problems and their solutions in marketing field crops. (d) Dairy and Poultry. Problems and their solutions in marketing dairy and poultry products. (e) Horticultural Crops. Problems

and their solutions in marketing horticultural crops. Field trip cost \$5. Prerequisite: 354.

1-4 Land Resource Economics. (Same as Forestry 471 and Economics 471.) The use of land as an economic variable in production of goods and services; land markets; group versus individual conflicts; elementary land resources planning techniques. Field trips cost about \$5. Prerequisite: GSB 211, Economics 215, or Forestry 215, or Forestry 470.

3-4 Advanced Farm Power. Farm power theory and its application, for training teachers to diagnose and correct difficulties in engine, power transmission, and hydrostatic systems. Prerequisite: 373 or equivalent.

3-4 Advanced Farm Machinery. Materials on construction; basic mechanics involved in tillage machinery; rotary power transmission; product cleaning, drying, and sorting; costs of operation; materials handling. Prerequisites: 350, 373, and 374, or consent of instructor.

2-3 Seminar-Research-Work Experience on International Agricultural Problems. Weekly two-hour discussion period on methods by which foreign students can adapt information and training obtained in U.S. oriented courses to the solution of important agricultural problems in their home countries. Complemented by work experience and research on the University farms, laboratories, and in the library.

5-3 Principles and Philosophies of Vocational and Technical Education. (See Technical and Industrial Education 485.)

5-3 Agricultural Industries Research Methods. Agricultural economics research methods with particular reference to types of research problems encountered, sources of data, problems in developing new data and methods of analysis. Prerequisite: consent of chairman.

2-3 to 6 Agricultural Occupation Internship. Prepares coordinators to fulfill their responsibilities in selected areas of agricultural related occupations through an internship in the area of specialization and through orientation and related technical information. Prerequisite: 312b or consent of chairman.

1-1 to 6 Readings. Contemporary books and periodicals on selected areas of the field.

1-1 to 6 Readings in Resource Economics. (Same as Forestry 520b and Economics 502.) Directed reading in the field of natural resource economics.

5-3 Interrelated Vocational Cooperative Education. (See Technical and Industrial Education 525.)

5-4 Production Management. A study of the principles of production economics upon which problems in agricultural production and resource use can be analyzed. Emphasis on principles applicable to the farm business and to farm policy, including concepts relating to the decision-making process and farm planning under perfect and imperfect knowledge and with limited resources. Prerequisites: 12 hours equivalent in economics, agricultural economics, or consent of instructor.

5-2 Advanced Agricultural Prices. Continuation of analysis of factors affecting agricultural prices; the application of these factors in price prediction. Prerequisite: 352.

5-4 Advanced Agricultural Marketing. Current complex problems in agricultural marketing and methods of developing solutions; cooperative activities. Prerequisite: 12 hours or equivalent in economics and agricultural economics.

5-1 to 6 Research. Directed research in selected areas of agricultural industries.

5-1 to 6 Seminar. Problems relating to various phases of the field of agricultural industries, such as farm management, marketing, prices, farm policy, and agricultural economics.

5-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Animal Industries

41-8 (4,4) Animal Nutrition. (a) Physical and chemical properties of nutrients and their uses and principles involved in determination of nutrient requirements. (b) An integration of the basic facts concerning the nature of nutrients and their metabolism. Must be taken in a,b sequence. Prerequisites: 315 and organic chemistry or equivalent.

20-4 Commercial Poultry Production. Broilers, layers, and turkeys as adapted to poultry speciality farms. Field trips. Prerequisite: 121.

- 430-4 Dairy Cattle Breeding and Management.** Application of principles of breeding, nutrition, physiology to the management of the dairy herd. Field trip required. Prerequisite: 332.
- 431-4 Reproductive Physiology of Domestic Animals.** Comparative physiology of reproduction in farm animals and the principles of artificial insemination. Prerequisite: one course in physiology.
- 432-3 Quantitative Inheritance of Farm Animals.** A review of the principles underlying the influence of mutation, selection, migration, and random drift in animal breeding population; estimation and interpretations of heritability and genetic correlations; effects of variances of quantitative traits of farm animals. Prerequisite: 332.
- 433-3 Dairy Cattle Nutrition.** Application of the latest knowledge of digestion and metabolism in ruminants, and their nutritional requirements to dairy herd feeding. Prerequisite: 315.
- 434-3 Physiology of Lactation.** Anatomy of the mammary gland, hormonal control of development and secretion, milk synthesis, physiology and mechanics of milking. Prerequisite: organic chemistry and physiology.
- 456b-2, 456d-2 Agricultural Marketing Problems and Practices.** (See Agricultural Industries 456.)
- 465-5 Swine Production.** Breed selection, breeding, feeding, management, and marketing of swine. Field trip. Prerequisites: 315, 322.
- 480-4 Sheep Production.** Breeding, feeding, and management of sheep. Field trip. Prerequisites: 315, 332, 431.
- 485-4 Beef Production.** Breeding, feeding, and management of beef and dual purpose cattle. Field trip costs about \$3. Prerequisites: 315, 332, 341.
- 487-4 Commercial Livestock Feeding.** Principles and problems in fattening beef cattle and sheep for market. Prerequisites: 315, organic chemistry.
- 502-3 Surgical Research Techniques in Farm Animals.** Basic methods of experimental surgery and sampling of biological materials in research on farm animals. Practice of techniques discussed in the lectures. Prerequisite: consent of instructor.
- 505-8 (4,4) Research Methods in Agricultural Science.** (a) Experimental design and biometry as applied to agricultural research. (b) Instrumentation and analytical procedures as applied to agricultural research. Prerequisite: consent of instructor.
- 520-1 to 6 Readings in Animal Industries.** Readings in specialized fields under the direction of approved graduate specialists.
- 525-4 Advanced Poultry Production.** Study and interpretation of the objectives, design, and results of research in poultry feeding, breeding, and management.
- 530-4 Advanced Dairy Production.** Study and interpretation of research in dairy farming, including buildings, herd management, quality milk production, and dairy marketing problems. Prerequisite: 430.
- 565-4 Advanced Swine Production.** Study and interpretation of research in swine feeding, breeding, housing, management and marketing problems. Prerequisite: 465.
- 575-1 to 6 Individual Research.** Investigation of a problem in animal science under the supervision of an approved graduate specialist.
- 579-4 Animal Behavior** (See Zoology 579.)
- 581-1 to 6 Seminar.** Problems relating to various phases of animal industries.
- 599-1 to 9 Thesis.** Minimum of 5 hours to be counted toward a master's degree.

Anthropology

- 400-4 Man and Culture.** The nature of culture and cultural process. Relationships of culture and man as an individual and as a group. Emphasis on anthropological point of view." Prerequisite: 250 or equivalent.
- 401-4 Language in Culture.** Language as a part of culture. Linguistics and study of culture. Prerequisite: 275d or GSB 102a.
- 402-3 Human Biology.** The interaction of biological and cultural behavior. This course would view man as to his zoological positions, genetics, past, present; and the biological bases for his unique behavior in the animal world, i.e., cultural behavior. Prerequisite: 275d or GSB 102a.
- 403-3 General Archaeology.** Theory and methodology. The basic concepts underlying anthropological interpretations of man's past. Prerequisite: or GSB 102a.

4-4 Primitive Art and Technology. The development of man as an art-loving and tool-using being. Artistic and technological traditions of non-Western peoples, past and present. Prerequisite: 275d or GSB 102a.

5-3 Social Anthropology. A comparative approach to the organizational structures of human groups. Functional aspects and distributions of kinship, political, religious, and economic systems. Prerequisite: 275d or GSB 102a.

7-3 General Ethnology. Ethnology as a major sub-field of anthropology, including interest in ethnohistorical studies as well as the more traditional objects of the field. Prerequisite: 275d, or GSB 102a.

3-3 History of Anthropological Thought. The growth of anthropology as an academic discipline to about 1940, with emphasis upon the concepts and ideas since 1860. Prerequisite: 275d or GSB 102a.

9-3 Applied Anthropology. The application of anthropological principles to the solution of problems of the modern world. Contributions of anthropology to the work of the educator, social worker, administrator, business man, government official, and other specialists dealing with man in Western and non-Western cultures. Prerequisite: 275d or GSB 102.

3-3 Introduction to General Linguistics. A study of language theory, classification and change. Prerequisite: 275d or GSB 102a.

5-3 Logic of the Social Sciences. (Same as Philosophy 415). Logical and methodological examination of the social studies as types of knowledge. Basic problems in philosophy of science with major emphasis upon social science: relationship of theory to fact, nature of induction, nature of causal law, stability, influence of value judgments, etc. Intended for students with considerable maturity in a social science or in philosophy.

3-4 Languages of the World. A description of typological and genetic (historical) relationships among languages of the world, with emphasis on comparative phonology and grammatical structure in time and space. Prerequisite: 275d or GSB 102a.

3-3 Archaeology of North America. An introduction to the methods of archaeology and a survey of prehistoric Indian cultures north of Mexico, with particular emphasis upon the cultures of the Mississippi Valley. Prerequisite: 275d or GSB 102a.

3-3 Comparative Economics. A comparative study of economic systems, with emphasis upon those found in primitive societies. Studies of systems which fall outside the conventional systems such as capitalism, socialism, and communism. Prerequisite: 275d or GSB 102a.

3-3 Comparative Folklore. A comparative study of the role of folklore in various cultures of the world, with emphasis upon non-literate societies. Analysis of motifs, themes, and other elements; comparisons between non-literate and literate groups. Prerequisite: 275b or GSB 102a.

4-3 Comparative Law. Legal premises upon which societies are based; systems of the non-literate world; case studies of instances where these systems come into contact with those of literate, technologically advanced cultures. Prerequisite: 275d or GSB 102a.

4-3 Comparative Religion. Comparative study of religious systems, with emphasis upon those of non-literate societies. Examination of basic premises and elements of those belief systems normally excluded from discussions of "Great Religions." Prerequisite: 275d or GSB 102a.

4-6 (3,3) Ethnomusicology. (Same as Music 471 except no prerequisite.)

4-1 to 18 Individual Study in Anthropology. Guided research upon anthropological problems. Students should consult the chairman before enrolling. Prerequisite: 250 or equivalent.

The following seminars will deal with areal and topical problems relevant to the title listed; they will vary in subject matter from year to year. Course schedules will indicate who is the instructor of a particular course. Consultation with the department will indicate the scope of a course.

51 3 to 9 Seminar in New World Archaeology.

51 3 to 9 Seminar in Mesoamerican Archaeology.

51 3 to 9 Seminar in Old World Archaeology.

52 3 to 9 Seminar in the Ethnology of the New World.

52 3 to 9 Seminar in the Ethnology of Mesoamerica.

52 3 to 9 Seminar in the Anthropology of Oceania.

52 3 to 9 Seminar in the Anthropology of Africa.

524-3 to 9 Seminar in the Anthropology of Europe.

535-3 to 9 Seminar in Physical Anthropology.

545-3 to 9 Seminar in Linguistics.

550-3 to 9 Seminar in the Cultures of Latin America. Topics such as the impact of European conquest and dominance upon the native peoples and cultures in Latin America, pre- and post-conquest manuscripts, assimilation of nonindigenous peoples, with the native cultures.

560-3 to 9 Seminar in Comparative Social Organization. Topics such as religion, political organization, social structure, economics, kinship.

562-3 to 9 Seminar in the Anthropology of Contemporary Peoples. Topics such as applied anthropology, peasant cultures, American culture and values.

565-3 to 9 Seminar in Cultural Change and Development. Topics such as the building of cultures, acculturation, the rise of civilization.

567-3 to 9 Seminar in Anthropological Theory and Method. The theory and method of archaeology, or ethnology or physical anthropology.

570-3 to 9 Seminar in Art and Technology. Topics such as the art of the early civilizations, the cultural background of art and technology, experimental problems of art, and technology.

575-3 to 9 Seminar in the Individual and Culture. Topics such as themes and values, culture personality, enculturation, education.

581-3 to 9 Seminar in Anthropology. Topics will be announced.

582-1 to 27 Problems in Archaeology. Guided research upon archaeological problems.

584-1 to 27 Problems in Cultural Anthropology. Guided research upon problems of ethnology, social anthropology, and linguistics.

585-1 to 27 Readings in Anthropology. Guided readings designed to cover special topics and to fill gaps in the student's specialized anthropological background.

595-6 (3,3) Field Methods in Ethnology. Includes anthropological methods of enquiry and documentation of culture and habitat together with appropriate instruction in the techniques of field work, such as photography and sound recording. Stress will be laid in the second part of the course (595b) on the linguistic context of culture; its appropriate recording and structural analysis.

596-6 (3,3) Field Methods in Archaeology. Includes anthropological methods of enquiry and documentation of culture and habitat, together with appropriate instruction in the techniques of field work. Stress will be laid in the second part of the course (596b) on the practical application of archaeological methods and techniques to field work.

597-1 to 27 Fieldwork in Anthropology. Requirements as directed by staff.

599-1 to 9 Thesis.

600-1 to 48 Dissertation. No more than 18 hours in any quarter.

Applied Science

401-12 (4,4,4) X-Ray Crystallography. (a) Introductory Crystallography. Lattice theory of the crystal. Miller indices. Crystal zones. The Bravais lattices. Symmetry elements. Proper and improper rotations. Point groups: crystal classes. Operators involving translation. Space groups. Elements of crystal structure. Coordination. Structure types. (b) X-Ray Diffraction Technique. X-ray diffraction by single crystals: fundamental equations. Reciprocal lattice and Ewald sphere. Optical analog: The optical diffractometer. Single crystal photographic methods: the Laue method: rotating and oscillation, Weissberg, Buerger-precession and Jong-Bourman. Divergent and convergent-beam techniques. Interpretation of the x-ray diagrams. Diffractometric methods: fundamentals. Identification of polycrystalline materials with x-ray diffractometer (power method). Single crystal diffractometry. Absolute intensity measurements. (c) Crystal Structure Analysis. Fundamental diffraction relationships. Determination of the cell size, chemical formula, symmetry and space group. Measurement of intensities: geometrical and physical factors affecting intensities. The structure factor; phase of the structure factor. The anisotropy temperature factor. Fourier synthesis. Electron-density projections. The phase problem. Utilization of anomalous dispersion. Direct determination. Patterson method. Refinement of the structure with high speed computer.

410-8 (4,4) Electronics and Instrumentation for the Life Sciences. (a) Review of electrical theory and electrical aspects of biological systems; introduction

circuit analysis; fundamentals of instrumentation, primarily electronic; laboratory. (b) Transducers and characteristics of instruments used in biological research; basic computer and data-system theory and applications; analysis of biological waveforms; simulation of biological systems; laboratory.

18-3 Digital Computers in Research. Computational techniques for matrix inversion, solution of linear equations, and characteristic roots and vectors; least square analysis, curve-fitting, and regression; design of experiment; solution of nonlinear equations; finding zeros of a function, min-max functional approximation techniques; generation of approximate solutions. Prerequisite: Engineering 222 and Mathematics 150a.

21-3 Programming Languages. A study of the development and use of programming languages for high speed stored program digital computers. Included are problem-, procedure-, and machine-oriented languages, symbolic languages, interpretive systems, macro assemblers, and list processors. A comparison of the languages will be made and each student will prepare programs using the languages studied. Prerequisite: Engineering 222 or consent of instructor.

22-3 Programming Systems. The use and methods of electronic data processing systems. Topics are searching, ordering, codifying, information retrieval, process control, executive routines, and heuristic programming. The student will apply system techniques for solution of problems using one or more of the available high speed digital computers. Prerequisite: Engineering 222 or Mathematics 225 or consent of instructor.

30-2 to 8 Special Problems. Special opportunity for students to obtain assistance and guidance in the investigation and solution of selected technical problems. Prerequisite: consent of coordinator.

31-9 (3,3,3) Nuclear Science. An introductory course to provide a background for further work in nuclear science. Lectures and problems in radioactivity and the uses of radio isotopes, nuclear engineering, introductory reactor theory, and use of an analog computer in solving problems of neutron transport and reactor kinetics. Prerequisites: Mathematics 252b and Applied Science 300.

32-3 Nuclear Laboratory. Health physics instruments; characteristics of alpha, beta, and gamma rays; radioactive decay; counting statistics; fundamental neutral experiments. Prerequisite: 300 or Physics 300.

33-6 (3,3) Engineering Analysis. (a) Basic vector field theory; transformation theorems. Methods of solution for basic ordinary differential equations with applications to engineering systems. Prerequisite: Mathematics 252. (b) Basic methods of solution for partial differential equations with emphasis on applications of the Laplace, Poisson and heat equations to engineering problems. Basic complex variables, matrix theory, numerical analysis and simulation techniques applied to engineering systems. Prerequisite: 470a or Mathematics 305a.

34-16 (4,4,4,4) Materials Science. (a) The Crystal Structure of Materials. The concept of ionic, metallic, van der Waals, and covalent bond. The concept of hydrogen bond. Solid solutions. Interstitial phases. The crystal chemistry of inorganic compounds. Coordination structures. The role of radicals in crystal structures. The organic crystals. Long chain molecular crystals. Clathrate and molecular complexes. The structure of polymers. The structure of glass. The structure of liquids. (b) Crystalline Materials Preparation. Phase nucleation. Modern theories of crystal growth. Homogeneous and heterogeneous nucleation. Absorption. Layer growth. Dendritic growth: impurities. Rate of crystallization. Preparative crystallization. Twinning. Spiral growth theory. Recrystallization. (c) Perfection of Crystalline Materials. The solid as an imperfect body. Point defects. Isomorphic substitution. Composition disorder. Electron holes and traps. Other point defects. Diffusion. Monodimensional imperfections. Dislocations. The role of dislocations in growth and phase transition. Two dimensional imperfections. Crystal surface. Grain boundaries. Three dimensional imperfections. The role of imperfections in the physical properties of crystalline materials. (d) Thermodynamics of solids. The potential energy of ionic and molecular crystals. Band theory. Stability of solid phases. Equilibrium diagrams. Influence of temperature, pressure, and composition. Polymorphism: role of crystal structure. The thermodynamics of the imperfect crystal.

35-12 (4,4,4) Physical Properties of Crystalline Materials. (a) In Relation to Its Symmetry. General principles: The groundwork of crystal physics.

Transformations and second-rank tensors. Equilibrium properties: The stress tensor. The strain tensor and thermal expansion. Piezoelectricity: Third rank tensors. Elasticity: Fourth-rank tensors. The matrix method. Thermodynamics of equilibrium properties of crystals. Transport properties: Thermal and electrical conductivity. Thermoelectricity. Crystal Optics: Natural and artificial double refraction: second order effects. Optical activity. (b) In Relation to Its Structure I. Thermal expansion in relation to crystal structure. Compressibility in relation to crystal structure. Influence of temperature. Magnetic and electrical properties in relation to crystal structure. Piezoelectricity and pyromagnetism. Ferroelectricity and ferroelectrics. Antiferroelectrics. Ferrielectrics. Ferromagnetic crystals. Antiferromagnetics. Domain structure. Phase transitions. (c) In Relation to Its Structure II. Ionic polarizability. Influence of temperature. Influence of structure in crystal optics. Molecular refractivity. Structural theory of optical activity. Elasticity and crystal structure. Piezoelectricity. Plastic deformation. Slip. Creep. Cleavage.

504-12 (4,4,4) X-Ray Diffraction and the Solid State. (Same as Physics 504) (a) Diffraction by an arbitrary object in Fourier transform formulation. Symmetry properties of scattering functions, the convolution theorem, the function or autoconvolution, the two repeated Fourier transformations, X-ray diffraction by an atom, by a molecule, by an ideal crystal and by a finite crystal. Optical transforms: Fraunhofer diffraction of a circular aperture, of a molecule and of a crystal of disc like atoms. The Fourier synthesis and Patterson synthesis. The inverse Fourier syntheses. High speed computation of Fourier transforms and of Fourier series. (b) The Born-Laval theory of temperature diffuse scattering of x-rays: Determination of elastic constants, dispersion relations of frequencies and velocities, interatomic force constants and elastic vibrational spectrum. Determination of Debye characteristic temperatures from the inversion phenomenon of one-phonon scattering. The Inverse Fourier Transform approach. The use of optical diffractometry and optical convolution in the interpretation of imperfect crystals.

521-6 (3,3) Design of Automatic Programming Language Processors. Analysis of design and construction of automatic programming language processors. An investigation of the structure of scientific and business oriented compiler list processors, and information processing languages. The student will be expected to review recent papers on these topics, to prepare an aspect of the theory, prepare flow charts and program segments of the processors for the languages studied. Prerequisite: 421.

522-6 (3,3) Programming Systems Design. Design of monitor systems, executive routines, simulators and other systems. An analysis of problems countered in designing a programming system. The student will be expected to review recent papers on these topics, prepare flow charts, to complete an aspect of the theory, and to write programs for segments of the systems studied. Prerequisite: 422.

530-3 Nuclear Processing. Processing of ore to fuel; reprocessing spent fuel; waste disposal; isotope separation and purification; materials; special reports. Prerequisite: 431b.

570-2 to 6 Special Investigations. For students who wish to make a thorough study or investigation of a specific problem in technological education.

580-1 to 9 Seminar. Collective and individual study of selected issues and problems relating to various technological areas.

599-1 to 9 Thesis.

Art

Art Education: 408, 460, 466, 560, 566, 599.

Art History: 445, 482, 483, 571, 573, 599.

Studio: 401, 405, 406, 410, 416, 420, 430, 436, 440, 441, 446, 493, 501, 502, 506, 511, 516, 520, 526, 530, 540, 546, 599.

401-2 to 12 Research in Painting.

405-2 to 12 Studio in Sculpture.

406-2 to 12 Studio in Painting.

408-4 Art Education for Elementary Teachers II.

410-2 to 12 Research in Prints.

416-2 to 12 Studio in Prints.

420-2 to 12 Research in Pottery.

- 6-2 to 12 Studio in Pottery.
- 10-2 to 12 Research in Metal Construction.
- 16-2 to 12 Studio in Metal Construction.
- 10-2 to 12 Research in Weaving.
- 11-2 to 12 Studio in Drawing.
- 12-2 to 12 Studio in Drawing. Prerequisite: 341-12.
- 15-9 (3,3,3) Modern Art. (a) 19th century. (b) Early 20th century, (c) mid 20th century.
- 16-2 to 12 Studio in Weaving.
- 17a-3 The Art of Ancient Egypt and the Near East. A survey of principal monuments and archeological evidence relevant to an appraisal of the origins and development of art in the early civilizations of Africa, Western Asia, Europe and the Aegean from prehistoric times to the rise of the Persian Empire.
- 17b-3 The Art of Ancient Greece. A study of the origins, development and influence of art produced in Greece and its colonies from the Bronze age to the Roman Empire.
- 17c-3 The Art of The Ancient Romans. An appraisal of the material culture and art of the Roman civilization, its debt to other ancient civilizations and achievements in architecture, sculpture and painting from its foundation until the reign of Constantine.
- 18a-3 Early Christian and Byzantine Art. A survey of problems related to art and architecture produced in Christian communities and under the aegis of the Byzantine Empire until the Fall of Constantinople.
- 18b-3 Early Medieval and Romanesque Art. A study of the development of architecture and Art in Europe from the fall of the Roman Empire to the formulation of the Gothic style.
- 18c-3 Gothic Art. A survey of major developments in Architecture, Sculpture, and painting in Europe from the earliest formulation of Gothic Style to its decline in the Renaissance period.
- 19a-3 Art of the Renaissance in Europe. A study of developments in art during the 15th Century in Italy and the Lowlands leading to the High Renaissance and its impact in European painting, sculpture, and architecture in the 16th Century. Prerequisite: 225a,b,c.
- 19b-3 Baroque Art in Europe. A study of the formation of national style in the arts of Italy, Spain, Austria, Germany, France, Flanders and Holland from the 16th Century to the 17th Centuries with particular attention to major masters.
- 19c-3 The Art of 18th Century Europe. A study of architecture, sculpture and painting in European countries and colonies from the end of the 17th Century to the French Revolution with particular emphasis on the Rococo art of Italy, England, Spain and France.
- 20-1 The Visual Arts in Higher Education.
- 21a-3 Art of Ancient Asia and America. A survey of early developments in architecture and the plastic arts of related civilization in India, China, Japan and Ancient America, from prehistoric evidence to major monuments of the 1st Millennium, A.D.
- 21b-3 Painting In the Far East. General survey of the major pictorial arts of China from six dynasties to Ch'ing dynasty, or Korea from Silla period to Goryeo dynasty, and of Japan from Asuka to Edo periods. An attempt will be made to trace influences central to the development and spread of important styles and to relate art to the classics of Oriental aesthetics.
- 21c-3 Islamic Art. A survey of important monuments and art works produced in the context of Islamic culture in the Near East, Africa, Spain, Persia, Turkey and India from the 17th Century to the present.
- 24-2 to 12 Research in Art Education.
- 24-2 to 12 Studio in Art Education.
- 24-3 Baroque Painting in Italy. Major developments in style and expression in Italian painting from the late Mannerist period until the early 18th Century.
- 24-3 Art History Seminar. Lectures, readings, and reports on artists, styles, subjects of special interest which will be announced periodically.
- 24-3 Research in Art History. Individual research in the painting, sculpture, architecture, and related arts of the various periods.
- 24-2 to 12 Advanced Sculpture.
- 25-2 to 12 Seminar in Painting.

- 502-2 to 12 Seminar in Sculpture.
 504-2 to 12 Research in Sculpture.
 506-2 to 12 Research in Painting.
 511-2 to 12 Seminar in Prints.
 516-2 to 12 Research in Prints.
 520-2 to 12 Seminar in Pottery.
 526-2 to 12 Research in Pottery.
 530-2 to 12 Seminar in Metal Construction.
 536-2 to 12 Research in Metal Construction.
 540-2 to 12 Seminar in Weaving.
 541-2 to 12 Research in Drawing. Prerequisite: 12 hours 300-level courses.
 546-2 to 12 Research in Weaving.
 560-2 to 12 Seminar in Art Education.
 566-2 to 12 Research in Art Education.
 571-2 to 5 Readings in Art History.
 573-3 to 12 Problems of Art History. A detailed study of single works stylistic problems in selected areas of world art.
 599-2 to 9 Thesis.

Botany

- 400-5 Plant Anatomy. An introduction to cell division, development, and maturation of the structures of the vascular plants. Laboratory fee \$5. Prerequisites: 300, 301 or consent of instructor.
 404-5 The Algae. Structure, development, and relationships of the algae. Laboratory and some field work. Laboratory fee. Prerequisite: 300.
 405-5 Mycology. Structure, development, and relationships of the fungi. Problems of economic and scientific interest stressed. Laboratory. Prerequisite: 300.
 406-5 Industrial Mycology. A consideration of the myriad ways in which fungi impinge on man's affairs, with special emphasis upon their various industrial application—real and potential. 3 lectures and 4 laboratory hours per week. Prerequisite: 405 or consent of instructor.
 411-4 The Bryophytes and Pteridophytes. Structure, development, and relationships of the liverworts and mosses, and the ferns and fern allies. Laboratory. Prerequisite: 301.
 412-4 The Spermatophytes. Structure, development, and relationships of the gymnosperms and angiosperms. Laboratory fee. Prerequisites: 301, 313.
 414-5 Paleobotany. (Same as Geology 414). An introduction to the study of fossil plants emphasizing the major features of plant evolution and the applications of paleobotany to problems in the botanical and geological sciences. Lecture, laboratory, and field trips. Student cost about \$5. Prerequisite: 300 or 400 or consent of instructor.
 420-4 Physiology of Fungi. A treatment of the physiological activities of fungi with particular stress upon (1) those aspects peculiar to the group by virtue of their being nonchlorophyllous plants, and (2) an exploration of the possible explanations of the parasitic vs. the saprophytic habit. Prerequisite: 300 or consent of instructor.
 425-15 (5,5,5) Advanced Plant Physiology. (a) Physics of the plant, water relations, membrane phenomena, photobiology. (b) Covers the absorption, translocation, function and interaction of inorganic nutrient elements in green plants with application to forest, agronomic, and horticultural species. (c) Chemistry of the plant, anabolic and catabolic processes, photosynthesis, respiration, chemosynthesis. Prerequisites: 320, Chemistry 350, or a chemistry course, minor.
 428-3 Plant Nutrition. The physiological importance of carbon-, nitrogen-, and phosphorus-containing compounds is stressed. Prerequisites: organic chemistry, minor in botany or agriculture.
 440-4 Ecology of Grasses and Grasslands. Structure, analysis, and dynamics of grassland communities; structure and growth of individual species. Field and laboratory work costs about \$5. Prerequisite: GSA 340 or consent of instructor.
 445-5 Ecology of Forests and Arable Lands. Forest areas in North America. Developmental and structural analysis of forest types. Autecology of important species. Field trips, approximate cost \$10. Prerequisite: GSA 340.
 449-3 Elements of Taxonomy. Principles of taxonomic research including

Classical and experimental methods. 1 lecture and 4 laboratory hours per week. Field and laboratory expenses \$5. Prerequisite: 313 or equivalent, or consent of instructor.

50-3 Plant Geography. World distribution of plants and plant communities related to historical, environmental, and floristic factors. Prerequisite: consent of instructor.

51-4 Introduction to Floristics. Principles involved and methods used in the analysis of the flora of an area. Laboratory and field work. Student cost about \$10. Prerequisite: 313.

56-5 Plant Pathology. (Same as Plant Industries 355.) A study of plant diseases caused by fungi, bacteria, and viruses. Special attention given diseases of southern Illinois plants. Laboratory and field trips. Laboratory fee. Prerequisite: consent of instructor.

57-4 Forest Pathology. Nature and control of forest and shade tree diseases. A study of tree diseases in forests, parks, streets, and nurseries. Fungi important in decay and stain of timber and its products are included. Laboratory fee. Prerequisite: 456 or consent of instructor.

70-4 Methods of Teaching High School Biology. Methods, objectives, types of courses taught in secondary school biology. Laboratory and field trips. Prerequisite: major in botany or zoology.

80-4 Classic Principles of Botany. Theories, principles, and developments in the various divisions of the plant sciences. Prerequisite: GSA 203 or consent of instructor.

90-5 Biosystematic Plant Anatomy. Study of the taxonomic implications of developmental and positional variation of tissues and cell types within plants. Two lecture and six laboratory hours per week. Prerequisite: 400. Recommended: 412, 449.

93-5 (5,5,5) Angiosperm Taxonomy. (a) Systematic treatment of all families of the monocotyledoneae. (b,c) Systematic treatment of all families of dicotyledoneae. Laboratory fee. Prerequisite: consent of instructor.

10-4 Bio-ecology. (See Zoology 510).

22-5 Advanced Microtechnique. Preparation and presentation of research materials. Laboratory work only. Prerequisite: consent of department. Credit on work completed.

25-5 Cytology. (Same as Zoology 525). Physiochemical, chemical, and morphological organization of the cell. Ultrastructure of the cellular organelles. Biochemical and submicroscopical organization of the hereditary material. Morphology and function of the spindle of the nucleus and chromosomes during the mitotic cycle. Synthesis and replication of nucleic acids. RNA and protein synthesis. The genetic code. Enzymes and cell metabolism. Prerequisite: 315 or Zoology 401.

26-5 Cytogenetics. Correlation of cytology with genetics. Cell mechanics and nuclear division. Mitosis, meiosis, crossing over and mapping of chromosomes. Mutation, mitotic agents, effect of irradiation, polyploidy, structural aberrations, polytene chromosomes. Synthesis of new species, comparative karyomorphology. Evolution and cytogenetics. Prerequisite: 525 or consent of instructor.

3-3 to 4 Growth and Development in Plants. External and internal factors that they effect development and growth of plants, photoperiodism, and the role of growth-promoting substances. 1 hour to be arranged. Prerequisite: 320.

35-3 Energetics of Aquatic Ecosystems. Energy flows in aquatic habitats; photosynthesis and respiration rate determinations under natural and laboratory conditions; determination of dominant genera in the communities; daily and annual energy budgets; factors influencing utilization of light by autotrophic systems; influence of daily and annual energy budgets on stratification of current systems, and on seasonal succession in the community. Prerequisite: consent of instructor.

32-3 Biosystematics. An examination of species concepts and factors effecting the formation of species. Evidence from the fields of geneecology, cytotaxonomy, genetics, numerical taxonomy, and chromotography are discussed as well as the phenomena of hybridization, polyploidy, and apomixis. Prerequisite: 315 or Zoology 401 or consent of instructor.

33-5 Experimental Ecology. Experiments on plant response to environmental factors. Design of experiments, statistical methods, presentation of individual research findings. Laboratory. Prerequisites: 320, GSA 340, or consent of instructor.

51-4 The Natural Vegetation of the Mississippi Basin, Upland. Floristic

studies of the upland vegetation which occurs in the central basin of the Mississippi River. Student cost \$10. Prerequisite: 313 or consent of instructor.

552-4 Mississippi Flora, Aquatic. An analysis of the aquatic vegetation of the Central Mississippi basin, discussing importance to wildlife. Student cost \$10. Prerequisite: 313 or consent of instructor.

555-12 (4,4,4) Advanced Plant Pathology. (a) A study of facultative fungal parasitism with emphasis on the physiology of host-parasite interactions. (b)

A study of obligate fungal parasitism with emphasis on the physiology of host-parasite interactions. (c) A study of bacterial and viral parasitism with emphasis on the physiology of host-parasite interactions and biochemistry of virus reproduction. Prerequisite: 456 or consent of instructor.

570-2 to 5 Readings.

580-1 to 4 Seminar. To be taken by all graduate students majoring in botany.

590-2 to 4 Introduction to Research. Methods of presentation of research materials, including written reports, graphs, photographs, bibliographies. Taxonomy students learn to write keys and descriptions; Botanical Latin; nomenclature.

591-3 to 9 Research. Assignments involving research and individual problem. Prerequisite: consent of department.

599-3 to 9 Thesis. Work in the research for and presentation of a thesis. No more than 9 hours nor fewer than 5 hours will be allowed on thesis work. Total hours in 591 and 599 cannot exceed 15 hours to be applied to the master's degree.

600-1 to 36 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Business Administration

500-4 Research Methods and Communications. Analysis and functional applications of the communication process in the planning, design and presentation of business research data. Provision of a rationale for subsequent studies involving investigative methods.

501-4 Quantitative Methods for Decision Making. Study of the means for testing the validity and reliability of managerial conclusions. Selected areas include criteria development, value analysis, and statistical analysis, including both parametric and non-parametric applications of analysis.

502-4 Business and Society. Study of the external environment of business: social, political and ethical dimensions; conflicts of business-labor-government power groups. Social responsibilities in the formulation of a business management philosophy.

510-4 Managerial Accounting and Control. Relationship of accounting to the functions of production, finance, and distribution; emphasis is given to the usefulness of accounting in administering and controlling an enterprise.

511-4 Accounting Theory. Contemporary advanced accounting theory, including controversial issues with emphasis on net income determination and asset valuation; particular attention given to current publications of the professional and governmental agencies.

512-4 Advanced Auditing. Development of auditing theory and its implications for auditing practice; emphasis on auditing standards and concepts, pronouncements and bulletins of the American Institute of Certified Public Accountants, and current literature.

513-4 CPA and Advanced Accounting Problems. Highly technical problems not covered in undergraduate courses primarily drawn from the American Institute of Certified Public Accountants' examinations.

514-4 Controllership. Function of controllership in a business organization; analysis of the duties and responsibilities of a controller; contribution of a controller to effective planning, coordination, and control through accounting; case studies.

519-4 Seminar in Accounting. Discussion of current problems and theories in accounting.

521-4 Business Conditions Analysis. Adaptation of the business firm to business conditions as indicated by measurements, evaluations, and forecasts.

526-4 Managerial Economics. A course in the economics of the firm. Emphasizes demand, costs, prices, and profits in developing a conceptual business-decision framework.

- 30-4 Financial Management.** A study of financial principles and practices with special emphasis on their relation to managerial planning and control.
- 31-4 Financial Policies.** An evaluation of selected financial policies of corporate enterprise with emphasis on capital budgeting, on the equity and current position.
- 32-4 Financial Institutions and Markets.** The principal financial institutions and markets will be studied in relation to their contribution to the efficient operation of the individual enterprise and the total economy.
- 39-4 Seminar in Finance.** Current issues and practices in business finance. Each student will select a problem for intensive exploration and report his findings to the class.
- 40-4 Managerial and Organization Behavior.** Case analyses of human problems in the business organization. Application of findings of behavioral science research to organizational problems. Development of direction and leadership skills.
- 41-4 Operations Analysis and System Controls.** Study of production functions of the firm. Analyses of operational inter-relations, design of planning procedures, and the application of control systems.
- 42-4 History and Theory of Management.** An analytical study of the background and growth of management theory from its early beginnings to the present. Emphasis will be largely on the theory and practice of business management.
- 43-4 Personnel Management.** Study of the most recent developments in personnel management. Individual reports, book reports, and survey of current professional literature form the bases of the course.
- 44-4 Production Management.** Study of the production function associated with various kinds of businesses. Concern is on the integration of production with other functions of business. Analyses with focus upon managerial problems.
- 49-4 Seminar in Management.** Study of contemporary theory and practice and recent trends in the field of management. Individual and group research reports.
- 50-4 Marketing Management.** A managerial approach in the determination of policies employed in solving problems in marketing.
- 51-4 Product Strategy and Management.** Product management and its relationships with business policies and procedures; the development of multi-product strategies, means of developing such strategies, and the problems and methods of commercialization.
- 52-4 Advanced Marketing Research and Analysis.** The development of advanced procedures, methods and theory of quantitative and qualitative analysis of primary and secondary marketing data.
- 53-4 Transportation Management.** Students will be required to investigate and discuss before the seminar group such topics as intercarrier competition, rate level adjustment, financing, and public policy considerations.
- 54-4 Marketing Theory.** Theory in related disciplines is considered in regard to evolving marketing theory. Evaluation of possible theory applications emphasized.
- 59-4 Seminar in Marketing.** Students select and defend, on an individual basis, problems in marketing theory, research, and policy. May be repeated once with consent of department.
- 60-4 International Business Operation.** An advanced course for candidates for the Master of Business Administration degree who have a background in business administration theory and practice and who have a special interest in management at the international level.
- 60-4 Independent Study.** Directed independent study in selected areas of business administration.
- 68-4 Business Policies.** A decision-making frame of reference for application of functional and tool area courses to business cases. Analysis of external and internal environmental constraints on business policy formulation and administration.
- 69-4 to 8 Thesis.**

Chemistry

- 1-4 Intermediate Inorganic Chemistry.** Modern inorganic chemistry involv-

ing atomic structure, chemical bonds, complexes, and chelate structures; chemistry of familiar and less familiar elements. 3 lecture hours per week. Prerequisite: 461b.

412-3 Inorganic Preparations. A study of several important inorganic syntheses. 1 lecture and 6 laboratory hours per week. Prerequisites: 235; 305b or 341c.

432-8 (4,4) Instrumental Analytical Measurements. Theory and practice of instrumental analytical measurements, including spectrophotometric, electroanalytical, and chromatographic methods. 2 lecture and 6 laboratory hours per week. May be taken in either sequence. Corequisite: 461b.

433-3 Intermediate Quantitative Analysis. A study of the analysis of complex materials, with emphasis on separations, functional group analysis, and instrumental applications. 2 lecture and 3 laboratory hours per week. Prerequisites: 432a or b and 461c.

438-3 Review of Analytical Chemistry. A review in depth of current analytical practices in research and industry, including fundamental equilibria, separations, and modern instrumental techniques; designed to update graduate students who are deficient in these areas. Prerequisite: Chemistry 433 equivalent.

446-4 Qualitative Organic Analysis. A systematic study of the separation and identification of organic compounds. 2 lecture and 6 laboratory hours per week. Prerequisite: 305b or 341c and 461c.

447-3 Quantitative Organic Chemistry. The determination of functional groups and elements commonly found in organic compounds by selected methods of analysis; illustration of general methods of procedure in the field of quantitative organic chemistry. 1 lecture and 6 laboratory hours per week. Prerequisite: 305b or 341c.

451-9 to 11 (3,3,3 or 4) Biochemistry. (a) Chemistry and functions of amino acids, proteins, and enzymes. (b) Carbohydrate chemistry, function, and metabolism; biochemical energetics; citric acid cycle; oxidative phosphorylation. (c) Photosynthesis; lipid chemistry, function, and metabolism; nitrogen metabolism; nucleic acid and protein biosynthesis; metabolic regulation. Prerequisite: 235, 305b, 341c.

455-8 (4,4) Biochemistry Laboratory. Modern biochemical laboratory techniques. (a) Isolation, purification, and characterization of constituents of living cells. (b) Investigations of pathways, kinetics, energetics, and regulatory mechanisms related to metabolism and enzymic activity. One lecture and 3 laboratory hours per week. Prerequisite: 451.

460-5 Principles of Physical Chemistry. A one-term course in physical chemistry designed especially for non-chemistry majors including prospective teachers of high school chemistry. Three hours of lecture and six hours laboratory per week, one hour of which will be used for special instruction. Prerequisites: 235, 305b, or 341c, and one year of physics or consent of instructor.

461-12 (4,4,4) Physical Chemistry. A fundamental course in physical chemistry. 3 lecture and 3 laboratory hours per week. Prerequisites: 235, 12 hours of physics, and one year of calculus. Must be taken in a,b,c sequence, and each is a prerequisite for the next course in the sequence.

464-3 Introduction to Quantum Chemistry. Quantum chemistry as applied to atoms and molecules. Three lecture hours per week. Prerequisite: 461c or consent of instructor.

471-3 Industrial Chemistry. A survey of modern industrial chemistry and introduction to chemical research processes. 3 lecture hours per week. Prerequisite: 305b or 341c.

472-12 (4,4,4) X-Ray Crystallography. (See Applied Science 401.)

490-2 Chemical Literature. A description of the various sources of chemical information and the techniques for carrying out literature searches. 2 lecture hours per week. Prerequisites: 235; 305b or 341c, reading knowledge of German or consent of instructor.

496-1 to 12 Chemical Problems. Investigation of individual problems under the direction of a staff member. Prerequisite: consent of instructor and department chairman.

504-3 Mechanisms and Synthesis in Organic Chemistry. Examination of fundamental mechanisms and syntheses of organic chemistry. Prerequisite: 341c.

511-9 (3,3,3) Advanced Inorganic Chemistry. Lecture. (a) A theoretical and empirical treatment of chemical bonding and molecular structure. (b)

- systematic treatment of physical-inorganic chemistry based on the principles learned in (a). The b,c sequence is not mandatory. Prerequisite: 461c.
- 2-2 to 30 (2 to 6 per quarter) **Advanced Topics in Inorganic Chemistry.** Selected topics such as kinetics of inorganic reactions, stereochemistry of organic systems, chemistry of coordination compounds, nonaqueous solvent systems, and others. Prerequisites: 511a and consent of instructor.
- 3-3 **Theory of Quantitative Analysis.** The phenomena utilized in analytical chemistry with emphasis on separation, organic reagents, and complex methods. Lecture. Prerequisite: 433 or satisfactory field examination.
- 3-3 **Instrumental Methods of Analysis.** Theory and practice of instrumental measurements in analysis with emphasis on commercial samples and applications to research. Lecture and laboratory. Prerequisite: 432 or satisfactory field examination.
- 2-2 to 30 (2 to 6 per quarter) **Advanced Topics in Analytical Chemistry.** Selected topics such as microanalytical chemistry, absorption spectroscopy, and electroanalytical chemistry. Prerequisite: 432.
- 3-3 **Advanced Organic Chemistry.** An advanced course covering covalent bonding, structure, stereochemistry, reactions, reaction mechanisms, substituent effects, correlation of physical and chemical properties, and physical methods of organic chemistry. Lecture Prerequisite: 444 or satisfactory field examination.
- 3-3 **Advanced Organic Chemistry.** Continuation of Chemistry 541. Lecture. Prerequisite: 541.
- 3-3 **Advanced Organic Chemistry.** Continuation of Chemistry 542. Prerequisite: 542.
- 3-3 to 6 **Advanced Laboratory Preparations in Organic Chemistry.** Prerequisites: 446 and consent of instructor.
- 2-2 to 30 (2 to 6 per quarter) **Advanced Topics in Organic Chemistry.** Specialized topics in organic chemistry. The topic to be covered is announced by the department. Prerequisite: 543.
- 3-3 **Nucleic Acids and Protein Biosynthesis.** Proteins and nucleic acids. Three lecture hours per week. Prerequisite: 451c.
- 3-3 **Carbohydrate Chemistry.** Simple sugars, oligosaccharides, and polysaccharides. Three lecture hours per week. Prerequisite: 451c.
- 3-3 **Plant Biochemistry.** Three lecture hours per week. Prerequisite: 451c.
- 4-4 **Biochemical Mechanisms.** Molecular transformations in biochemistry in terms of general mechanistic principles in chemistry. 3 lecture hours per week. Prerequisite: 451c.
- 3-3 **Enzymes.** Advanced enzyme chemistry. 3 lecture hours per week. Prerequisite: 451c.
- 2-2 to 30 (2 to 6 per quarter) **Advanced Topics in Biochemistry.** Selected topics such as enzymology and physical biochemistry. Prerequisite: 451c.
- 6-3 **Chemical Thermodynamics.** Basic methods and theories as applied to chemical problems. Lecture. Prerequisites: 461c or consent of instructor.
- 6-6 (3,3) **Quantum Chemistry.** Basic Principles. Lecture. Prerequisite: 464 or consent of instructor.
- 6-3 **Chemical Dynamics.** Experimental description and classical theories of rate of chemical reactions; kinetic theory of non-uniform gases and its application to reacting systems; molecular beam techniques. Lecture. Prerequisite: 461c.
- 6-3 **Statistical Thermodynamics.** Elements of statistical mechanics and application to relatively simple systems. Alternates with 563. Prerequisite: 562 or consent of instructor.
- 6-2 to 30 (2 to 6 per quarter) **Advanced Topics in Physical Chemistry.** Solids and macromolecules, quantum chemistry of atoms, diatomic molecules and polyatomic molecules, statistical mechanics and others. Prerequisite: 561.
- 7-1 to 3 **Graduate Seminar.**
- 9-2 to 15 (2 to 6 per quarter) **Special Readings in Chemistry.** Assigned primary work in any of the five fields of chemistry with individual instruction by a staff member. (a) Analytical, (b) biochemistry, (c) inorganic, (d) organic, (e) physical. Prerequisites: 24 hours of 500-level chemistry and consent of chairman.
- 9-0 to 9 **Advanced Seminar in Chemistry.** Advanced level talks presented by graduate students; (a) analytical, (b) biochemistry, (c) inorganic, (d) organic, and (e) physical chemistry. Prerequisite: consent of chairman.

- 596-3 to 9 **Advanced Chemical Problems.** Individual study and investigation in preparation for research. Prerequisite: consent of chairman.
- 597-3 to 15 **Research and Thesis.** Prerequisite: consent of chairman.
- 598-3 to 48 **Research—Doctoral.** Prerequisite: consent of chairman.
- 600-3 to 48 **Dissertation—Doctoral.** Prerequisite: 598.

Cinema and Photography

- 401-4 **History of the Cinema.** History, esthetics, and appreciation of cinema. Screening of films of representative type and historical significance. Not open to students who have had GSC 349.
- 402-4 **History of Still Photography.** History, esthetics, and appreciation of still photography. Not open to students who have had GSC 348.
- 411-1 to 10 **Workshop in Still Photography.** Advanced work in special photographic techniques and applications. Prerequisite: consent of department.
- 429-3 **Photographic Methods in Science and Technology.** Photomicroscopy, specimen, infrared, and ultraviolet photography, high speed and time-lapse motion pictures, slide series production. Prerequisite: 260c, 341a.
- 431-1 to 12 **Problems in Still Photography and Cinematography.** Special projects for advanced students in still photography and cinematography. Prerequisite: by permission.
- 428-3 **Managing the Industrial Photographic Unit.** Practices, procedures, administration, and management of typical units. Prerequisite: by permission.

Clothing and Textiles

- 423-4 **Advanced Family Housing.** (See Home and Family 423.)
- 431-4 **Advanced Applied Design.** Research problems in experimentation with materials in textile design, linoleum block printing, stencilling, contemporary embroidery, silk-screen printing, etc. Prerequisite: 331 or consent of chairman.
- 432-2 to 8 **Workshop.** Designed to aid leaders in the field with current problems. Discussion, reports, lectures, and other methods of analyzing and working on solutions to problems. Prerequisite: consent of chairman.
- 433-4 **Advanced Pattern Designing.** Application of flat pattern design principles to the making of patterns for garments of various designs and fabrics. Fitting and pattern alteration related to various figure types. Production analysis. Prerequisite: 233 or consent of chairman.
- 434-4 **History of Clothing.** Development of clothing from prehistoric times to the present. Social, economic, and aesthetic background. Technical innovations that made possible its design.
- 440-4 **Clothing the Family.** Needs and wants of individuals at various developmental stages, in family and societal settings with respect to apparel consumption; functional and fashion-motivated choice of clothing; and family budgets.
- 470-3 **Interior Design Seminar.** A study and appraisal of noted interiors and architecture as interpreted in selected buildings and by selected designers. Prerequisite: consent of chairman.
- 473-4 **Advanced Tailoring.** The student will tailor one garment for home use. Time-saving methods, high-quality construction details, and professional finishes stressed. Prerequisite: 360 or consent of chairman.
- 474-4 **Advanced Textiles.** The physical and chemical analysis of textiles. Problems dealing with standards, labeling, and legislation. Current literature developments in the field. Prerequisites: 304 or consent of chairman.
- 481-2 to 6 **Readings.** Supervised readings for qualified students. Prerequisite: consent of chairman.
- 500-4 **Research Methods.** Study of methods employed in research in clothing, textiles, and interiors. Critique of literature, theses, and research. Development of research design based on interest and need of student. Prerequisite: statistics or consent of chairman.
- 570-4 **Clothing and Textiles Seminar.** Selected problems within the field of clothing and textiles.
- 572-2 to 8 **Special Problems.** For students recommended by their chairman and approved by the chairman of Clothing and Textiles, and the instructor in charge for independent work or directed study.

- 2-4 **Foundations of Fashion.** Anthropological approaches to fashion and socio-economic and psychological forces as determinants of fashion in modern times. Prerequisites: 329 and 339, or consent of chairman.
- 3-3 (1,1,1) **College Teaching of Clothing, Textiles, and Interiors.** Central issues, objectives, and current practices. For preparation of college teachers.
- 2-2 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.

Design

- 0-0 to 2 **Materials and Basic Techniques.** Same as 200 and 300.
- 1-5 to 15 **Research in Product-Shelter Design.** Problems dealing with large shops. All problems carried from conception to actual full-scale construction. Development of prototype for mass-production techniques. Small research projects will be developed under grants given to the department. Prerequisite: 12 hours of 366 or its equivalent.
- 1-5 to 15 **Research in Visual Design.** Problems dealing with room-to-eye scale and larger, i.e., posters, car cards, strip film, film, exhibitions, etc. Advanced graphic and photographic technology. Development of prototypes for mass-production techniques. Small research projects will be developed under grants given to the department. Prerequisite: 12 hours of 375 or its equivalent.
- 1-2 to 12 **Studio in Product-Shelter Design.** Special projects developed with adjunct and visiting professors.
- 1-2 to 12 **Studio in Visual Design.** Special projects developed with adjunct and visiting professors.
- 1-4 to 10 **Educational Tool Systems.** Designs of specialized instructional systems, including design of learning environments and ancillary support systems programmed learning.
- 1-4 to 12 **Studies in the Industrial Process.** Design of products and product systems utilizing contemporary technology for solutions to significant human problems.
- 1-4 to 12 **Research in Product Design.** Studies of specialized needs or problem areas (i.e., equipment for the handicapped, needs of underdeveloped areas, etc.).
- 1-4 to 12 **Studies in Communications Design.** Concerned with the over-all systems of human communications, including visual and graphic media.
- 1-4 to 12 **Research in Communications Design.** Specialized areas of visual and graphic communication extended through various technical systems. Development of related systems involving the whole range of communications included.
- 1-2 to 16 **Field Study in Design.** Design activity (local, national, or international) carried out with a designated faculty member as liaison. Written report assigned and final report required. All projects must have written approval by the chairman and the liaison faculty member.
- 1-4 to 12 **Environmental Control.** Selected studies in environ control systems, with particular reference to latest technical advances (i.e., closed ecology and autonomous systems developments) and to contributions in the study of human environment control by other disciplines.
- 1-4 to 12 **Design Science Exploration.** Procedural methodology and systems approach to comprehensive anticipatory design science.
- 1-4 **World Ecological Studies.** Review and analysis of man's present socio-economic situation in terms of scientific and technological trending-material energy resources, human ecology networks.
- 1-4 to 8 **Structural Evolution.** Structural morphology and relational hierarchies in science and technology. Differentiation and evolution of industrial systems: complex: analysis of world service industry networks.
- 1-2 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.

Economics

- 1-4 **Economic and Business Statistics II.** Techniques for making decisions under the economic conditions are not known with certainty. 3 hours lecture; 3 hours laboratory. Prerequisite: 307 or GSD 110, or GSD 108c, or GSD 114c, or consent of instructor.

- 411-4 Collective Bargaining and Dispute Settlement.** Nature, issues, procedures, economic effects. Analysis of actual collective bargaining situation. Prerequisite: 310 or consent of instructor.
- 416-4 Money and Banking II.** Emphasis upon the Federal Reserve System and other banking systems. Prerequisite: 315 or consent of instructor (C); 300 (E).
- 418-4 Economic History of Europe.** A survey of the economic growth of Europe with emphasis upon the development of European agriculture, industry, finance, and international trade since 1750. Prerequisite: 215, or GSB 211a, or consent of instructor.
- 419-4 Latin American Economic Development.** A survey of the resource base of Latin American economic development with special reference to the problems of transition from an export-import to an integrated industrial economy; monetary policies; problems of economic planning. Prerequisite: 215, or GSB 211a, or consent of instructor.
- 420-4 Recent Economic History of the United States.** Review and analysis of the chief characteristics, trends, and continuing problems of the economy of the United States in the 20th century. Prerequisites: 215.
- 422-4 Introduction to Economic Development.** An analysis of the preconditions, processes, and problems involved in economic development. Both theory and policy relevant to development, with special emphasis upon "developing" or "emerging" economies, are stressed. Prerequisites: 215.
- 429-4 International Economics.** Intensive treatment of the principles of international economics with special emphasis on the classical and modern theories of international trade. Income effects. Balance of payments adjustment. Prerequisites: 215 or consent of instructor.
- 430-4 Regional Economy.** Natural economic regions, governmental action in the T.V.A.), local applications. Prerequisites: 215.
- 431-3 Public Finance II.** State and local. Prerequisite: 330 or consent of instructor.
- 433-4 Inflation, Growth, and Stability.** National income theory with emphasis on (a) the influence of government budgetary programs on the level of national income, employment, growth, and the price level, and (b) the institutional difficulties of formulating and executing a Federal budget program. Prerequisite: 215 or consent of instructor. Note: A student may not receive credit for both 433 and 441.
- 436-3 Government and Labor.** (Same as Government 436.) A study of labor relations and legislation considering both constitutional and economic aspects. Prerequisite: 205 or 215 or GSB 211c or consent of instructor.
- 440-4 Intermediate Micro Theory.** A more intensive treatment of price theory. Prerequisites: 215 or consent of instructor.
- 441-4 Intermediate Macro Theory.** Basic analytical concepts of the modern theory of aggregative income determination. Prerequisites: 205 or 214 or consent of instructor.
- 450-6 (3,3) History of Economic Thought.** The development of economic theory. (a) Ancients to 1850; (b) 1850 to present. Must be taken in sequence. Prerequisites: 215 or consent of instructor.
- 460-4 Russian Economy.** Development of Russian trade, agriculture, industry, government, finance, and standards of living in successive periods in relation to the historical, geographic, economic, and ideological background. Prerequisite: 215, or GSB 211a, or consent of instructor.
- 461-8 (4,4) Comparative Economic Development in Asia.** A comparison of the economies of Japan, India, and China within the framework of emerging economic theory of developing economies (a) Japan from Tokugawa period to the present. (b) Contemporary China and India. Prerequisite: 215 or GSB 211a, or consent of instructor.
- 462-4 Economic Development of the Middle East.** Economic structure of countries constituting the Middle East; economic, political, social and cultural forces influencing development. Prerequisites: 215.
- 465-4 Mathematical Economics I.** A systematic survey of mathematical economic theory. Conditions of static equilibrium (including stability conditions), dynamic models using difference equations, and linear production model; input-output analysis and activity analysis (linear programming). Prerequisite: 440 and consent of instructor.
- 467-4 Econometrics I.** Introduction to resource allocation under uncertainty. Probabilistic economic models, theory of games and economic choices and stochastic economic processes. Prerequisite: consent of instructor.

4 Land Resource Economics. (Same as Forestry 471 and Agricultural Industries 471.) The use of land as an economic variable in production of goods and services; land market; group versus individual conflicts; elementary and resources planning techniques. Prerequisite: 440, or 441, or Agricultural Industries 350, or Forestry 470.

4 Dynamic Economics: Fluctuations and Growth. A study of the causal factors which produce fluctuations in economic activity and/or growth. An identification of the factors which affect the length of the cycle, its amplitude and the stability or instability of equilibrium. An examination of the theories and issues of economic growth. Prerequisite: 441 or consent of instructor.

4 Comparative Economic Systems. Capitalism, socialism, fascism, and other forms of the economy. Prerequisite: 215 or consent of instructor.

4 Workshop in Economic Education. (Same as Education 490.) Designed to assist elementary and secondary school teachers in promoting economic understanding in the minds of their students through the translation of economic principles and problems into classroom teaching materials.

4 to 8 Economics Seminar. A study of a common, general topic in the field of economics, with individual reports on special topics. Prerequisite: 206, 214 and 215, or consent of instructor.

1 to 5 Economics Readings. Contemporary books and periodicals in economics. Prerequisite: consent of department.

1 to 6 Readings in Resource Economics. (Same as Forestry 520b and Agricultural Industries 520b.) Directed readings in the field of resource economics. Prerequisite: consent of instructor.

4 Labor Economics. Economic principles involved in the employment relationship. Such topics as wage theory, the labor market, employment and unemployment, and the economic effect of collective bargaining are covered. Prerequisite: 310, or 411, or consent of instructor.

4 Monetary Theory and Policy. Current monetary theory and policy emphasized. Federal Reserve policy is analyzed. Necessity for coordination of monetary policy with fiscal policy and debt management operations is discussed. Prerequisites: 315 and 441, or consent of instructor.

8 (4,4) Economic Development Theory and Policy. (a) Classical, neoclassical, and modern contributions to the theory of development; theories of underdevelopment. (b) Basic approaches to economic development; laissez-faire; balanced growth; unbalanced growth; role of government; methods of financing; and foreign aid. Must be taken in a,b sequence. Prerequisite: 440,

4 Managerial Economics. (Same as Business Administration 526.) A course in the economics of the firm. Designed to develop a conceptual framework for business decision making with emphasis on demand, costs, prices, and profits. Prerequisites: 214 and 215, or 413, or consent of instructor. Credit may not be earned in both Economics 440 and this course.

4 Foreign Trade and Finance. Emphasis on the advanced theory of international trade and finance. Survey of significant literature in international trade and finance. Study of more advanced tools of analysis. Prerequisite: 429 or consent of instructor.

4 Seminar in International Economics. Application of theory to current international economic developments. Empirical studies. Foreign economic policy. Prerequisite: 530 or consent of instructor.

4 Public Finance Theory and Practice. Historical development of public finance theories with analysis of their policy implications. Prerequisite: 330 or consent of instructor.

4 National Income Theory. Keynesian and post-Keynesian developments in national income theory. Empirical research concerned with characteristics and magnitudes of important national income concepts, such as the consumption function, is examined. Recent American policies and problems bearing on national income fluctuations are considered. Prerequisite: 441 or consent of instructor.

4 Price Theory. Designed to develop skills in the use of the analytical methods, including the basic mathematical techniques, used in price theory. Prerequisite: 440 or consent of instructor.

4 Seminar in Economic Policy. A consideration of departures in the American economy from the principle of resource allocation by the price mechanism, and an attempt to develop principles of economic policy which could

serve as guides in efforts to raise living standards and promote economic growth. Prerequisites: 440 and 441 or consent of instructor.

545-4 Oligopoly and Related Market Structures. Theories of oligopoly, duopoly, and monopolistic competition. Emphasis on the problems of their construction when the participants in the market recognize their interdependence. Prerequisite: 542.

552-4 Seminar in Economic Thought. An exploration of the basic philosophical assumptions which underlie the various types of economic thought with special emphasis upon the historical development of the premises of modern day economic theories. Prerequisite: 450a,b or consent of instructor.

555-4 Seminar in Economic History. An examination of the structural economic changes in various economies throughout the world. Prerequisites: consent of instructor.

562-4 Seminar in Economic Systems. A final, theoretically-oriented examination of economic systems. Includes recent theoretical models; contemporary changes in major economic systems; the emergence of mixed systems. Analyses economic, social, and political systems and evaluates attempts to place economic systems within to context of general systems theory. Prerequisite: 481 or consent of instructor.

566-4 Mathematical Economics II. Linear economic models. Linear programming. Input-Output analysis and general equilibrium models. Prerequisite: 465 or 465, or consent of instructor.

567-4 Econometrics II. Problems in utilizing multivariate statistical techniques in the testing of complex economic models. Prerequisite: 467, 566, and Mathematics 410c or equivalent.

575-4 Economic Regulation. An analysis of the economic causes and effects of the regulation of agriculture, business, and labor. Prerequisite: 440 or consent of instructor.

581-4 Economics of Welfare. The application of economic theory to the quest for economic welfare. Includes consideration of income distribution, rate of economic growth, the pricing system, and the role of government. Prerequisite: 440 or equivalent.

582-4 Economic Behavior. A theoretical and empirical study of the behavioral aspects of economics, including the behavior of firms, households, and government. This course draws upon the recent literature of economics and also, on frontier areas, upon directly relevant concepts and findings of related behavioral sciences. Prerequisite: 440 or equivalent or consent of instructor.

583-4 Methodological Foundations of Economics. A systematic analysis of the nature, philosophical content, premises, scope, boundaries, and characteristic methods of economics. The history of economic thought is drawn upon, but major focus is upon the contemporary state of the discipline as well as upon apparent methodological trends. Prerequisites: 440 and 441 or equivalent.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Doctoral Dissertation. Hours and credit to be arranged by candidate.

Educational Administration and Foundations

Students who wish to take the following courses on the Carbondale campus will need approval by the Department of Educational Administration and Supervision prior to Graduate Office program approval: 420, 424, 434, 456, 500, 527, 533, 534a,b, 535, 539, 556.

431-4 History of Education in the United States. An historical study of the problems of American education which have relevance to contemporary education.

432-4 Education and Social Forces. Analysis and classification of propaganda. Designed to show how public opinion is formed by a use of current materials from the different channels of communication. Differences between propaganda and indoctrination.

500-4 Research Methods. Introduction to educational research with practical training in research writing techniques and evaluation in education.

501-12 (4,4,4) Seminar in Educational Administration. The interdisciplinary approach to the study of the theory of educational administration. Open to students in approved sixth year and doctoral programs only.

- 4 Seminar in Comparative Education. Educational ideas and practices of various countries of the world, both Eastern and Western, and their impact upon our culture and education.
- 4 Seminar in Comparative Education: Soviet Russia. A study of Soviet education in historical, cultural, political, philosophical, and world perspective. Emphasis is on education in Communist morality and the creation of the "New Soviet Man." Includes a consideration of the challenge to American education and the issue of the study of Communism in our schools.
- 4 Seminar in Philosophy of Education. An interpretation of modern educational problems and trends in the light of basic philosophical viewpoints. Excerpts from the leading philosophical writings are used. Prerequisite: 554 or equivalent.
- 4 Seminar in History of European Education. A survey and interpretation of education in Europe from the Greek era to the present. Stresses the relationship of European to American education.
- 4 Seminar: Curriculum in Relation to American Culture. The effect of historical movements on curriculum in our nation at all ages and grade levels studied on a more intensive basis as applied to present-day curricular patterns. Prerequisite: 460 or consent of instructor.
- 12 (4,4,4) The Twentieth Century and Education. Major movements in the contemporary world are studied in terms of their importance for American education.
- 8 (4,4) Interdisciplinary Seminar in Educational Administration. Covers basic topics in fields related to Educational Administration. Prerequisite: consent of instructor.
- 12 (4,4,4) Internship Practicum. The study of theory and practice in school administration pursued simultaneously by the student in cooperation with a public school and the Department. Prerequisite: consent of the department advisory committee.
- 3 Workshop in Adult Education. For teachers and administrators in adult education programs. Problems related to the adult learner, program planning, methods and materials. Prerequisite: consent of instructor.
- 8 (4,4) Legal Basis of American Education. (a) Exploration of principles of law applicable to public schools and school personnel. (b) Illinois school law. Study of the legal aspects of Illinois public education with principle emphasis on statutory law and its interpretation by the courts. Must be taken in sequence. Prerequisite: 420.
- 12 (4,4,4) School Administration. Basic orientation to the field of school administration and to the legal and extra-legal forces affecting public school education.
- 2 to 4 Current Issues in School Administration. A field laboratory course for principals and superintendents.
- 4 School Buildings. Various phases of physical plant design and maintenance of concern to the school administrator.
- 4 School Finance. A study of the principles and issues of Public School Finance. Revenues, expenditures, indebtedness, and fiscal controls are dealt with.
- 4 School Business Administration. Principles and practices governing the management of business affairs of a public school system.
- 2 to 4 Educational Application of Electronic Data Processing.
- 4 Research in Problems of School Administration. An intensive course for school principals on the theory and principles of administration.
- 3 Administrator's Workshop. A special program for the consideration of administrative problems pertinent to superintendents, high school principals, and elementary school principals.
- 4 Community Development Through the School. Comprehensive survey of the resources of a particular community: the cataloguing of material for the use by the teachers of the community to help determine needed curriculum changes.
- 4 Contrasting Philosophies of Education. Deals both historically and contemporaneously with the ideologies which have developed from different concepts and philosophies of education. Prerequisite: 355 or Philosophy 355 or equivalent.
- 8 (4,4) School Supervision. (a) The function of the principal or supervisor in the improvement of instruction. Some activities, methods, and devices for improving the effectiveness of teaching. (b) Seminar in educational supervision.

sion. Special research problems in supervision for advanced graduate students. Must be taken in a,b sequence.

560-4 Curriculum. Modern practices and procedures in curriculum development, with attention to the professional, social, economic, and other major factors, in curriculum planning.

563-4 School Public Relations. To meet the needs of teachers, supervisors and administrators, in the area of public relations. Prerequisite: consent of instructor.

575-1 to 4 Individual Research. Selection, investigation, and writing of a research assignment under the personal supervision of a graduate faculty member in one of the following areas: (a) curriculum, (b) supervision, (c) buildings, (d) finance, (e) school law, (f) comparative education; (g) history of education, (h) philosophy of education, (j) administration, (k) elementary education. Prerequisite: 500, approval of department adviser and consent of instructor.

576-1 to 4 Readings in Administration and Supervision. Open only to advanced graduate students. Prerequisite: 501a.

589-2 to 12 General Graduate Seminar. (Same as Philosophy 589). For students having special interests in the history of philosophy and the systematic development of philosophic ideas. Prerequisite: consent of instructor.

591-2 Seminar in Social and Philosophical Foundations. Concurrent with Guidance 590 as part of sequence required of all students who are beginning advanced graduate study for the Doctor of Philosophy degree in education. Prerequisite: advanced standing.

592-4 Doctoral Seminar In Cultural Foundations of Education. An integrated seminar in the cultural foundations of education for doctoral students in education. Prerequisite: 591.

596-5 to 9 Independent Investigation. Field study required of each student working for the sixth-year specialist certificate.

597-1 to 3, 598-1 to 3, 599-1 to 3. Thesis. Minimum of 5 hours to be counted toward the master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Elementary Education

401-2 to 4 Problems in Public School Reading. Requirements: attendance at sessions of a reading conference, preparation of a paper showing practical applications of theory to the student's own teaching situation.

410-4 Improvement of Instruction in Arithmetic in Kindergarten-Primary Grades. Recent findings and current practices in building a basis for quantitative thinking in early childhood education. Special emphasis upon placement of content and of techniques to aid children in understanding the number system. Prerequisite: Mathematics 210.

411-4 Seminar in Instruction. To assist student teachers and in-service teachers in solving classroom problems. Involves clinical study and discussion of behavioral and learning situations, with special attention to the development of characteristics and needs of students.

413-4 Children's Literature. Emphasizes types of literature, analysis of literary qualities, selection and presentation of literature for children. Not for students who have had English 213. Prerequisite: Guidance 305.

415-2 to 4 Improvement of Instruction in Arithmetic in the Elementary School. Items to be taught, the grade placement of content, newer instructional techniques and materials of instruction, and means of evaluating achievement. Prerequisite: Mathematics 210 or consent of instructor.

430-3 Workshop in Creative Writing in the Elementary School. Techniques encouraging creative writing in the elementary school.

431-2 to 4 Education for the Disadvantaged Child. An understanding of culturally disadvantaged children with emphasis on the nonurban poor. Discussion of necessary adjustments of school programs emphasizing early school admission, experimental background, self-concept, language development, learning style.

433-4 Workshop in Kindergarten-Primary Education. Meets needs of in-service teachers in such areas as curriculum adjustment, remedial teaching, development, and early childhood education. No credit if student has completed 333 or 390.

- 4 to 8 Workshop in Elementary School Foreign Language Instruction.**
- 4 Problems in Reading.** Practices and trends in the teaching of reading; materials of instruction in reading, particularly remedial materials; techniques and materials for prevention of reading difficulties; diagnosis and remediation of reading difficulties. Prerequisites: senior standing, 337. Not open to students who have had 505.
- 4 Workshop in Elementary School Science.** Brief review of aims and methods. Emphasis upon selection and use of curriculum materials including curricular developments, planning for teaching and learning, and evaluation.
- 4 Teaching Elementary School Science.** Study of content and methods of elementary school science.
- 4 Workshop in Social Studies.** Material on critical areas of the world commonly emphasized in elementary social studies. Areas considered: significant geographical concepts, Asia, Africa, Russia, and Eastern Europe. Standing specialists in social science present their specialties.
- 4 Parent Involvement in Education.** Study of materials, techniques, and resources suitable for use by teachers in helping parents and teachers to understand how they can help each other in the partnership responsibilities of the education of culturally disadvantaged children. Prerequisite: student teaching or consent of instructor.
- 4 Seminar in Psychology of Elementary School Subjects.** Psychological principles of learning applied to the mastery of materials used in elementary school subjects. Prerequisites: 314, Guidance 305.
- 2 to 3 Workshop in Economic Education in Elementary Schools.** A study of newer programs stressing economic understandings of the social studies in the elementary school.
- 9 NDEA Institute in Reading.** Emphasizes newer methods and techniques of teaching reading, research findings and applications, adaptation of methods and techniques to various types of pupils. Critical evaluation of new approaches. Prerequisite: students must be selected in advance.
- 4 Readings in the Elementary School.** First course in the reading sequence. Survey of reading problems, aspects of the reading process, modern practices in teaching reading.
- 2 to 4 Readings in Reading.** Independent reading; acquaintanceship with literature and research in reading. Conference periods. Prerequisite: 505 or consent of instructor.
- 4 to 8 Practicum in Reading.** For advanced students; teaching demonstrations and evaluations. Each student works with a group of reading difficulty cases. Prerequisites: 521a,b, and c, and consent of instructor.
- 4 to 8 Seminar: Problems in Reading.** Major field content seminar: Problems and practices; comprehensive review and evaluation of research and literature. Each student pursues a problem of his own interest.
- 4 Organization and Administration of Reading Programs.** For reading specialists, principals, supervisors, consultants. Recent trends in elementary and high school reading programs, providing instruction for total school population, materials and equipment, in-service training, role of the reading specialist. Problems of class members are studied and discussed. Prerequisites: 461 and 505.
- 4 Special Problems in the Teaching of Arithmetic in the Elementary School.** A seminar course which covers important problems in arithmetic in the elementary school. Variable content. Prerequisite: 415 or consent of instructor.
- 10 to 12 Internship in Reading.** Culminating experience for doctoral candidates. Each student supervises reading services in his own or cooperating school. Conference periods. Prerequisites: 521a,b,c and consent of instructor.
- 7 to 4 Kindergarten-Primary Practicum.** Practical applications of advanced theory in the Laboratory School. Readings and research related to real problems in the kindergarten-primary classroom. Prerequisite: 8 hours student teaching.
- 8 Supervision of Student Teachers.** The function of the supervisory teacher in the student teacher situation. Particular attention to the problem of student teaching in the public schools. A course for present and prospective teachers who wish to be more effective in dealing with student teachers.
- 19 to 4 Readings in Research—Elementary Mathematics.** Independent readings. Acquaintance with the research literature in elementary mathematics. Conference periods. Prerequisites: 415, 515.

- 520-4 Diagnosis and Correction of Elementary Mathematics Disabilities.** Causes of mathematical difficulties, observation and instrument procedure experience in preparing materials for diagnosis and for corrective purposes. Prerequisite: 515 or concurrent registration.
- 521-12 (4,4,4) Diagnosis and Correction of Reading Disabilities.** Causes of reading difficulties; observation and interview procedures; standardized tests, instruments, and informal inventories; analysis techniques; experiences in preparing materials for corrective purposes. Each student diagnoses a case and treats a reading disability case under supervision. Prerequisites: 505, or concurrent registration with 505, and teaching experience.
- 525-4 Kindergarten-Primary Seminar.** Exploration of research literature on problems in early childhood education. Each student to select problem to present and to present paper to the seminar. Prerequisite: Educational Administration 500 or equivalent.
- 537-4 Kindergarten-Primary Reading.** A survey of problems in the development of a reading program for the primary grades, followed by extensive study of selected problems. Prerequisite: 337 or consent of instructor.
- 541-4 Problems in Elementary School Science.** Emphasis upon identifying and planning for the solution of problems related to the science curriculum and problems in the classroom concerning teaching and learning. Prerequisites: 441, or 442, and Educational Administration 500.
- 542-3 to 4 Language Arts in the Elementary School.** The practical bearing of investigation and theory on the improvement of current practices in teaching of the language arts other than reading. Attention given to evaluation of teaching materials in these areas.
- 543-4 Teaching the Social Studies in the Elementary School.** Organization of material for teaching purposes, techniques of classroom presentation, bibliographies or materials, use of audio and visual aids to instruction, and techniques for evaluating student progress. Readings, lectures, and discussions related to required teaching experience.
- 557-4 The Elementary Principalship.** Designed to meet many of the particular needs of persons interested in qualifying for appointments as elementary school principals. Other than the administrative responsibilities of the elementary principal, such topics as the grouping of pupils, the elementary school's program, and personnel are studied.
- 558-3 to 4 Leadership in Elementary Education.** A study of some newer developments in the organization and instruction of the elementary school. Team teaching, a non-graded school, grouping and the impact of newer curricular developments.
- 559-4 Workshop in Instructional Leadership.**
- 560-4 Kindergarten-Primary Education.** A survey of current problems and practices in early childhood education for children from four to eight years of age, with emphasis on wide reading in current research literature. Prerequisite: consent of instructor.
- 561-4 The Elementary School Curriculum.** A critical study of the reorganization, construction, and administration of the elementary school curriculum and the installation, adaptation, and administration of the revised curriculum.
- 563-4 Organization of the Elementary School.** An analysis of types of elementary school organization with special attention to influence of school organization upon the educational program. Application of research findings to selection and use of materials of instruction. Special consideration to student's professional problems.
- 570-2 to 4 Seminar, Research in Elementary Education.** Critical analysis of the most significant research studies in organization, learning, teaching, curriculum in the elementary education.
- 575-2 to 4 Individual Research.** The selection, investigation, and writing of a research topic, under the personal supervision of a member of the departmental graduate staff, in one of the following areas: (a) curriculum, (b) supervision, (c) language arts, (d) science, (e) reading, (f) social studies, (g) problems in elementary education, (h) arithmetic, (j) problems in kindergarten-primary, (k) elementary education administration and supervision.
- 596-5 to 9 Independent Investigation.** Field study required of each student working for the sixth year specialist certificate. The work should be done in the setting of a school system where the student is employed or where cooperation is extended. The study involves selecting of the problem, su

pertinent literature, recording of results, and appropriate interpretations and summarizations.

3 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

1 to 48 Dissertation. Minimum of 36 hours for the Doctor of Philosophy degree.

Engineering

3 (3,3,3) Principles of Propulsion. (a) The basic principles of propulsion dynamics. (b) The thermodynamics of fluid flow and application to propulsion systems. (c) An extensive treatment of the technological problems in the design of propulsion systems. Must be taken in a,b,c sequence. Prerequisite: 300a,b,c and 313.

3 Introductory Wave Motion. Wave motion in strings, bars, and fluids. Fourier methods. Electromagnetic waves. Prerequisite: Mathematics 252b.

3 Engineering Hydrology. Hydrologic cycle, hydrograph analyses, infiltration studies, groundwater exploration. Statistical analyses, flood routings. Mechanics of entrainment, movement and deposition of sediment material in moving fluids; analysis of roughness and sediment transport rate in rivers. Prerequisite: 313b.

9 (3,3,3) Engineering Practice. (a) Written communication encountered in engineering organizations, correspondence, memoranda, technical papers, specifications, and reports. Lectures, conferences, and frequent written assignments are adapted to the individual needs of each student. (b) The law of torts with enough emphasis on legal procedure to enable students to understand decided cases. Practice in applying some of the principles. (c) Engineering data evaluation by application of statistical techniques. Design of engineering experiments. Prerequisite: 222 and Mathematics 252a.

6 (3,3) Intermediate Mechanics of Fluids. (a) Application of the basic laws of nature to the theory of fluids using the continuum approach. Kinematics of fluid motion using various coordinate systems; and continuity equation. Dynamics of viscous fluid motion; the Navier-Stokes and Energy equations. Reduction to the fundamental system of equations. (b) Introduction to magneto-fluid-mechanics. Vorticity, stream functions, and the velocity potential. Euler and Bernoulli equations. Incompressible irrotational flows; methods for singularities and conformal mapping. The compressible flow equations. Must be taken in a,b sequence. Prerequisite: 313a,b, Mathematics 305a.

9 (3,3,3) Principles of Water Quality Control. (a) Analysis and treatment of surface water, sewage and industrial wastes. Laboratory. (b) Thermodynamics, fluid dynamics, and engineering unit operations and processes for the treatment of water and wastewaters. (c) Biology and biochemistry applied to the analysis and treatment of water and wastewaters. Prerequisite: Chemistry 202 and consent of instructor.

6 (3,3) Air Pollution Control. (a) Introduction to emission sources, transport, diffusion, and effect of air pollution. Aspects of social, meteorological, biological, physiological, and chemical relationships plus control methods and economics included. Laboratory. (b) Engineering control theory, procedures, and equipment related to particulate and gaseous emissions control. Source apportionment, atmospheric sampling, and analytical techniques covered. Laboratory.

3 Dynamics of Compressible Fluid Flow. Fluid dynamics and thermodynamics applied to compressible fluid flow. One and two dimensional subsonic and supersonic flows. The method of characteristics; shock wave theory and other selected topics. Prerequisite: 300b and 313.

9 (3,3,3) Transport Phenomena. (a) Mechanism of heat, mass and momentum transport on both molecular and continuum basis. Estimation of transport properties. Generalized equations of transport in one or three dimensional system. (b) Interphase transport in isothermal and nonisothermal systems. Unsteady state transport problems in multicomponent systems. Mechanism of mass, heat, and momentum transfer. (c) Macroscopic balances, diffusion operations, penetration theory, simultaneous mass and heat transfer, equilibrium operations. Prerequisite: 302a and 313b.

24 Operations Research and Mathematical Model Formulation. Application of digital computers to the mathematical modelling of physical systems

with particular emphasis on the simulation and problem solving technique of operations research. Dynamic models of transportation, allocation, and placement. Physical applications and computation techniques related to theory of games. Prerequisites: 222 and Mathematics 150b or consent of instructor.

423-3 Hybrid Computation. The simultaneous use of the analog and digital computer for the solution of engineering problems. Scaling of problems. Block diagrams and logic are stressed. Linear and nonlinear differential equations. Simulation as well as iterative analog computation are covered. Prerequisite: Engineering 222 or Mathematics 225.

430-2 to 8 Special Problems in Industry and Technology. Special opportunities for students to obtain assistance and guidance in the investigation and solution of selected technical problems. Prerequisite: consent of instructor.

431-6 Analog and Digital Computer Design. Introduction to the design of analog and digital computers. Subject includes: operational amplifiers, multiplying circuits, regulated power supplies, 3 column algebra, switching circuits, memory devices. Prerequisite: 435a.

432-3 Analog Computation in Engineering Design. An introduction to the theory and operation of an analog computer. Applications to engineering design. Simulation, optimization. Prerequisite: Mathematics 305a.

435-9 (3,3,3) Electronics. (a) Introduction to electronics for all students in engineering, (b,c) Semiconductor devices; equivalent circuits; transistor circuit analysis and design. Prerequisite: 331b.

436-3 Control Theory. Develops and makes use of the students' knowledge of electrical systems. Topics include Laplace transforms, stability conditions, compensation techniques, and state variables. Prerequisite: 331b.

437-4 Microwave Theory and Measurements. Theory of passive microwave devices for guiding, storing, coupling, or radiating electromagnetic energy. Theory of active and non-linear devices including klystrons, circulators, isolators. Microwave measurements. Prerequisite: 331c.

439-6 (3,3) Transient Analysis. Linear electrical and mechanical networks studied by means of the Laplace transform. Nonlinear networks are analyzed using the analog computer and phase plane techniques. Prerequisite: 331b and Mathematics 306b.

440-6 (3,3) Structures. (a) Analysis of statically determinate and statically indeterminate structures. Deflections. Slope deflection. Moment distribution. Model analysis. (b) Principles of structural design. Loads. Influence diagrams. Factor of safety. Structural materials. Structural requirements. Types of structures and their behavior. Must be taken in a,b sequence. Prerequisite: 311a,b.

441-3 Intermediate Mechanics of Vibrations. Equations of motion applied to systems with free and forced vibrations, damping, and multiple-degree-of-freedom; Euler's equations; introduction to Lagrange's equations and orbital mechanics. Prerequisite: 260c and Mathematics 305a.

442-4 Structural Design-Metal. Rational, empirical, and practical basis for design of metal structures with emphasis on structural steel and aluminum. Behavior of members and their connections. Prerequisite: 440a or consent of instructor.

443-9 (3,3,3) Engineering Design. Projects of a research design or development nature. The student will select a problem, develop the theory and solution, check the theory experimentally, analyze the data, and compare the results. The project can be from one to three quarters in length. Laboratory. Must be taken in a,b,c sequence. Prerequisites: 300, 311, 331 and senior standing.

444-4 Design of Reinforced Concrete. Ultimate strength and behavior of reinforced concrete members. Prerequisite: 440a,b.

446-6 (3,3) Energy Conversion. Theory of energy conversion devices and processes. Conventional rotating machines, and direct energy conversion devices such as photovoltaic, thermoelectric, and thermionic generators, fuel cells, and magneto hydrodynamic generators. Present development and application, future potential. Prerequisite: 300b and 331c.

447-4 Advanced Mechanics of Materials. Stress and strain at a point in three dimensions. Introduction to the theory of elasticity. Shear center and non-symmetrical bending; curved beams; elastic foundations; thick walled cylinders; theory of failures; energy methods. Prerequisite: 311a,b or Engineering Technology 311a,b or equivalent.

448-4 Experimental Stress Analysis. Theoretical and experimental methods

determining stresses and strains; use of optical, electrical, and mechanical instrumentation; relation of modeling and prototype; brittle coating; electrical resistance gages; photo-elasticity. Prerequisite: 311a,b or Engineering Technology 311a,b or equivalent.

49-3 Advanced Dynamics for Engineers. Kinematics and kinetics of three-dimensional motion; coriolis' acceleration; rigid body motion; central force motion; gyro dynamics; generalized coordinates; Euler's equations of motion; Lagrange's equations. Prerequisite: 260c.

50-4 Fundamentals of Reactive Systems. Chemical processes, stoichiometry, properties of gases, solution chemistry, modern techniques of analysis, surface chemistry. Non-ideal systems, rates and mechanisms of industrial processes. Instrumentation and process control. Laboratory. Prerequisites: 300a and chemistry 111b,c, or consent of instructor.

55-3 Engineering Geology. (Same as Geology 455.) Engineering problems encountered by man in dealing with geology and ground water. It will include studies of earthquake effects, land subsidence, landslides, pore water pressures, and methods of coping with these. Field trip required. Prerequisite: Geology 20 or consent of instructor.

62-6 (3,3) Matrix Methods in Structural Analysis. (a) Introduction to matrix algebra. Matrix force method. Stiffness matrix method. Matrix displacement method. Computer analysis of trusses and frames. Moment distribution. (b) Introduction to undamped and damped vibrations. State and transfer matrices in vibration analysis. Miscellaneous applications. Prerequisites: 440 or consent of instructor.

63-6 (3,3) Introductory Instrumentation. Strain gages, bolometers, diffraction gratings. Electromagnetic techniques. Chemical techniques. Spectroscopy. Photoelasticity. Signal sensing and data handling. Recording systems. Transducers. Prerequisite: 413, 435a; Mathematics 252b.

60a,b,c (3,3,3) Engineering Process Design. (a) Design of process equipment. Application of the fundamentals of conduction, convection, and radiation heat transfer. Combined mode and transient heat transfer. Design of equipment using simultaneous heat and mass transfer. (b) Design of process equipment. Application of the fundamentals of diffusion and mass transfer operations. Multicomponent systems and stagewise operations. (c) Original design of a process and determination of process variables and equipment. Analysis of construction cost. Prerequisite: 313a, 300a,b.

60-3 Convection Heat Transfer. Forced convection momentum and heat transfer in tubes and over external surfaces. Laminar flow and turbulent flow. Prerequisite: 420a, 431a, or consent of instructor.

61-3 Radiation Heat Transfer. Fundamentals of thermal radiation for diffuse and specular-diffuse systems. Applications to engineering systems. Prerequisite: Mathematics 305.

62-3 Conduction Heat Transfer. Principles of conduction heat transfer with emphasis on applications to engineering systems. Steady state and transient conduction using classical methods and numerical and analog computation.

63-6 (3,3) Heating and Cooling Systems. (a) The applications of heating and cooling to engineering systems. (b) The design of various systems, including automatic controls. May be taken in any sequence.

60-9 (3,3,3) Electromagnetic Fields. Static boundary value problems; conformal transformation; Schwartz-Christoffel transformation; harmonics; application of Maxwell's equations to plane waves in dielectrics and conductors, antennas, and radiation. Prerequisite: consent of instructor.

61-6 (3,3) Quantum Electronics. An introduction to quantum theory with applications taken from the field of electronics. A study of plasmas, fusion, atomic structure, superconductivity from a theoretical engineering view. Prerequisite: consent of instructor.

62-8 (4,4) Continuum Mechanics. (a) Definition of a tensor. Tensor algebra, special tensors, tensor derivatives, differential geometry, kinematics and dynamics. Tensor quantities in continuum mechanics, stress, strain. (b) Measures of stress and strain. Equations of equilibrium, constitutive equations, compatibility equations. Strain energy functions, linear theory of classical elasticity, special examples, stress functions and general four-function method. Prerequisite: Mathematics 305.

63-3 Mechanics of Viscous Fluids. The complete system of equations for laminar flow of a viscous fluid using the continuum approach, the stress and rates-of-deformation tensors, exact solutions to various boundary value problems, creeping motion, boundary layer theory, introduction to hydrodynamic

- stability, Orr-Sommerfeld equations, statistical theories of turbulence. Prerequisite: 413a,b or consent of instructor.
- 514-3 Mechanics of Inviscid Fluids.** A study of stream functions, the velocity potential, Euler equations, Bernoulli equations, various solutions to Laplace equation, added masses, Taylor theorem, Blasius and Kármán theorems, two-dimensional irrotational flows, Cauchy-Riemann equations, conformal mapping, vortex flow, thin airfoil theory, and free-streamline flows. Prerequisite: 413a or consent of instructor.
- 515-3 Wave Motion in Fluids.** A study of surface waves in liquids, group velocity and dispersion, shallow water waves, wave makers, sound waves, the method of characteristics, waves in a gas of variable density, shock waves, waves in a rotating fluid. Prerequisite: 413 a,b or consent of instructor.
- 516-8 (4,4) Water Resources Development.** (a) Engineering aspects of porous reservoir systems. Solid reservoir structure. Porous medium physics. Description of reservoirs. Reservoir fluids including physics and chemistry of water and hydrocarbons. (b) The performance of reservoir systems including reservoir flow with such topics as potential theory, well hydraulics and basin-wide interactions.
- 517-12 (4,4,4) Analysis and Design of Engineering Systems.** (a) Application of general system concepts to wide range of physical and engineering processes. Emphasis on variable flow of matter, energy, entropy, and information directed toward predicting performance for specified designs. Introduction of central theme of functional reticulation into multiported elements. Systematic study of relations and interactions in terms of logical operations, transformations, matrices, ordinary and partial differential equations, signal flow graphs, block and bond diagrams, analogies, and computing systems. Lectures and problems work cover electrical, mechanical, fluid, thermal, chemical, nuclear and biological systems. (c) Emphasis on the synthesis and design of systems assembled from multiported primitives to accomplish specific tasks and functions. Particular attention given to the use of analog and digital computers as electronic models for studying alternative designs and modes of operation. Lectures and problems dealing with stochastic processes and variables in both frequency and time domains, and with stationary and nonstationary parameters. Substantial portion of time allotted to original studies on a test basis using available electronic computers. (c) Advanced engineering systems designs. Prerequisite: graduate standing.
- 518-3 Introduction to Turbulence.** Application of the basic equations of motion to turbulent flow problems. Introduction of the correlation concept along with the macro- and micro-scale of turbulence. Isotropic turbulence. Methods and techniques used in the experimental study of turbulence. Prerequisite: 413a,b or consent of instructor.
- 519-3 Boundary Layer Theory.** Boundary layer equations. Laminar and turbulent boundary layers. Classical turbulent flow theories. Two and three-dimensional wake and jet flows. Prerequisite: 413a,b or consent of instructor.
- 520-6 (3,3) Reaction Engineering and Rate Processes.** (a) Chemical kinetics of homogeneous and heterogeneous reactions. Kinetic theories, mechanism and mathematical modeling. Interpretation of kinetic data. (b) Introduction of reactor design. Ideal reactors for batch and flow system. Design for multiple reactions. Temperature and pressure effects. Nonisothermal and nonadiabatic processes. Prerequisite: 420 or consent of instructor.
- 522-3 Advanced Topics in Operations Research.** Linear programming computational techniques and their applicability to particular operations research models. Topics include the approximation methods, forecasting and optimization techniques, constrained and bounded problems. Problem solution by use of a digital computer is emphasized. Prerequisite: 422.
- 525-3 Small Particle Phenomena.** Small particle formation, behavior, properties, emission, collection, and analysis. Includes atomization, combustion, transport of suspensions, filtration, light scattering. Prerequisite: graduate standing.
- 530-6 (3,3) Separation Processes and Equilibrium Operations.** (a) Phase equilibrium, multistage calculations in concurrent and counter-current operations, graphical methods, unsteady state stagewise operations. (b) Multicomponent systems, solution chemistry, nonideality in phase equilibrium, separation processes, applications in processing industry. Prerequisite: consent of instructor.
- 535-6 (3,3) Network Analysis and Synthesis.** Advanced analysis and synthesis

electrical networks. Driving point impedance and transfer functions; properties and testing of positive real functions; Hurwitz polynomials; Foster's and user's driving point synthesis of RL, RC, LC networks. Synthesis using methods of Brune, Bott and Duffin, Darlington, approximation problems and techniques, two part synthesis for ladder lattice and constant resistance filters, Butterworth and Chebyshev filters. Prerequisite: consent of instructor.

2-3 Theory of Plates. Analysis of bending, buckling, and vibration of plates of various shapes; slabs and membranes; complex variables method; linear and nonlinear behavior; refined theories; theory of bending of anisotropic and inhomogeneous plates. Prerequisite: Mathematics 305, or 407, or consent of instructor.

2-3 Elastic Stability. Bending of bars under simultaneous action of axial and lateral loads; buckling of compressed bars, frames, rings, and tubes; general buckling of beams; torsion of I beams; buckling of thin plates. Prerequisite: Mathematics 305, or 407, or consent of instructor.

1-4 Plastic Analysis of Structures. Methods of analysis, elastic-plastic deformations, general loading, and direct procedures of design. Two lectures per week covering the basic principles. Independent study. Prerequisite: 311a,b.

1-6 (3,3) Advanced Vibrations. (a) Emphasis on nonlinear vibrations. Topics include phase plane, nonlinear conservative systems, problem of rotating pendulum limit cycles of Poincaré, van der Pol equation, method of isoclines. (b) Liapounov stability criteria, bifurcation theory, perturbation methods, almost periodic oscillations, asymptotic methods for autonomous and non-autonomous systems. Prerequisite: Engineering 461, Mathematics 305a,b.

2 to 6 Special Investigations. (Same as Applied Science 570.)

0-1 to 9 Seminar. (Same as Applied Science 580.)

0-1 to 9 Thesis.

Engineering Technology

1-9 (3,3,3) Photogrammetry. (a) Principles and practice of terrestrial and aerial photogrammetric mapping, including planning flights, control surveys, controlled mosaics, radial-line control, simple stereoplotters, instruments, parallel distortions, graphical tilt determination, trimetrogon charting, and economics. (b) An advanced study of photogrammetric principles including controlled mosaics, rectification, graphical, mechanical, and analytical space orientation. Readings and reports from current technical literature. The principles of many photogrammetric plotters are studied together with economic relation of these instruments to density of field control, office methods, and personnel. (c) A study of the soil and rock areas of the United States and the patterns present in aerial photographs. Fundamental elements of soil patterns are analyzed to permit determination of materials present and their properties. Emphasis is placed on photo interpretation for engineering and regional planning purposes. Laboratory. Prerequisite: 363a or consent of instructor.

0-2 to 8 Special Problems in Industry and Technology. (Same as Applied Science 430.)

1-9 (3,3,3) Industrial Electronics and Communications. (a) Design of matching networks, impedance admittance locus diagrams, transmission line calculations, transmission line charts, stub matching. (b) Electromagnetic fields in rectangular and circular wave guides, microwave techniques, antennas. (c) Unified treatment of various types of transmission systems with emphasis on the role of system bandwidth and noise in limiting the transmission of information. Prerequisite: 303.

0-8 (4,4) Design and Analysis of Industrial Organizations and Productivity. Case studies of industrial production methods and the process of industrial decision making; determinants of manpower utilization; transfer and processing of information; determinants of productivity levels. Prerequisite: consent of instructor.

0-8 (4,4) Industrial Safety (same as Industrial Education 465). (a) Basic fundamental principles of industrial accident prevention; significant accident statistics and costs; appraising safety performances, industrial plant hazards and safeguards; fire control fundamentals. (b) Effective industrial safety organizations, management and supervision; industry safety psychology; safety training programs; industrial hygiene programs; health safeguards; occupational diseases and other industrial hazards.

- 507-4 Industrial Quality Control.** Study of quality control charts, technique procedures and methods. Theories of measurements, error, predictions, sampling, tests of significance, replacement models, and inventory servicing.
- 526-9 (3,3,3) Surveying and Photogrammetry.** (a) Advanced engineering measurements. Measurement systems; analysis of errors and error propagation; adjustment of condition measurements by the method of least squares and other methods. Prerequisite: consent of instructor. (b) Geodesy. Study of the effect of curvature of the earth on surveying methods and calculation figure of the earth; isostasy; magnetic properties of the earth; satellite geodesy; precise methods of surveying and leveling. (c) Land surveying and map projections. The theory of map projections; state coordinate systems; United States Public Land Systems; legal aspects of property boundaries; modern subdivision methods. Prerequisite: consent of instructor.
- 527-9 (3,3,3) Transportation and Highway Engineering.** (a) Traffic engineering. City and highway traffic surveys and designs. Accidents, congestion, delay, speed, volume, density, parking, channelization, lighting, traffic control, and routing. Signs signals, and markings. Urban traffic consideration in city planning. Driver habit patterns and reactions. (b) Airport design. Problems encountered in planning, design, construction and maintenance of large airports. (c) Advanced Highway Engineering. Highway planning and economic geometric design, bituminous materials. Soil stabilization. Prerequisite: consent of instructor.
- 540-8 (4,4) Design of Man-Machine Systems.** The mathematical modeling of man-machine systems, optimizing of control mechanisms and of output, economic analysis for product choice, use of linear programming and queueing procedures in product forecast analysis.
- 570-2 to 6 Special Investigations.** (Same as Applied Science 570.)
- 580-1 to 9 Seminar.** (Same as Applied Science 580.)
- 599-1 to 9 Thesis.**

English

- 400-4 Introduction to Structural Linguistics.** Methods of structuralizing: phonetics, phonemics, morphemics, syntax. Especially recommended for students preparing to teach English to native speakers.
- 402-4 Old English Literature in Translation.** A study of prose selections from Bede, Aelfric, and other writers, and of poetry from the simplest riddles and gnomic verses to the complex forms of the Caedmonian and Cynewulfian schools, the elegaic poems, and *Beowulf*. Emphasis is on the literary and cultural significance of works studied.
- 403-4 History of the English Language.** A survey of the development of the language from Indo-European to modern English with special emphasis on Middle and Early Modern English changes.
- 404-12 (4,4,4) Middle English Literature.** (a) Middle English literature including Chaucer; (b) Chaucer: early poems and *Troilus*; (c) Chaucer: *Cantebury Tales*. May be taken singly.
- 405-8 (4,4) Descriptive Linguistics.** (a) Structural phonology: survey of phonological theory (phonemic and distinctive feature theory); examination of various phonological systems. (b) Introduction to transformational generative grammar: the basic concepts and formalism of transformational generative grammars. Prerequisite: 400 and 407a, or consent of instructor.
- 406-4 English Phonology.** An analysis of spoken English, American and British. Prerequisites: English 400 or its equivalent.
- 407-8 (4,4) Articulatory Phonetics.** (a) Introduction: mechanics, processes. Laboratory work: transcription, production, perception. (b) Phonetic theory, linguistic phonetics.
- 412-16 (4,4,4,4) English Nondramatic Literature.** (a) 16th century, (b) 17th century, (c) The Augustan Age, 1660-1744, (d) The Age of Johnson, 1740-1798. May be taken singly.
- 418-4 English Literature, 1885-1914.** Poetry, drama and fiction of the late Victorian and early modern period.
- 420-8 (4,4) American Poetry.** (a) Trends in American poetry to 1900 with a critical analysis of the achievement of the important poets, (b) the important poets since 1900. May be taken singly.
- 421-16 (4,4,4,4) English Poetry.** (a) Early Romantics: major emphasis on general background and on Blake, Coleridge, and Wordsworth; (b) later

- Romantics: emphasis on Byron, Shelley, and Keats, the minor figures; (c) Victorian poets: Tennyson, Browning, Arnold, and other poets of England, 1830-1900; (d) modern British poets. May be taken singly.
- 125-4 **Modern Continental Poetry.** Representative poems by the major 20th century poets of France, Italy, Germany, Spain, Russia, and Greece.
- 131-12 (4,4,4) **Major American Writers.** Significant writers of fiction and nonfictional prose from the Puritans to the 20th century: (a) 1620-1800, (b) 1800-1865, (c) 1865-1915. May be taken singly.
- 138-4 **Intellectual Backgrounds of American Literature.** The relationship of basic ideas in America to American literature.
- 142-4 **Romantic Prose.** Fiction of Austen Scott, Mary Shelley, Peacock, the Gothic novelists; prose of Lamb, Landor, Hazlitt, DeQuincey; criticism, journals and letters.
- 143-4 **Victorian Prose.** The chief writers of nonfictional prose from the late Romantics to 1880.
- 147-4 **American Humor and Satire.** A consideration of the writers and forms of 19th and 20th century humor.
- 154-12 (4,4,4) **English Fiction.** (a) 18th century: Defoe through Jane Austen, (b) Victorian novel: 1830-1880, (c) 20th century. May be taken singly.
- 156-4 **Modern Continental Fiction.** Selected major works of European authors such as Mann, Silone, Camus, Kafka, Malraux, Hesse.
- 158-8 (4,4) **American Fiction.** (a) The novel in America from its beginning to the early 20th century, (b) trends and techniques in the American novel and short story since 1914. May be taken singly.
- 160-16 (4,4,4,4) **British Drama.** (a) Elizabethan drama: from the beginning of the drama in late Middle Ages through its flowering in such Elizabethan playwrights as Greene, Peele, Kyd, Marlowe, Heywood, Dekker, but excluding Shakespeare; (b) Jacobean drama: the Jacobean and Caroline playwrights: Jonson, Webster, Marston, Middleton, Beaumont and Fletcher, Massinger, Ford, Shirley; (c) Restoration and 18th century drama: after 1660, representative types of plays from Dryden to Sheridan; (d) Modern British drama.
- 164-4 **Modern Continental Drama.** The continental drama of Europe since 1870; representative plays of Scandinavia, Russia, Germany, France, Italy, Spain, and Portugal.
- 168-4 **American Drama.** The rise of the theater in America; with readings of plays, chiefly modern.
- 171-8 (4,4) **Shakespeare.** (a) The plays before 1600. (b) The plays of 1600 and later. Readings on the life of Shakespeare, the theater, and the acting companies. May be taken singly.
- 173-4 **Milton.** Reading of *Paradise Lost*, *Paradise Regained*, *Samson Agonistes*, minor poems, major treatises.
- 175-4 **Problems in the Teaching of English.** Aims, methods, materials, tests, programs, and other aspects of English instruction in the high school.
- 176-2 to 8 **Workshop in High School English.** Intensive study in lectures, laboratory, and conferences, on the teaching of English in high school. Curriculum, materials, methods, aims.
- 177-2 to 8 **Workshop in Junior High School English.** Intensive workshop study in lectures, laboratory, conferences on the teaching of English in junior high school. Curriculum, materials, methods, and aims. Directed by competent authorities in the field.
- 179-8 (4,4) **Professional Writing II.**
- 184-4 **Literature in Society.** An analysis of the structure and function of literature as a social institution.
- 185-8 (4,4) **Literary Criticism.** (a) History of criticism: ideas and techniques from Aristotle to the end of the 19th century, (b) modern criticism: recent critics and critical attitudes, and practice in writing criticism. Open only to seniors and graduate students.
- 187-12 (4,4,4) **Senior Honors Seminars.** (a,b) Topics will vary yearly. (c) Honors readings. Enrollment restricted to undergraduates. Departmental approval required.
- 189-2 to 6 **Readings in English.** For English majors only. Departmental approval required. No more than four hours may be taken in any one quarter.
- 190-2 **Materials and Methods of Research in English.** The principal tools of literary scholarship and the more important studies and journals. Practice the preparation of selective bibliographies and scholarly reports.
- 191-4 **Old English Grammar.** The development of the forms, the grammar, and readings.

- 502-4 Beowulf.** Readings of the poem and study of its form, language, and history. Prerequisite: 501.
- 504-8 (4,4) Advanced English Grammar.** (a) Application of transformational generative theory to study in depth of English syntax. (b) Generative phonology: the application of generative theory to the study of phonology. Prerequisite: 405a,b.
- 505-8 (4,4) Contrastive and Historical Linguistics.** (a) Comparison of the structure of English with the structure of other languages. (b) Historical linguistics: theories and methods in the study of the history and pre-history of languages and language families. Prerequisite: 400.
- 506-4 Old Norse.**
- 508-4 to 12 Studies in Chaucer.**
- 509-4 to 12 Studies in Middle English Literature.**
- 511-4 to 12 Studies in the Renaissance.**
- 513-4 to 12 Studies in 17th Century Literature.**
- 514-12 to 24 Studies in Restoration and 18th Century Literature.** (a) Restoration literature. (b) Early 18th century literature. (c) Later 18th century literature.
- 518-4 to 12 Studies in English Literature, 1885-1914.**
- 519-4 to 12 Studies in Contemporary British Literature.**
- 520-4 to 12 Studies in Romantic Writers.**
- 521-4 to 12 Studies in Victorian Poetry.**
- 524-4 to 12 Studies in the Metaphysical Poets.**
- 532-4 to 12 Studies in American Transcendentalism.**
- 534-4 to 12 Studies in Early 19th Century American Writers.**
- 536-4 to 12 Studies in Later 19th Century American Writers.**
- 537-4 to 12 Studies in 20th Century American Writers.**
- 538-4 to 12 Problems in American Literature.**
- 540-2 to 8 Studies in Linguistics.** Selected topics in theoretical and applied linguistics. Prerequisite: 400 or equivalent, consent of instructor.
- 543-4 to 12 Studies in Victorian Nonfiction Prose.**
- 555-4 to 12 Studies in the Victorian Novel.**
- 560-4 to 12 Studies in Renaissance Drama.**
- 566-4 to 12 Studies in Shakespeare.**
- 569-4 Seminar in Special Problems of English as a Foreign Language.** Independent study in preparing and testing of instructional materials for the teaching of English as a foreign language. Restricted to English as a Foreign Language students.
- 579-4 to 16 Studies in Modern Literature.**
- 580-4 Traditional Themes.** Persistent themes and legends in literature—King Arthur, Faust, Utopia, and the like.
- 581-12 (4,4,4) Problems in High School English.** (a) Composition. (b) Linguistics. (c) Literature.
- 585-2 Teaching College Composition.** Objectives, methods, and materials for the course; observation; and practice under supervision.
- 588-9 (3,3,3) Methods of Teaching English as a Foreign Language.** (a) Classroom techniques, (b) laboratory methods, (c) preparation of materials. Restricted to English as a Foreign Language students and must be taken a,b,c sequence.
- 594-8 (4,4) Studies in Literary Form and Symbolic Action.**
- 596-4 Stylistics.** Defines style and its workings throughout literary history; applies the methods of modern analyses to literary works in English, showing how natural and artificial modes (genre and period definitions, metre, etc.) relate to literary artifacts and to the situation of the work of art vis a vis the civilization that engendered it.
- 597-2 to 6 Readings in Linguistics.** Individual readings in linguistics under guidance. Prerequisite: 400 or equivalent; consent of department.
- 598-1 to 6 (1 to 3, 1 to 3) Review of English and American Literature.** Restricted to master's degree students.
- 600-1 to 48 Dissertation.**

Finance

- 421-4 Management of Business Finance.** The principal problems of managing the financial operation of an enterprise. Emphasis upon analysis and solution of problems pertaining to policy decisions. Prerequisite: 320.

22-4 Advanced Financial Management. The development of ability to use sophisticated analytical tools by the discussion of case situations dealing primarily with capitalization, return on investment, and cost of capital. Prerequisite: 421.

30-4 Business Finance. An introductory course combining both a description of the structure of business financing and an analysis of functional finance from a managerial viewpoint.

73-4 Business in its Legal Environment. Social and economic assessment of environmental factors influencing business policies and strategies. Emphasis is placed on legislation affecting competition and allocation of the firm's products and resources. Prerequisite: senior standing.

75-4 Budgeting and Systems. Aids in coordinating and directing business operation.

Food and Nutrition

20-3 Recent Developments in Nutrition. Critical study of current scientific literature in nutrition. Prerequisite: 320 or equivalent. Offered alternate years.

41-3 Recent Trends in Food. Critical study of current scientific literature on food. Prerequisite: 320 or equivalent. Offered alternate years.

81-2 to 4 Readings. Supervised readings for qualified students. Prerequisites: 320 or consent of instructor and department chairman.

90-3 Nutrition and Growth. Lectures, readings, and discussion on nutrition in relation to human growth. Prerequisite: 320 or equivalent. Offered alternate years.

00-4 Research Methods. Study of methods employed in research in food and nutrition. The development of a research design selected on the basis of the interest and need of the student. Field trip. Prerequisites: 420, 421, or equivalent and statistics. Offered alternate years.

15-1 to 6 Seminar. Participation of staff and students in reporting and discussing research papers, research in progress, and current professional meetings. Required for all graduate majors in Food and Nutrition, one credit per quarter. Prerequisite: 420 or 421.

20-3 Advanced Nutrition. The biochemical and physiological basis of the metabolism of nutrients; current concepts. Prerequisite: 420 or equivalent. Offered alternate years.

56-4 Advanced Experimental Foods. Individual problems in food research and interpretation of pertinent literature. Prerequisite: 356, or 500, or equivalent. Offered alternate years.

72-2 to 8 Special Problems. For students recommended by their adviser and approved by the head of the department and the instructor in charge for independent work in directed study.

99-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree. Registration with approval of instructor.

Foreign Languages

The following courses do not fall within the normal pattern of courses leading to advanced degrees:

51-0 French for Graduate Students.

51-0 German for Graduate Students.

51-0 Russian for Graduate Students.

51-0 Spanish for Graduate Students.

The purpose of these courses is to help graduate students prepare for proficiency examination as requested by the Graduate School for the Doctor of Philosophy degree. No prerequisite. Students must register for these courses and are advised to take them as part of, and not in addition to, their graduate program.

FRENCH

1-9 (3,3,3) French Literature of the 17th Century. (a) Tragedy: Corneille and Racine. (b) Comedy: Moliere. (c) Non-dramatic Literature.

02-6 (3,3) Contemporary French Novel. (a) Major themes, forms, and techniques in the novel with particular emphasis on Gide, Proust, Malraux, Sartre, Camus, and Robbe-Grillet. (b) A study of the dramatic masterpieces of Claudel, Claudel, Anouilh, Sartre, Camus, Ionesco, and Beckett with respect

to structure, technique, themes, and language. May be taken out of sequence.
Prerequisite: 354, 397.

403-9 (3,3,3) French Literature of the 18th Century. (a) Theater. (b) Novel. (c) Philosophic and Didactic Literature.

408-4 French Civilization. Society, culture, social institutions, and the arts of contemporary France. Lectures, slides, discussions. Prerequisite: 350, or consent of instructor.

409-3 French Romanticism in the Drama, Novel, and Poetry. Prerequisite: 354, 397.

419-3 French Poetry from Nerval through Symbolism. Prerequisite: 354, 397

429-6 (3,3) French Novel and Theatre, 1850-1930. (a) Realism, naturalism and the reaction to these in the novel, from Flaubert through Barres. (b) Realism, naturalism, and symbolism in the theatre from mid-19th Century to 1930. Prerequisite: 354, 397.

453-4 Methods in Teaching Modern Foreign Languages. Survey of general principles of second-language teaching, based upon insights of modern linguistics and learning-psychology. Intensive practical work in classroom and language laboratory with teachers experienced in the student's specific language field. Required of prospective teachers of modern foreign languages in the secondary schools. Prerequisite: concurrent or prior enrollment in a 300 level foreign language course.

461-4 French Stylistics. Writing style in French and its application to the development of skill in written expression. Advanced work in the principles of French grammar and composition. Prerequisite: 350 or consent of instructor.

498-3 Honors Seminar. Study of an author or a special topic. Restricted to undergraduates. Prerequisite: consent of department.

499-4 Honors Essay. Individual exploration of some question, author, theme of significance within the field of French literature or language. Restricted to undergraduates. Prerequisite: 498 and consent of department.

501-2 to 6 Seminar on a Selected French Author. Intensive study of one author. May be taken a maximum of 3 times.

502-3 French Literature from La Chanson de Roland to Rabelais.

509-2 to 6 Studies in 19th Century French Literature. Selected topics, moments, or authors.

515-6 (3,3) Old French. (a) Intensive reading and interpretation of the Chanson de Roland. (b) Reading of various Medieval works with linguistic analysis. Prerequisite: 410 or equivalent.

516-6 (3,3) French Literature of the Renaissance. (a) Rabelais and Montaigne. (b) la Pleiade.

520-4 Graduate Composition and Diction. Composition based on study of contemporary French authors; individual work in pronunciation and diction determined by entrance tests.

522-2 to 6 Studies in 20th Century French Literature. Selected topics, moments, or authors.

543-2 to 6 Research Problems. Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.

536-2 Teaching French at the College Level. Prepares graduate students in French for teaching at the university level. Required of all teaching assistants in French. May not be counted to satisfy secondary certification requirements.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

GERMAN

401-4 (2,2) Goethe's Faust. (a) The Faust legend and early Faust books and plays; the genesis of Goethe's Faust: reading of Part I. (b) Reading of Part II; study of the symbolism used such as the blending of paganism with Christianity and ancient Greek culture with Germanic culture. Must be taken in a,b sequence.

402-3 Advanced German Syntax. Descriptive and contrastive study of German syntax, with particular attention to the needs of prospective teachers.

403-3 German Ballads and Lyrics. A selective study of the foremost examples of German balladry and lyric poetry, ranging from the poetry of Klopstock and Burger to that of Hesse, Benn, etc. Lectures, recitations.

404-4 Weimar and Its Aftermath. German writings from the inception of the Weimar Republic to the end of World War II, with special reference to the

- correlation existing between literary expression and social, economic, and political conditions.
- 406-3 The German Comedy.** Comic and satirical works in German Literature, with special emphasis on the "Lustspiel" since 1800; lectures, reports.
- 407-2 Great German Plays of the 20th Century.** Study and selective readings of outstanding stage successes; lectures, reports.
- 408-4 German Civilization.** Intensive study of the German speaking areas of the world, with emphasis on the anthropological and sociological aspects of their respective cultures (Austrian, German, Swiss, "Reichs-deutsch," etc.); lectures, reports.
- 411-6 (3,3) Middle High German.** (a) Grammar, and selective readings in both MHG originals and NHG translations of such epics as the Nibelungenlied and Gudrun. (b) The courtly epic poetry of such authors as Wolfram von Eschenbach, Gottfried von Strassburg, Hartmann von Aue, the lyric poetry of Walther von der Vogelweide, and didactic prose.
- 413-6 (3,3) German Linguistics.** (a) Introduction to Comparative German Linguistics tracing relationships among German languages on the basis of phonology, morphology, and syntax. (b) History of the German language: a survey of the development of German through the Old, Middle, and High German periods; lectures, readings, reports.
- 497-1 to 2 Readings in 18th Century German Literature.** Departmental approval required.
- 498-1 to 2 Readings in 19th Century German Literature.** Departmental approval required.
- 499-1 to 2 Readings in 20th Century German Literature.** Departmental approval required.
- 500-2 Seminar in Contemporary Literature.** Intensive study of the works of representative German authors, with special reference to the correlation existing between literary expression and social, economic, and political conditions since 1900. Lectures, outside readings, reports.
- 501-2 to 6 Seminar on a Selected German Author.** Intensive study of one author—his life, his work, and his place in the literary and cultural development of civilization. Lectures, outside readings, reports.
- 506-2 Romanticism I.** Study of the forerunners of German Romanticism: Holderlin, Jean Paul; and the authors of Early Romanticism: the writers of the so-called "Berlin School," with special attention to their involvement and reaction to 18th century thought. Lectures, reports.
- 507-2 Romanticism II.** Study of Patriotic Romanticism: Kleist, Arndt, Korner, Uhland, etc. and Late Romanticism: Eichendorff, Lenau, Grillparzer, Heine, Morike, etc. Lectures, reports.
- 509-4 (2,2) Old High German.** (a) Phonology, morphology, etymology, and syntax. (b) Continued study of grammar and reading of Franconian, Bavarian, and Alemannic texts.
- 512-3 19th Century German Novel.** German literature from the decline of Romanticism to the end of the century. A study of trends and representative works of such authors as Keller, Fontane, Raabe, etc. Lectures, reports.
- 513-3 20th Century German Novel.** Continuation of 512. Study of representative writers of expressionism, "Neue Sachlichkeit," etc. Lectures, reports.
- 514-3 Seminar in Folklore.** Study of German folk literature, with emphasis on folk tales (such as Grimms' Household Tales, regional sagas, etc.), chapbooks (such as Dr. Faust, Till Eulenspiegel, etc.), folksongs (Des Knaben Wunderhorn), and folk drama. Lectures, reports.
- 533-3 Gothic.** Historical setting and significance of Gothic; phonology, morphology and syntax; selected readings from Wulfila.
- 543-2 to 6 Research Problems.** Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.
- 544-12 NDEA Summer Institute for Teachers.** Summer Institute for Teachers of German, conducted in West Germany.
- 599-2 to 9 Thesis.**

RUSSIAN

- 601-8 (4,4) The Russian Novel in the Nineteenth Century.** Should be taken in a,b sequence.
- 611-8 (4,4) Introduction to Russian Classical Literature.** Gogol, Pushkin, Dostoyevsky, Turgenyev, Tolstoy. Should be taken in a,b sequence.

- 413-4 Russian Drama in the Nineteenth Century.** Griboyedov, Gogol, Pushkin, and minor dramatists.
- 414-3 Russian Poetry from Zhukovsky to 1920.** A study of Russian Poetry from Sentimentalism through Symbolism.
- 425-3 Soviet Literature Since 1917.** A study of satirists and writers of everyday life. Constructivism and followers; Soviet literary criticism. Lectures, readings, and reports.
- 452-4 Advanced Composition and Conversation.** Oral and written composition of a practical nature for advanced students; emphasis on study of idiomatic expressions and current usage.
- 500-2 Seminar in Contemporary Russian Literature.** Intensive study of the works of representative Russian authors, with special reference to the correlation existing between literary expression and social, economic, and political conditions since the Revolution. Lectures, outside readings, reports are required.
- 501-2 Seminar on a Selected Russian Author.** Intensive study of one author—his life, his work, and his place in the literary and cultural development of civilization.
- 503-2 Seminar on 19th Century Russian Literature.** Intensive study of the modern Russian novel as an expression of social and cultural movements. Outside readings and class discussions.
- 509-3 Russian Literature Through the 17th Century.** A study of early Russian literature with emphasis on literature of the Kievan period. Analysis of texts and reports.
- 510-3 Russian Literature of the 18th Century.** The Baroque period, classicism and sentimentalism. Emphasis on the classical period of the 18th century. Analysis of texts and reports.
- 514-6 (2,2,2) History of the Russian Language.** A survey of the phonological, morphological, and syntactical changes from the period of the common Slavic to the present Russian literary language.
- 520-4 Russian Linguistic Structure.** A structural analysis of present-day Russian with special attention to Russian syntax. Free composition on Russian authors.
- 543-2 to 6 Research Problems.** Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.
- 599-2 to 9 Thesis.**

SPANISH (Iberian)

- 401-3 Spanish Novel of the 19th Century.** Study of representative novels of Fernan Caballero, Valera, Pereda, Galdos, etc.
- 402-3 Spanish Drama of the 18th and 19th Centuries.** Reading of representative plays of the chief dramatists from Moratin to the Generation of 1898.
- 403-3 Spanish Poetry.** General survey of Spanish poetry from its beginning to 1900.
- 404-6 (3,3) Spanish Literature of the Twentieth Century.** (a) The Generation of 1898. (b) Contemporary Novel and Essay. Main trends of the Spanish novel and essay since 1900.
- 415-3 Spanish Phonetics.** Analysis of the sounds of Spanish and their manner of production; intonation; levels of speech; oral practice.
- 440-6 (3,3) The Golden Age: Drama.** Plays of Lope de Vega, Calderon, Tirso de Molina, Ruiz de Alarcon, and others.
- 445-4 Cervantes.** Don Quixote; Other works assigned as collateral reading.
- 475-3 to 12 General Topics in Spanish.** Selected topics in literature or linguistics of special interest, for major concentrations in Spanish.
- 501-2 to 6 (2 per quarter) Seminar on a Selected Spanish Author.** Study of one author—his life, his works, and his relationships to the literary and social currents of his time.
- 505-3 The Picaresque Novel.** Study of the *Lazarillo*, with collateral reading of other masterpieces of this genre.
- 506-3 The Renaissance.** Literature of the Renaissance in Spain, including the drama, the novel, the lyric poetry, and the histories of the Indies.
- 515-6 (3,3) Old Spanish.** (a) Intensive reading and interpretation of the *Poema de Mio Cid*. (b) Reading of various medieval works with linguistic analysis. Prerequisite: 410 or equivalent.

- 520-3 **Seminar in Syntax.** Stylistics and grammatical analysis.
- 525-3 **The Spanish Ballads.** The romance studied as a part of the literature and folklore of Spain and the New World.
- 543-2 to 6 **Research Problems.** Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.
- 560-4 **Spanish and Latin American Bibliography.** Bibliography and research methods in Spanish and Spanish American culture. Introduction to the use of the chief reference works in the humanities and social sciences as they deal with Spain and Spanish America.
- 575-3 to 12 **Advanced Topics in Spanish.** Selected topics in literature or linguistics of special interest for major concentrations in Spanish.
- 599-2 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.

SPANISH (American)

- 521-3 **Survey of Modernism in Spanish American Poetry.** Study of its origins, characteristics and achievements.
- 522-3 **Contemporary Spanish American Poetry.** Spanish American poetry since modernism.
- 523-3 to 4 **The Mexican Novel of the 20th Century.** Emphasis on fiction dealing with the Revolution and related social problems.
- 524-3 to 4 **Gauche Literature.** Study of the Gauche as a social class and of the types of literature developed to portray and symbolize his way of life, attitudes and values.
- 526-3 **The Mexican Short Story.** Survey of the Mexican short story from pre-Conquest to the present.
- 527-3 **Spanish American Drama.** Study of representative works of Florencio Sanchez, Rodolfo Usigli, Armando Mooock, Samuel Eichelbaum, Xavier Villarrutia, and others.
- 575-3 to 12 **General Topics in Spanish.** (See Spanish—Iberian).
- 578-4 **Seminar in Latin American Thought.** (See Philosophy 478.)
- 580-2 to 6 (2 per quarter) **Seminar in Latin American Fiction.** The works of a specific novelist or group of novels on a similar theme studied as a reflection of social and cultural conditions in a country or geographical area.
- 585-3 **Mexican Essayists of the 19th Century.** Currents of Mexican thought in the 19th century.
- 588-3 **Seminar on Spanish American Poetry.** Study of the works of a single poet, of a group of poets, or of literary trends or movements.
- 591-3 **Seminar on Spanish American Literary Criticism.** Significant documents of literary criticism from Independence to the present.
- 593-2 to 6 **Research Problems.** (See Spanish—Iberian.)
- 596-4 **Spanish and Latin American Bibliography.** (See Spanish—Iberian.)
- 597-3 to 12 **Advanced Topics in Spanish.** (See Spanish—Iberian).
- 599-2 to 9 **Thesis.**

ROMANCE PHILOLOGY

- 510-4 **Romance Philology I.** Survey of phonology, morphology, and syntax changes in Romance languages in general; special attention to the developments in French and Spanish for majors in these fields.
- 514-4 **Romance Philology II.** Studies in syntax of Old French and Old Spanish. Prerequisite: 410 or equivalent.
- 516-4 **Arthurian Romance.** Readings in the Arthurian Romances of the student's major interest (French or Spanish) with reference to the genre as a whole. Prerequisite: 410 or equivalent.

Forestry

- 501-3 **Advanced Forest Mensuration.** Theory and practical problems in biometrics to obtain estimates of forest populations. Use of computers and other advanced techniques. Prerequisite: 363a,b or equivalent.
- 510-3 **Forest Management for Wildlife.** Interrelations between forest practices and game. Forest protection from mammals and birds. Emphasis is on treatment of the forest. Prerequisite: Zoology 463, forestry major, or consent of instructor.

420-4 Advanced Wood Technology. The study of wood as an industrial and structural material; the botanical, physical, chemical, and mechanical properties are discussed. The advantages and disadvantages of wood as a raw material are analyzed. Prerequisite: 320, Mathematics 111a,b or equivalent

427-3 Mineral Nutrition of Plants.

433-4 Forest Products Industries. Raw material requirements, the processes and the products of forest industries. The past, present, and future economic status of each industry is briefly examined. Prerequisite: 320 or consent of instructor.

440-4 Ecology of Grasses and Grasslands. (Same as Botany 440.) Structure analysis and dynamics of grassland communities; structure and growth of individual species. Prerequisite: GSA 340 or consent of instructor.

450-4 Forest Park Management. Fundamentals in the management and administration of parks and recreation areas, at the metropolitan state and federal level. Includes purpose, objectives, criteria for selection, policy, management practices, and problems in providing outdoor recreation in a natural environment. Prerequisites: 350a,b or consent of instructor.

451-7 (3,4) Forest Park Plans. Fundamental and applied principles and elements involved in site, master, and comprehensive planning for outdoor recreation at the state, metropolitan, and federal level. Prerequisites: 350a,b or consent of instructor.

460-3 Forest Park Field Studies. Park conditions, visitors, and management practices in different county, state, and federal park systems in the United States. Extended field trip. Cost shared by students. Prerequisite: 350a.

465-2 Forestry Field Studies. An extended trip to study forest conditions and silviculture in different forest regions of the United States. Cost shared by students. Prerequisites: 330, 363a, 365a.

466-3 Forest Watershed Management. Effects of treatment of forested watersheds on quality and quantity of water yield. Consideration of alternative water use and flood control. Prerequisites: 301, GSA 330, or consent of instructor.

470-8 (4,4) Economics of Forestry. (a) Introduction to forest economics forestry production and investment. Prerequisite: GSB 211a. (b) Forestry marketing, macro-economics and planning. Prerequisite: 470a or consent of instructor.

471-4 Land Resource Economics. (Same as Agricultural Industries 471 and Economics 471.) The use of land as an economic variable in production of goods and services; land markets; group versus individual conflicts; elementary land resources planning techniques. Prerequisite: 470a or Economics 440 or Agricultural Industries 350.

475-4 Forest Management. The application of business procedures and technical forestry principles to manage forest properties for their resources and benefits. Prerequisite: 363, 365.

490-4 to 16 Practicum. Supervised practicum experience in a professional setting. Emphasis on administration, supervision, teaching, and program leadership in community, school, park and forest, institution, and other recreation settings. Prerequisite: consent of instructor.

520a-1 to 6 Readings in Forestry or Forest Recreation. Intensive consideration is given to current practices and problems in forestry. Prerequisite: consent of instructor.

520b-1 to 6 Readings in Resource Economics. (Same as Economics 502 or Agricultural Industries 520b.) Directed readings in the field of resource economics. Prerequisites: consent of instructor and 375 or equivalent.

520c-1 to 6 Readings in Forest Products or Wood Service. Advanced study of the techniques of manufacture in the wood and fiber using industries. Also advanced study of physical, mechanical and chemical properties of wood as a material. Prerequisite: consent of instructor.

570-4 Principles of Research. Research philosophy, approaches to research theory, hypotheses, inference and prediction; problem identification, project development and organization; methods of data collection, analysis and presentation; drawing conclusions and organizing results. Prerequisite: 3 hours in statistical methods or consent of instructor.

575-1 to 6 Research. Directed research in selected fields of forestry.

581-1 to 6 Advanced Forestry Seminar. Study and discussion of contemporary forestry problems. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Geography

100-3 Geographic Methods. Designed to introduce the geographic methods of integrating physical, economic, and cultural elements in the study of areas with the emphasis placed on problem situations. Cartographic and quantitative techniques will be emphasized. Prerequisites: GSB 101a, 302, 304, 306, and consent of department.

102-10 (4,3,3) Advanced Physical Geography I. Deals with one or more of the following land forms, climate, soil, and water; depending on, and varying with, interests of the instructors. Thus, a student may register more than one time. Emphasis will be directed at familiarizing the student with techniques of analysis, and at developing concepts and principles that underlie understanding of the phenomena and their geographic significance. Prerequisite: 302 or consent of instructor.

103-7 (4,3) Advanced Physical Geography II. Content drawn from same broad range of topics as 402. To be alternated with 402 to enable student to specialize further in physical geography. Prerequisite: 302 or consent of instructor.

104-10 (4,3,3) Advanced Economic Geography I. Deals with one or more of the following: transportation, manufacturing, agriculture, resources, trade and urban geography; depending on, and varying with, interests of instructors. Thus, a student may register more than one time. Emphasis will be directed at familiarizing the student with techniques of analysis, and at developing concepts and principles that underlie understanding of the phenomena and their geographic significance. Prerequisite: 304.

105-7 (4,3) Advanced Economic Geography II. Content drawn from same broad range of topics as 404. To be alternated with 404 to enable student to specialize further in economic geography. Prerequisite: 304 or consent of instructor.

106-10 (4,3,3) Advanced Cultural Geography I. Deals with one or more of the following: population, settlement, ethnic characteristics, political factors; depending on, and varying with, interests of the instructors. Thus, a student may register more than one time. Emphasis will be directed at familiarizing the student with techniques of analysis, and at developing concepts and principles that underlie understanding of the phenomena and their geographic significance. Prerequisite: 306.

107-7 (4,3) Advanced Cultural Geography II. Content drawn from same broad range of topics as 406. To be alternated with 406 to enable student to specialize further in cultural geography. Prerequisite: 306 or consent of instructor.

110-8 (4,4) Advanced Geographic Techniques. Geographic applications of cartographic and quantitative research techniques. Prerequisite: 310 or consent of instructor.

116-8 (4,4) Cartography. Instruction and practice in the techniques of map-making and problems in map reproduction. Laboratory. Prerequisite: 310.

124-2 to 12 Regional Problems in Conservation.

140-2 to 6 Reading for Majors. Supervised readings in selected subjects. Prerequisite: advanced standing.

143-4 Teaching of Geography. Presentation and evaluation of methods of teaching geography. Emphasis upon geographic literature, illustrative materials, and teaching devices suitable to particular age levels. Prerequisite: 300.

151-7 (4,3) Regional Geography: Anglo-America. Deals geographically with present-day United States and Canada. (a) A general survey of the area, open to non-majors. (b) Investigates specific topics in depth, for majors.

152-7 (4,3) Advanced Regional Geography: Europe. See 461.

153-7 (4,3) Advanced Regional Geography: Mediterranean Lands and Southwestern Asia. See 461.

154-7 (4,3) Advanced Regional Geography: Soviet World. See 461.

155-7 (4,3) Advanced Regional Geography: Sub-Saharan Africa. See 461.

156-7 (4,3) Advanced Regional Geography: Eastern and Southern Asia. See 461.

157-7 (4,3) Advanced Regional Geography: Latin America. See 461.

158-7 (4,3) Advanced Regional Geography: Oceania. See 461.

170-16 (4,4,4-8) Urban Planning. (Same as Government 470.) (a) Planning

concepts and methods, (b) field problems, (c) planning and public administration internship. Prerequisite: junior standing.

471-8 (4,4) Regional Planning. Examination of the viewpoint, methods, and techniques of regional planning. Prerequisite: consent of instructor.

480-4 Workshop in the Teaching of Geography. Gives the geographic approach to man in space. Skills and techniques in the use of maps, globes, pictures, statistics and graphics, and reading the landscape and literature will be acquired.

487 (2,4,4) Honors in Geography. (a) Tutorial, (b) reading, (c) supervised research. Must be spread over the last two years of the undergraduate's career. Open to students in the honors program with consent of the department. May be taken in either a,b,c or b,a,c sequence.

490-1 to 16 Tutorial in Geography. Individual and small group conference with staff members to examine geographic concepts. Prerequisite: Institut status.

500-4 Geographic Techniques I. Emphasizes field and quantitative techniques used in geography.

501-4 Geographic Techniques II. Emphasizes the conceptual framework of geography, library and bibliographic techniques, and geographic writing.

505-8 (2,2,2,2) Pro-Seminar in Geography. Discussion of basic issues and development of professional perspective in (a) Physical, (b) Economic, (c) Cultural, (d) Geographic Thought. Taught by the entire resident staff.

511-4 Philosophy of Geography. The nature of geography. Current trends in the field, present-day geographers, and schools of thought. Geography's place among the disciplines.

514-2 Teaching of College Geography.

515-4 to 6 Field Course. Designed to give actual experience in the field. Under guidance of staff members students will gather data and work toward the solution of selected field problems in one particular region of the world. The course will not be offered on campus, but will be in a field camp location suited to the study of selected problems. Prerequisite: consent of department.

520-2 to 12 Seminar in Physical Geography.

521-2 to 12 Seminar in Economic Geography.

522-2 to 12 Seminar in Regional Geography.

523-4 to 12 Seminar in Cartography.

524-2 to 8 Seminar in Cultural Geography.

527-2 to 8 Seminar in Urban and Regional Planning. Prerequisite: graduate standing or consent of instructor.

530-2 to 10 Independent Studies in Geography.

540a-2 to 36 Research in Physical Geography.

540b-2 to 36 Research in Economic Geography.

540c-2 to 36 Research in Regional Geography.

540d-2 to 36 Research in Cultural Geography.

599-9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor or Philosophy degree.

Geology

400-3 Earth Science Seminar. Two classroom meetings per week and two field trips on the observational, interpretive, and communicative aspects of earth science subjects. Prerequisite: all earth science minor courses.

410-4 Stratigraphy and Sedimentation. The characteristic features of sedimentary rocks and their processes of origin; the classification of stratigraphic units, methods of correlation, and paleogeologic reconstruction. Laboratory. Prerequisites: 220, 221, 310a,b, 315, and 425a,b or consent of instructor.

411-3 Mineralogy III. Elementary crystallography. Applications of physical principles to mineralogical problems.

414-5 Paleobotany. (See Botany 414.)

415-3 Optical Mineralogy. The optical properties of minerals and the use of the petrographic microscope for identification of crystals by the immersion method and by thin section. Laboratory. Prerequisites: 310, Physics 208.

416-4 X-Ray Crystallography. Introduction to the study, measurement, and identification of unknown crystalline materials by X-ray diffraction techniques.

especially the Debye-Scherrer methods). Upon request, non-geology majors may work with unknowns from their own fields of study. Prerequisites: 310, Mathematics 150.

20-8 (4,4) Geology of Petroleum. The geological occurrence of petroleum, including origin, migration, and accumulation; a survey of exploration methods and production problems and techniques. Laboratory study applies geological knowledge to the search for and production of petroleum. Laboratory. Prerequisites: 221, 302.

25-8 (4,4) Invertebrate Paleontology. Principles of paleontology and a survey of important invertebrate phyla and their fossil representatives. Also study of paleoecology. Laboratory. Must be taken in a,b sequence. Prerequisite: 221 or GSA 201.

30-4 Physiographic Provinces of North America. Gives the student an intelligent appreciation of the evolution of land forms in the physiographic provinces of North America and explains the surface features in a landscape. Prerequisite: 220.

35-8 (4,4) Hydrogeology. Introduces the geological factors in the origin, distribution, movement, and chemistry of natural water of the earth. Prerequisites: 315, Mathematics 150b, and Physics 207.

36-8 (4,4) Elementary Exploration Geophysics. Lectures on theory and interpretation of geophysical exploration methods. Laboratory to involve use of instrumentation and interpretation of field data. Field trips required. Prerequisite: 220, Physics 211 or concurrent enrollment.

45-3 (1,1,1) Seminar in Geology. Study of major problems in Geology. Primarily student discussion based on library work. Prerequisite: senior standing.

50-12 (9,3) Field Geology. (a) Field mapping including problems in stratigraphy, structure, paleontology, physiography, and economic geology. Requires written geologic report. Consult the department for dates, cost and equipment. (b) Advanced field problems. Prerequisite: 302, 315.

55-3 Engineering Geology. (See Engineering 455.)

60-4 Geological Data Processing. Two lecture and two laboratory periods each week for instruction in computer application to geological problems including the processing and programming of data and the interpretation and evaluation of results. Prerequisites: Engineering 222 or Mathematics 225.

70-11 (4,4,3) Stratigraphy. (a) Advanced sedimentation. Physical aspects of modern sediments are examined in detail and related to the geometry of the depositional body and its environment. (b) Stratigraphic methods. Stratigraphic correlations are explained using lithologic, paleontologic, electrical, magnetic, radio active and seismic data. (c) Regional stratigraphy of North America. Investigates the established stratigraphic subdivisions of North American geology. Prerequisite: 425.

75-12 (4,4,4) Mineral Deposits. (principles, metallics, nonmetallics) Principles of mineral deposition and genesis, and the origins and geologic settings of the important mineral deposits of the world. Laboratory. Prerequisites: 302, 425.

80-12 (4,4,4) Advanced Petrology. (a) Igneous Petrology. Physical chemistry, petrographic classification, and genetic relationships of the igneous rocks. (b) Metamorphic Petrology. Physical chemistry, petrographic classification, and genetic relationships of the metamorphic rocks. (c) Sedimentary Petrology. Petrographic classification and origin of sedimentary rocks. Prerequisites: 310, 425, or equivalent.

85-3 to 9 Micropaleontology. Structure, classification, paleoecology, stratigraphic distribution, and evolution of microfossils. Laboratory work in techniques of collection, preparation, and study of microfossils. Identification and use of microfossils in solving stratigraphic problems. Preparation for research in micropaleontology. (a) Conodonts and ostracodes. (b) Foraminifera. (c) Lesser-known groups, invertebrates and algae, pollen and spores. Prerequisite: 425.

90-8 (4,4) Advanced Invertebrate Paleontology. Research in paleontology and the use of microfossils in solving stratigraphic problems: (a) Bryozoans, mollusks, and arthropods. (b) Coelenterates, brachiopods, and echinoderms. Prerequisite: 425 or consent of instructor.

95-1 to 9 Advanced Studies.

95-1 to 9 Research.

95-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Government

406-4 The American Chief Executive: President and Governor. A study of the origin and background of the presidency and the governorship, qualifications, nomination and election, succession and removal, the organization of the executive branch, and the powers and functions of the president and governor. Prerequisites: 231, 232 (C); GSB 203a (E).

410-3 Labor and Politics. A political history of the American labor movement from its early century origins to the present. Attention given to the political philosophy and practice of labor unions. Prerequisite: 231.

415-9 (3,3,3) Political Behavior. (a) Critical behavioral evaluation and synthesis of empirical studies attempting to predict political choice and conflict behavior. (b) Integration of applicable behavioral theory and findings in incorporating a structural-functional systems approach and general systems analysis for constructing research designs. (c) Introduction to the technique of behavioral political science. Prerequisite: 231.

420-3 Pressure Groups and Politics. An analysis of interest groups and their techniques of political propaganda. Prerequisite: 231.

425-4 Blacks and Whites in American Politics. Topics include various forms of political participation, leadership behavior, and analysis of political strategies including the Black Power concept. Prerequisite: 231 or GSB 211b.

430-3 Government and National Security. A study of the organization of government for national security; the historical and current developments in civil-military relations; the legal status of over-seas military aid programs; international defense programs; and the problem of disarmament. Prerequisite: 231 or consent of instructor.

436-3 Government and Labor. (See Economics 436.)

438-4 Social Welfare Legislation. The Social Security Act and other legislation of major significance for the welfare and maintenance of the family, the handicapped, children, and other special groups. Their relationship of the legal structure of federal, state, county, township, and municipal welfare facilities and institutions with indications of economic and social consequences. Prerequisite: consent of instructor.

440-4 Public Personnel Administration. An analysis of some of the central problems encountered by the government executive in recruiting, maintaining and developing personnel, such as political neutrality, leadership and motivation, career development, security regulations, and the role of personnel in policy planning and execution. Prerequisite: GSB 203a, 360.

441-4 Philosophy of Politics. (See Philosophy 441.)

450-12 (4,4,4) Latin American Governments. The countries covered are (a) those of the Caribbean area; (b) those of South America; (c) this section deals with the government relations between the United States and the Latin American nations. Prerequisite: 200, GSB 203a.

451-4 International Politics of Europe. Nation-state system in Europe; foreign politics of major states; nationalism as a source of conflict, Soviet expansionism; and progress toward European security and unification.

452-4 Governments and Politics of Sub-Sahara Africa. A study of the governments and politics of the former and present British and French territories: Ghana, Nigeria, Kenya, Guinea, Congo, Senegal, etc. Prerequisite: GSB 360 or consent of instructor.

453-12 (4,4,4) Soviet Russia. An intensive study and research exercise in communist government and politics. Prerequisite: 200, GSB 390, or consent of instructor.

454-8 Development of German Democracy. Involves a summer's residence in Germany with classroom material supplemented by lectures by German professors and government officials. Prerequisite: consent of instructor.

455-4 Major Governments of Western and Central Europe. A comparative study of the political systems of the major countries of Western and Central Europe. Prerequisite: GSB 390 or consent of instructor.

456-4 Great Britain and the Commonwealth. The commonwealth association and the politics of Great Britain and the "Old Commonwealth" countries: Australia, Canada, New Zealand.

457-8 (4,4) Government and Politics in the Near and Middle East. Iran, Iraq, Syria, Lebanon, Egypt, Jordan, Saudi Arabia, etc. Prerequisite: GSB 390 or consent of instructor.

58-12 (4,4,4) Government and Politics of Asia. (a) Burma, Thailand, Malaya, Indochina, Indonesia, Philippines. (b) China, Japan, Korea, Formosa. (c) India, Pakistan, Ceylon. Prerequisite: GSB 390 or consent of instructor.

59-4 Politics of Developing Areas. A survey, theoretical and descriptive, of the impact upon politics of the process of development, and the role of the governmental system in the direction and control of development. Prerequisite: GSB 390 or consent of instructor.

61-4 Organizational Theory and Public Administration. Analysis of various theoretical approaches to public administration with emphasis on recent American literature in this field. Prerequisite: 360 or consent of instructor.

62-3 Intergovernmental Relations. A course dealing with the interrelationships between the various levels of government in the United States. Prerequisite: 231 or GSB 211b.

63-3 Government, Social, and Economic Policy. Exploration of contemporary agencies of policy determination within the national government; attention to methods and devices utilized to effectuate national social and economic policy within the federal system; appraisal of historical developments, trends, and results as they affect American governmental, constitutional, and political philosophy, public administration, and the general welfare. Prerequisite: GSB 11c consent of instructor.

66-3 State Government and Administration. Leading problems of government and administration of American states. Prerequisite: 232.

67-4 Urban Politics. Institutions, processes, and functions of American urban governments. Prerequisite: 232.

69-3 Administration of State and Local Finance. An examination of the administrative problems connected with local and state revenues and expenditures in the U.S. Prerequisite: 232.

70 Urban Planning. (See Geography 470.)

71-4 The Organization and Administration of American Foreign Policy. An advanced course dealing with the organizational and administrative aspects of American foreign policy. Prerequisite: 243 or 371.

72-4 International Organization. Development and organization of international governmental and administrative systems, with emphasis on the United Nations. Prerequisite: GSB 303.

75-8 (4,4) International Law. Rules and practices governing the nations in their relations in peace and war. Prerequisite: GSB 303.

78-4 International Politics. A study of the interplay of political forces in the international community. Particular emphasis will be placed on war-time diplomacy, peace treaties, the alignments and conflicts of power in the post-war period. Prerequisite: GSB 303 or consent of instructor.

80-4 The Pacific and the Far East. Political and strategic problems in this area. Prerequisite: GSB 303 or History 370.

84-8 (4,4) History of Western Political Theories. (Same as Philosophy 484)
a) Outstanding political theories of the ancient and medieval periods, including theories of Plato, Aristotle, Cicero, St. Augustine, and Thomas Aquinas.
b) Important political theories from the Renaissance to the end of the 18th century, including the theories of Machiavelli, Hobbes, Rousseau, Locke, and Burke.

87-6 (3,3) American Political Ideas. An historical study of the political ideas of leading American statesmen and publicists, and their resulting influence upon our governmental system. Prerequisite: 305 or GSB 385.

88-9 (3,3,3) Recent Political Theory. (a) The outstanding Anglo-American liberal political theorists from John Stuart Mill to the present. (b) The outstanding "scientific" political theorists from Karl Marx to the present. (c) The outstanding idealistic and nationalistic political theorists from Hegel to the present. Prerequisite: GSB 385 or 390.

95-8 (4,4) Constitutional Law. (a) Constitutional law of the United States with emphasis upon cases dealing with the framework of our federal system.
b) American liberties. Prerequisite: 231.

97-4 Administrative Law. Law as it affects public officials in carrying out their rights, duties, and necessary functions of the public office. Prerequisite: 30.

98-4 Jurisprudence. (Theories of Law.) Major schools in legal thinking. Positive law and natural law. Idea of justice and concept of natural rights. Prerequisite: 231.

499-4 Scope and Method of Government. Practical training in research and writing techniques in the field of government. Bibliographical materials, foot notes, use of law library facilities, and government documents. Required of all beginning graduate students.

500-6 (3,3) Methods of Empirical Research. (a) Problems in the philosophy of science as related to research in political science. (b) Techniques of data gathering and analysis for political science research.

501-2 to 9 Seminar in Contemporary Legislation. Prerequisite: 340 or consent of instructor.

502-2 to 9 Seminar in Governmental Problems. Prerequisite: consent of instructor.

503-2 to 9 Seminar in Pressure Groups. Prerequisite: 420 or consent of instructor.

504-4 Judicial Process. An examination of the literature on such topics as judicial selection, the impact of court decisions, court procedure, and the factors affecting the decision-making behavior of judges. Prerequisite: 495 or equivalent or consent of instructor.

505-2 to 9 Seminar in Political Parties. Prerequisites: 380, 420, or consent of instructor.

506-2 to 9 Seminar in Political Behavior. Prerequisite: 415 or consent of instructor.

508-2 to 9 Seminar in International Relations. Prerequisites: 370, 472 or 473 or consent of instructor.

509-2 to 9 Seminar in International Organization. Prerequisite: 472 or consent of instructor.

510-2 to 9 Seminar in State Government. Prerequisite: 466 or consent of instructor.

511-2 to 9 Seminar in Local Government. Prerequisite: 467 or consent of instructor.

512-2 to 9 Seminar in Public Administration. Prerequisite: 360 or consent of instructor.

513-2 to 9 Seminar in Constitutional Law. Prerequisite: 395 or consent of instructor.

515-2 to 9 Seminar in Comparative Government.

516-2 to 9 Seminar in Municipal Administration. Prerequisite: 467 or consent of instructor.

517-2 to 9 Seminar in Problems in Political Theory. Prerequisite: 360 or consent of instructor.

520-2 to 9 Seminar in American Foreign Policy. Prerequisite: 371 or consent of instructor.

521-1 to 12 Readings. Supervised readings in selected subjects. Not more than 6 hours may apply toward the master's degree. Prerequisite: consent of instructor.

525-2 to 9 Seminar in International Law. Prerequisite: 475 or consent of instructor.

530-4 to 12 Internship in Public Affairs. Field work in the office of a governmental agency; city, county, state, national, or international. Under certain circumstances it might be in the office of a political party organization or that of some organized pressure group. The type of internship and the place and organization in which it is taken must be mutually satisfactory to the student and the department. A paper in which the student correlates his academic knowledge with his practical experience is required. Prerequisite: consent of department.

582-4 Criminal Law and the Correctional Process. A review of the basic principles and administration of the criminal law and the legal foundation of the juvenile court, the sentencing process, parole and probation, and the changing concept of mental competency. Prerequisite: consent of instructor.

584-4 Seminar in Correctional Program Management. A critical analysis of management influence on treatment programs in various correctional settings. Field trips, observation, and research in addition to readings. Prerequisite: consent of instructor.

595-2 to 12 Individual Research. Selection, investigation, and writing of research topic under the personal supervision of a member of the department graduate staff. Prerequisite: 499 or consent of instructor.

599-1 to 9 Thesis. Prerequisite: 499 or consent of instructor. Minimum of 6 hours to be counted toward a degree.

500-1 to 48 **Dissertation.** Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Guidance and Educational Psychology

412-4 **Mental Hygiene.** A survey of principles concerning factors and conditions in personal life that tend to facilitate or deter mental health. Mental health viewed as living creatively in an atmosphere of satisfactory inter-personal relations. Prerequisite: 305.

422-8 (4,4) **Educational Measurement and Statistics.** (a) Study of the theory and techniques of measurement. Special attention to the construction and use of teacher-made tests. (b) Study of standardized tests and other measuring devices to reveal individual and group characteristics. Emphasizes application and interpretation for counseling, education, and research purposes. Prerequisite: 305.

442-4 **Basic Principles of Guidance.** Introductory course on student personnel services. Survey of philosophy, principles, and organization of guidance services. Prerequisite: 305.

481-2 to 10 **Seminar.** Conducted by staff members and distinguished guest lecturers on pertinent topics. Prerequisite: 305 and consent of instructor and department.

501-2 to 12 **Special Research Problems.** For majors in Guidance. Formulating, investigating, and reporting on a problem in the area of guidance. Prerequisites: advanced standing and consent of department.

505-4 **Introduction to Statistical Methods.** Covers such basic descriptive techniques as measures of central tendency and variability, graphical presentation of data, and various derived scores. Also correlation, sampling theory, and hypothesis testing.

506-4 **Advanced Statistical Methods.** Basic statistical inference techniques: correlation, hypothesis testing, confidence intervals, introduction to prediction and one-way analysis of variance. Prerequisite: 505.

507-4 **Design and Analysis of Experiments.** Systems of organizing and analyzing data so that maximum information can be obtained. Analysis of variance, factorial design, square designs, mixed designs, tests of homogeneity, analysis of covariance, and multiple linear regression. Prerequisite: 506.

511-4 **Educational Implications of Learning Theories.** Survey of the major theories of learning. Emphasizes the implications of these theories for classroom practice. Prerequisite: advanced standing.

515-4 **Psychological Aspects of Education.** Designed to survey the applications of psychology to educational settings. Prerequisite: advanced standing.

521-8 (4,4) **Analysis of Classroom Behavior.** Trains school psychologists and other school personnel to serve as a consultant to classroom teachers regarding (a) prevention and modification of undesirable classroom behaviors and (b) effective use of learning principles. Must be taken in a,b sequence. Prerequisite: 305.

530-4 **Standardized Testing: Theory, Use, and Interpretation.** Principles and procedures for studying individual pupils and their problems for guidance purposes. Emphasis on interview, observation, ratings, case study, cumulative record. Prerequisite: 505.

531-4 **Theory of Measurement.** Standardized tests and other measuring devices studied to reveal individual and group characteristics. Application and interpretation for counseling, education, and research purposes. Prerequisite: 505 or consent of instructor.

532-8 (4,4) **Individual Measurement Theory.** (a) Assessment of individual mental factors with attention to theories, test validation, analysis of intelligence, and related research. Historical review, test standardization, and interpretation of the Stanford-Binet and Wechsler Scales are emphasized. (b) Discussion of problems in the administration of intelligence tests. Administration of the Stanford-Binet and the Wechsler intelligence scales for children. Must be taken in a,b sequence. Prerequisite: 505 or consent of instructor.

537-4 **Counseling Theory and Practice.** Systematic study of the assumptions and fundamental practices of major approaches to counseling. Observation and practice utilized to supplement didactic discussion. Prerequisite: consent of department.

541-4 **Occupational Information and Guidance.** For school counselors, indus-

trial supervisors, and teachers to give an orientation to and experience with occupational information and vocational adjustment. Prerequisite: 442.

543-4 Guidance Through Groups. Study of the methods, techniques and materials for the organization and utilization of groups for guidance purpose. Prerequisite: 442.

545-2 to 4 Seminar. Doctoral seminar in behavioral foundations of education. Open only to students admitted to doctoral curricula who have completed 590.

546-8 (4,4) Personality Assessment. The review of related literature covering test development, standardization procedures, related research, and test interpretation. (a) Assessment of individual interests, motivations, and perceptual systems with attention to theories and assumptions of objective diagnostic tests. (b) Projective diagnostic tests, theories, and assumptions stressed. Must be taken in a,b sequence. Prerequisite: 532a or consent of instructor.

548a-2 to 4 Practicum in Secondary Guidance. Supervised experience in group and individual guidance procedures with children and in working with parents and teachers. The development and organization of a secondary school guidance program is stressed, including the use and interpretation of occupational and other test materials appropriate for the secondary school. Prerequisite: 537 or consent of instructor.

548b-2 to 4 Practicum in Elementary Guidance. Supervised experience in group and individual guidance procedures with children and in working with parents and teachers. The development and organization of an elementary school guidance program is stressed, including the use and interpretation of occupational and other test materials appropriate for the elementary school. Prerequisite: 537 or consent of instructor.

548c-4 to 8 Practicum in Counseling. Practical experience at the appropriate grade level in counseling with a representative sample of the population. Includes counseling and listening to recordings of counseling sessions individually or in groups. Prerequisite: consent of instructor.

548d-2 to 8 Practicum in School Psychology. Supervised experience to help the student work effectively as a psychologist in the school setting. Focus on the application of specific psychological skills, the teacher consultation, and program planning for educationally handicapped children. Prerequisite: consent of instructor.

553-2 to 4 Organization and Administration of Guidance and Pupil Personnel Services. Principles, procedures, and plans necessary for initiating, developing, and appraising a school guidance program. Prerequisite: 537.

555-2 to 12 Seminar in School Psychology. Major professional issues and responsibilities; the school as a social system; ethical considerations; school-related agencies and facilities; and professional organizations. Assists the student prepare the project proposal required for the specialist's certificate. Prerequisite: consent of instructor.

562-8 (4,4) Human Development in Education. Theories and research evidence regarding child development and behavior are investigated. These considerations focus upon implications for research and educational practices. (a) Childhood. Prerequisite: advanced standing. (b) Adolescence. May be taken in a,b sequence.

567-2 to 12 Topical Seminar in Educational Psychology. Contemporary topics and problems in the area of educational psychology. Conceptual and empirical activities. Prerequisite: consent of instructor.

568-2 to 16 Topical Seminar in Counseling and Guidance. Issues in counseling, counseling theories, research methodology, contemporary and classical research design, modern trends in applied research. Prerequisite: consent of instructor.

580-2 to 10 Topical Seminar in Statistics and Measurement. Discussion of practical experience in dealing with advanced statistical and measurement problems. In-service training is available for advanced graduate students. Prerequisite: consent of instructor.

581-1 to 12 Internship in Counseling, Guidance, and Counselor Supervision. Prerequisite: 548c.

590-2 Seminar in Behavioral Foundations. A course required of all students beginning advanced graduate study. Students examine empirical modes of inquiry and empirical formulations of learning behavior. Topics explored include the classroom as a social system, the learner, learning models and ca

language. (Taken concurrently with Educational Administration 591. Prerequisite: formal admission to Doctor of Philosophy studies.)

6-2 to 12 **Independent Investigation.** For specialist's certificate students. Prerequisite: consent of instructor.

7-1 to 10 **Independent Study.** For doctoral students in educational psychology. Formulating, investigating, and reporting on research problems in the area of guidance and educational psychology. Prerequisite: consent of department.

9-3 to 9 **Thesis.**

0-1 to 48 **Dissertation.**

Health Education

0-4 **Health Appraisal of School Children.** The role of the teacher in the health appraisal of the school child, including school health examinations, use of health records, and emphasis on training for recognition of health deviations from normal common among school children. Not open to students who have had 450.

5-4 **Sex Education in Schools.** Problems of teaching sex education in schools. Designed to meet state requirements for preparation of teachers.

5s-3 to 4 **Workshop in Driver Education and Traffic Safety.** Summer course designed for pre-service and in-service teachers of driver education and traffic safety. Individual and group problems will be treated. Lectures by safety authorities, demonstrations, field trips, audio-visual materials, and individually supervised research in special problem areas. Prerequisite: 302 equivalent.

2s-4 **Practicum in Driver and Traffic Safety Education II.** Provides prospective teachers with dual-control, simulation, and multiple-car laboratory teaching experiences. Teaching beginners, developing programmed lessons, methods, and materials of instruction included. Prerequisite: 302s.

3s-4 **Driver and Traffic Safety Education Program Administration III.** Includes a study of program administration, supervision, and planning. Prerequisite: 442s.

3s-4 **Driver Simulation.** For in-service and pre-service teachers and supervisors of driver and traffic safety education. Methods of instruction, equipment familiarization, program development and objectives. Prerequisite: 443s consent of the instructor.

4-4 **Health Education in the Elementary School.** Responsibilities of schools to instruct their students in basic fundamentals of how to live healthfully. Principles, methods, programs and materials for the elementary teacher. The integration of health with other subjects, health observation of children, abnormalities, screening tests, and related materials. Not open to students who have had 400.

4-4 **School Health Program.** Shows the prospective teacher the fundamental processes involved in the teaching of health education at the secondary level.

4-4 **Workshop in Health Education.** Summer course for in-service teachers, administrators, advanced students, nurses, social workers, and others interested in public health aspects of school and community living. Individual problems in classroom health treated as units in such fields as speech defects and their detection and correction, communicable disease control, nutrition, social and mental hygiene. Lectures, demonstrations, films, field trips, and individually supervised research in special problems. Prerequisite: 100 or its equivalent.

4-4 **Health Education Workshop.** A continuation of 461 with emphasis on actual school health teaching objectives.

4-1 to 4 **Workshop in Health Education with Emphasis in Disaster Preparedness.** A continuation of 462.

4-4 **Workshop in Alcohol Education.** Summer course for in-service teachers, administrators, and others interested in the development and improvement of alcohol education programs at the elementary and secondary school levels. Includes approaches to understanding physiology of alcohol, cultural differences and patterns of alcohol problems, teenage drinking and current theories and approaches to alcoholism. Emphasis on the analysis and development of content, methods, materials, teacher preparation, and special needs problems of individual communities. Demonstrations, lectures, films, field trips, and individual research in special areas.

47-4 **Organization and Administration of School Health.** Appraisal of overall

school organization for health education, including health service and personnel, health and safety instruction, school environment, school health examination, local, state, and federal resources for health, health councils, and interdepartmental relationships.

475s-3 Traffic Law Enforcement and Planning. Acquaints Safety and Driver Education teachers with the purposes of traffic law enforcement and engineering and the methods used to fulfill these purposes on ways of improving existing services. Prerequisite: 433s or consent of instructor.

480s-4 Workshop in Safety Education. Summer course for in-service teachers, nurses, administrators, advanced students, and others interested in safety education as it applies to the public school and the community. Individual problems, lectures, demonstrations, films, field trips, and individual group study in special areas of interest. Prerequisite: 313 or 323 or consent of instructor.

481s-4 Safety Education Workshop. A continuation of 480s with emphasis on methods and evaluation of total school safety education. Prerequisite: 313 or 323s or 480s or consent of instructor.

485-4 International Health. A survey and analysis of the health beliefs, values, and practices of peoples in other cultures, with particular attention to how these beliefs and practices fit into a total way of life. An international orientation of potential value to both prospective teachers and students in other fields.

488-4 Health Education Aspects of Environmental Sanitation. Application of principles of learning to man's contacts with his environment: water, food, air, radiation, housing, and refuse. Emphasis is placed upon both individual and community aspects of environmental health. Prerequisites: 100, 205, or equivalent.

489-4 Introduction to Vital Statistics. An introduction to bio-statistics; examination of theories of population growth; understandings of collection, organization, summarization, presentation, evaluation, and interpretation of data relative to biological happenings. Prerequisite: Mathematics 120 or equivalent.

490-2 to 8. Field Work in School and Community Health. Field training, observation, and participation in current public and school health programs. Area schools and public health agencies will be utilized to provide practical experience for the health education student. Restricted to majors in the department.

491-4 Health Teaching Methods in School and Community. Various dimensions of teacher-student relations in the classroom with emphasis on the multiple roles of the teacher. Prerequisite: 305, 471, or consent of instructor.

500-4 Community Organization for Health Education. Review of the philosophies of community organization for health; techniques of group work; current research in community organization and examination of programs of community health agencies.

510-4 Construction of the Curriculum in Health Education and Safety. Review of health and safety instruction programs in elementary and secondary schools; consideration of health and safety needs and interests and their relations to the curriculum, evaluation of health texts, and evaluation of current research.

511-5 Practicum in Health Education Workshop. Designed to give graduate and post-graduate students experiences in organizing, planning, and operating in-service training programs through workshop methods.

515-4 Review of Current Literature in Health Education, Public Health and Safety Education. A survey and analysis of the newer publications in related fields of health education, public health, and safety education.

520-4 to 6 Special Projects in Health Education and Safety. Detailed research and study on advanced problems in the fields of public health, safety education, and health education.

525s-4 Organization, Administration, and Supervision of Safety Education. Designed to give the student basic principles of organization, administration, and supervision of safety education. Problems, policies practices, and methods involved in the organization and administration of a safety education program.

526-4 Evaluation in Health Education and Safety. Surveys and analysis of health and safety testing and evaluation, procedure includes surveys; inventories; knowledge, behavior and attitude tests; check lists; and questionnaires; their uses and limitations. Evaluation of total school health and safety program is emphasized. Prerequisite: consent of department.

530s-4 Problems and Research in Accident Prevention. Principles of accident

vention, causes of accidents, problems of behavior in school, home, traffic and transportation. Prerequisites: 443s, 525s, or consent of instructor.

533a-4 Human Conservation. An analysis of community health problem trends and changes including aging; chronic and degenerative diseases; mental illnesses; traumatic illness, injuries, and defects; radiological hazards; communicable diseases; and maternal and child health problems. An epidemiological approach to the cause, nature, extent, and trends in erosion and wastage of human resources. Prerequisite: permission of instructor.

533b-4 Human Conservation II. An analysis of community structures in relation to positive health services, education, and health living in respect to community health problems and health requirements. A study of trends in programming to meet minimum health requirements and to care for or ameliorate existing health problems and hazards on a communitywide basis. Prerequisite: 533.

533c-4 Human Conservation III. An analysis of the unmet health needs or requirements for optimum conservation of human resources in the community including a study of pilot and experimental programs and research in community efforts to meet health needs and solve existing health problems. An evaluative approach to existing health programming and research including an analysis of further needed experimentation and research and possible sources for leadership and funds for promoting community health research, programmings, and plannings. Prerequisites: 533a,b.

536-4 Professional Preparation in Health Education. National, state, local factors influencing teacher preparation in health education, including accreditation of teacher education programs, certification of health education teachers. Undergraduate and graduate curricula developed and analyzed.

540-4 to 12 Field Internship. Full quarter of field work with an approved department of public health or voluntary health agency under the supervision of the agency officer in charge and the supervisor from the Department of Health Education.

547-3 (1,1,1) Seminar in Health Education and Safety. Devoted to discussing individual health and safety projects, presenting research problems, and preliminary presentation of dissertation topics.

549-3 to 9 Thesis.

540-1 to 48 Dissertation. The dissertation for the Doctor of Philosophy degree at the College of Education must meet the minimum requirements of 36 hours.

Higher Education

542-2 Principles of College Student Personnel Work. An exploratory course designed to acquaint the student with the career possibilities and functions of higher education.

540-4 Higher Education in the United States. An overview of American higher education: its development and scope, organizations and functions, issues and criticisms.

542-4 Higher Education in Selected Nations. Study of higher education systems and trends outside the United States, and of the university in world affairs.

545-4 Organization and Administration in Higher Education. Theories and practices in governance of various types of higher education institutions with attention, through case studies, to problems of formal and informal structures, personnel policies, decision-making, institutional self-study, and societal-governmental relations.

545-4 College Student Personnel Work: Operations and Policies. Study of organization, functions, and undergirding policies of student personnel services and programs in contemporary colleges and universities.

545-4 College Student and College Culture. A study of the nature of the student, the impact of the college on student development, the nature of the college as a unique social institution, and the interaction between the student and his institution.

545-4 College Teacher and College Teaching. Study of contextual roles of academic man as teacher, scholar, and faculty member; of teaching-learning processes, programs, and evaluations; and of professional values, including academic freedom.

545-1 to 12 Readings in Higher Education. Supervised readings in aspects

of such general areas in higher education as college teaching and learning, central administration, college student services, policy issues, or history of higher education. Prerequisite: consent of instructor.

523-1 to 12 Internship in Higher Education. Supervised field experience in appropriate settings, with evaluative seminars. (a) College Teaching. (b) College Student Personnel. (c) College Administration. (d) Institutional Research. Prerequisite: consent of department.

524-2 to 6 Individual Study. Individual inquiry into selected problems in higher education. Prerequisite: consent of instructor.

535-2 Higher Education Seminar I. A series of seminars for specialized areas of administrative practice and policy. (a) Educational Programming in Student Housing. (b) Business Administration of Student Housing. (c) Student Personnel Group Work. (d) Non-Academic Personnel Management. (e) Problems in Central Administration. (f) Business and Fiscal Administration. (g) Academic and Faculty Administration. (h) Administration of Admissions and Records. (i) Junior College Administration. (j) The Technical Institute. (k) Adult and Continuing Education. (m) Institutional Research. (p) Development and Management of Organized Research.

545-3 Higher Education Seminar II. A series of seminars for reflective and scholarly inquiry into significant domains in higher education. Prerequisite: consent of instructor. (q) History of Higher Education. (r) Sociology of Higher Education. (s) Law, Legislatures, and Higher Education. (t) Aesthetics and Higher Education. (v) The Federal Government and Higher Education.

551-4 Curriculum Design and Policy. Study of assumptions, materials, methods, and evaluation in the designs of various curricula in colleges and universities, with attention to curriculum resources and policy.

555-4 Philosophy of Higher Education. (Same as Philosophy 555.) Critical examination of assumptions and aims, operations and consequences, and basic concepts and symbols of higher education from philosophic perspectives.

565-4 The Community-Junior College. A study of the nature and functions of the junior (or community) college in American higher education, and its relationships to the community and other educational institutions. Course content treats special problems of curriculum, student services, finances, faculty selection and growth, and general policy.

578-4 Economic Aspects of Higher Education. A study of economic aspects of higher education in American society. The emphasis on sources and management of college and university financing includes budgeting, control, and current trends.

589-4 to 6 Advanced Research. Selection, investigation, and writing of a special research project under the personal supervision of a graduate faculty member. Prerequisite: consent of instructor.

595-1 to 12 Higher Education Seminar III. Varied content. Prerequisite: consent of instructor.

599-1 to 9 Thesis.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

History

401-9 (3,3,3) History of the South. Social, economic, political, and cultural developments of the South. (a) To 1850. (b) 1850-1900. (c) Since 1900.

403-6 (3,3) American Economic History. (a) to 1800. (b) 1800-1900.

405-6 (3,3) United States History 1850-1896. (a) Civil war. (b) Reconstruction and industrialization. Prerequisite: GSB 300b or consent of the instructor.

406-6 (3,3) Diplomatic History of Europe. (a) From the Congress of Vienna to the Fall of Bismarck (1815-1890). (b) From 1890 to the present.

409-6 (3,3) U.S. Constitutional History. A content and research course involving origin and development of the American constitution, from English background through the convention to the present. (a) 19th Century. (b) 20th Century.

410-2 to 5 Special Readings in History. Supervised readings for students with sufficient background. Registration by special permission only. Offered on demand.

411-9 (3,3,3) Social and Intellectual History of the United States. (a) 1789-1830. (b) 1830-1900. (c) 1900 to present. The development of American

- ciety and a study of various types of economic, social, and political thought that have influenced it.
- 4-9 (3,3,3) **Intellectual History of Modern Europe.** (a) The Enlightenment, (b) The 19th century, (c) The 20th century.
- 5-6 (3,3) **Early Modern Europe.** (a) Renaissance. (b) Reformation. Prerequisite: Six hours of 300-level social science or consent of the instructor.
- 7-9 (3,3,3) **Advanced English History.** (a) The Empire-Commonwealth. (b) Constitutional history. (c) English culture in the age of the American Revolution. (d) Tudor England.
- 9-6 (3,3) **Europe in the Age of Absolutism.** (a) 1648-1715. (b) 1715-1789. Prerequisite: Six hours of 300-level social science or consent of instructor.
- 10-4 **The French Revolution.** A sketch of the passing of feudalism in France, the background and development of the revolutionary movement, and the Napoleonic period.
- 15-6 (3,3) **American Colonial History.** (a) Discovery and Settlement, (b) British Imperial structure.
- 18-3 **The Age of Jackson.** Origins, background, and development of that phase of American democracy associated with the Jacksonian era. The political, social, and economic history of the years 1815-1844.
- 19-9 (3,3,3) **Late Modern Europe.** (a) Age of Revolution, 1815-1880. (b) 1890-1918. (c) Since 1918. Age of Dictatorships.
- 24-9 (3,3,3) **The Social and Political History of Modern Europe.** (a) 1815-1870. (b) 1870-1914. (c) Since 1914. Prerequisite: Six hours of 300-level social science or consent of instructor.
- 25-9 (3,3,3) **Twentieth-Century United States History.** Important developments in recent United States history. (a) 1896-1919. (b) 1919-1937. (c) 1937-present. Prerequisite: GSB 300c or consent of instructor.
- 29-9 (3,3,3) **History of American Diplomacy.** A study of the important treaty relations of the United States, and a general consideration of American foreign policies. (a) America in isolation (to 1860). (b) The emerging America (from 1860 to 1920). (c) America on the world scene (1920 to the present). Prerequisite: GSB 300 a,b.
- 31-9 (3,3,3) **History of the West.** (a) Colonial. (b) Trans-Allegheny. (c) Trans-Mississippi.
- 33-6 (3,3) **History of Southeast Asia.** (a) To 1900. (b) 1900 to present.
- 34-6 (3,3) **Advanced African History.** (a) Cultural history of traditional states, the slave trade, and the interaction of traditional systems and European culture. (b) Investigations into the most important historical questions and interpretations of the regions covered in (a). Prerequisite: 349a,b, or c, or consent of instructor, or graduate standing.
- 35-3 **Historiography.** Development of history as a written subject, including methods and philosophy of the various historians in ancient, medieval, and modern periods.
- 36-3 **Historical Research and Thesis Writing.** The rules of historical research studied and applied to a definite topic. For history majors only.
- 37-3 **History of Inner-Asian Relations.** Tribes, migrations, wars, and power politics in Central Asia and outlying areas of China from Han times through a century rivalries to latest development along the Sino-Soviet frontier.
- 38-9 (3,3,3) **Social and Intellectual History of the Middle Ages.** (a) 500-1000. (b) 1000-1250. (c) 1250-1500.
- 39-6 (3,3) **History of France.** French social, economic, political, and intellectual evolution from medieval origins to the present day and of the French contributions to Western culture. Prerequisite: 6 hours 300-level social science, or consent of department.
- 40-6 (3,3) **History of Germany.** (a) German state and society from the Middle Ages to the early 19th century. (b) Germany since 1815. Prerequisite: Six hours of 300-level social science or consent of instructor.
- 41-6 (3,3) **History of Russia.** (a) Traditional Russia to 1905. (b) Revolutionary Russia Since 1905.
- 42-3 **Argentina and Chile.** A narrative and comparative study of the independent era of the history of these two leading states of South America.
- 43-6 (3,3) **History of Mexico.** (a) 19th century. (b) 20th century. Significant political, economic, diplomatic, social, and cultural aspects of Mexican life from independence to modern Mexican life.
- 44-6 (3,3) **The Caribbean Area.** (a) In the 18th and 19th centuries. (b) In the 20th century. An inquiry into the changing role of the political, eco-

- conomic, strategic and cultural nature of this Mediterranean of the New World. (3,3) **Dictatorship in Latin America.** A political, economic, social and military study of the domestic and international aspects of dictatorship. (a) 19th century. (b) 20th century. Prerequisite: junior standing.
- 476-3 Andean South America Since Independence.** A narrative and comparative study of Bolivia, Colombia, Ecuador, and Peru in the nineteenth and twentieth centuries. Prerequisite: 6 hours of 300-level social science or consent of department.
- 477-3 Brazil Since Independence.** Cultural, diplomatic, military, political, and socio-economic elements of Brazilian life from independence to the current era. Prerequisite: 6 hours of 300-level social science or consent of instructor.
- 481-6 (3,3) History of Rome.** (a) Rome from republic to empire, 133 B.C. to A.D. 14. (b) Roman Empire to the death of Constantine. Prerequisite: 6 hours of 300-level social science or consent of instructor.
- 482-6 (3,3) Cultural History of Greece.** (a) Hellenic civilization as reflected in its religious, historical, scientific, and philosophical thought, and in its literature and art. (b) The decline of the Greek city-states in the 4th century B.C., the Age of Alexander, and the political, social, economic, religious, and cultural developments of the Hellenistic period. Prerequisite: 6 hours of 300-level social science or consent of department.
- 498-6 (3,3) History Honors.** Study of the great ideas and works of history for senior honors students in history; directed research for the honors thesis. (a) History honors. (b) Research, honors thesis. Prerequisite: consent of department.
- 500-4 to 10 History Seminar.** (a) American history, (b) European history, (c) Latin American history.
- 509-4 Studies in Negro History.** Readings, discussions, and papers, of selected areas of Negro life and thought.
- 510-2 to 12 Readings in History.** Individual readings course. Prerequisite: consent of department.
- 511-4 Studies in the Middle Ages.** Extensive reading and discussion in selected topics of medieval European history.
- 512-4 Studies in Modern Europe.** Advanced readings in problems of modern Europe. Emphasis on economic, social, and intellectual history. Prerequisite: 430a,b or consent of instructor.
- 514-4 Studies in Asian History.** Pro-seminar course on select topics in Asian History. Prerequisite: consent of department.
- 515-8 (4,4) Seminar in Twentieth Century United States History.** United States history since 1896 with emphasis upon politics and political behavior. Prerequisites: graduate status.
- 516-8 to 16 (4,4) Seminar in European History.** Must be taken in a,b sequence. May be repeated once. Prerequisite: consent of instructor.
- 518-4 England in the Age of the "Glorious Revolution."** An analysis of the ideas and forces that converted the English government into a liberal state with an emphasis on the concepts and principles later applied in the establishment of the American Constitution.
- 519-8 (4,4) The Age of Jefferson.** Rise and development of Jeffersonian Democracy, 1790-1824, with emphasis upon social, economic, and political programs of Republicans and Federalists; the clash of mercantile and agrarian interests.
- 520-8 (4,4) Sectionalism and Reform.** Study of major political, economic, and social issues, 1820-1850, which divided the United States and prepared the way for civil war.
- 521-8 (4,4) Seminar in American Diplomatic History.** A content and research course concerning selected studies in American diplomacy. Prerequisite: 6 hours of 300-level social science or consent of instructor and 440.
- 522-8 (4,4) Seminar in American Economic History.** (a) Reading seminar in the economic aspects of American history. (b) Research seminar problem. Prerequisites: Economics 214 or 215 or consent of instructor.
- 523-8 (4,4) Seminar in American Social History.** Research and writing in selected topics relating to the development of American society and institutions. Prerequisite: consent of instructor.
- 524-8 (4,4) Seminar in American Constitutional History.** (a) Reading seminar devoted to the important literature in constitutional history. (b) Research seminar in which the student will closely investigate a significant topic. Prerequisite: consent of instructor.

- 5-8 (4,4) **Seminar in American Colonial History.** Advanced research in specific areas of American Colonial history. Prerequisite: consent of instructor.
- 3-4 **New Viewpoints in American History.** New interpretations and recent developments in American history. Prerequisite: GSB 300.
- 8-8 (4,4) **Seminar in Illinois History.** A seminar in selected topics in Illinois history, 1818-1918. Prerequisite: consent of instructor.
- 4-4 **United States-Mexican Relations.** A content and research course concerning international relations between the United States and Mexico.
- 5-12 (4,4,4) **Studies in Latin American History.** A content and research course concerning selected studies in Latin American history.
- 8-3 (1,1,1) **Teaching History in College.** Required of all first-year teaching assistants.
- 9-1 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 0-1 to 4 **Dissertation.**

Home and Family

- 7-2 to 8 **Workshop.** Aids workers in professions related to home and family.
- 3-4 **Advanced Family Housing.** (Same as Clothing and Textiles 423.) Further appreciation and understanding of aesthetic, economic, psychic, and social factors influencing choice of family housing today. Prerequisite: 323.
- 4-4 **Selection, Use, and Care of Appliances.** Materials used in equipment, methods of construction, and principles of operation of appliances for cooking, refrigeration, laundering, cleaning; selection, operation, and care of appliances to obtain maximum satisfaction in use. Offered on demand. Prerequisite: 324 or consent of instructor.
- 5-4 **Work Simplification in Home Management.** Basic scientific work simplification principles applied to work done in the home by full-time, employed or physically handicapped homemakers.
- 5-4 **Administration of Pre-School Program.** Objectives in pre-school programs. Programming, including housing, equipment, health protection, and supervision. Field trip. Prerequisite: 345b or consent of instructor.
- 3-4 **Infant Development.** Current theories and knowledge concerning growth and development of infants with related laboratory and field experiences. Prerequisite: 237 or Psychology 301 or equivalent.
- 3-2 **Practicum in Parent-Child Study.** Designed to increase student's ability to work with parents and parent groups through an awareness of factors in the parent-child relationship and knowledge of current research and methods in parent education. Integration with infant and child development laboratories and related field experience. Prerequisites: 227 and 237 or equivalent.
- 4-2 to 6 **Field Experience.** Opportunity for supervised learning experiences in selected areas. Prerequisite: consent of chairman of department.
- 4-2 to 6 **Readings.** Supervised readings for qualified students. Prerequisite: consent of instructor and chairman.
- 5-4 **Research Methods.** The nature of the scientific method and basic techniques in home and family research as applied to the collection, analysis and interpretation of data. Prerequisite: Guidance 505.
- 5-4 **Trends in Consumer Problems.** Social, legal, and economic problems that pertain to the consumer. Selection of individual problems for investigation. Prerequisite: 341 or equivalent.
- 5-4 **Advanced Home Management.** Readings, observations, projects, and discussions on selected problems with emphasis on time, money, energy, and family relations. Prerequisites: 331 and 332 or equivalent.
- 5-4 **The Pre-School Child.** Growth of the child from birth to six years with emphasis on the various aspects of growth and their interrelationships.
- 5-4 **Child Development Through Home and School.** The normal, healthy development of children as it takes place in the home and is promoted by the curriculum and other school activities.
- 5-4 **Interpersonal Relationships Within the Family.** Factors that promote satisfactions within the immediate family. Prerequisites: 227 or GSB 341, 237, and 331.
- 5-4 **Recent Research.** Review of selected research in various phases of home economics in related fields. Sources of research include colleges, universities, and governmental and industrial agencies. Offered on demand.
- 5-2 to 8 **Special Problems.** For students recommended by their chairman

and approved by the head of the department and the instructor in charge for independent work or directed study.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.
600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Home Economics Education

414-4 Home Economics for Elementary Teachers. Units of work in nutrition, school lunches, family and social relationships, textiles, and clothing.

415-1 Introduction to Graduate Study. Seminar to orient the student to graduate work through relation of courses to goals of program, standards of work, habits of thinking, communication of ideas, uses of professional materials and publications. Required. Students should take at first opportunity.

481-2 to 6 Readings. Supervised readings for qualified students. Prerequisite: consent of instructor and chairman of department.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Technical and Industrial Education 485.)

500-4 Research Methods. Methods employed in research in home economics education with special study of one according to interest and needs of student. Development of prospectus. Prerequisite: 505.

505-4 Home Economics in Secondary Schools. Consideration of the curriculum for homemaking education in the secondary school. A critical survey of resources. The place of homemaking education in the school and community.

506-4 Evaluative Procedures in Home Economics. Principles and procedures underlying appraisal and evaluation. Development and critical consideration of instruments for appraising pupil growth and the program of instruction. Emphasis placed on values.

507-2 to 8 Workshop. Designed to aid home economics teachers, supervisors, and leaders in the field with current problems. Resource people are used. Discussions, reports, lectures, and other methods of analyzing and working on solutions to problems. Emphasis for the workshop will be stated in the announcement of the course.

510-4 Supervision of Home Economics. Nature, function, and techniques of supervision at all levels. Emphasis given to supervision of student teachers. Experience in the field will be provided for qualified teachers.

510A-1 to 4 Practicum in Supervision. Experience in using a variety of techniques at various levels and areas of supervision both on and off campus. Prerequisite: 510 or Educational Administration 556 or consent of instructor.

515-4 Trends and Issues in Home Economics Education. Current trends, problems, needs in the field. Attention given to problems and needs of students.

516-4 Advanced Methods of Teaching Home Economics. Recent trends in methods based on research and experimental programs; furthering good relations in homemaking classes as means of clarifying and accomplishing goals; teacher's role; techniques useful in furthering good relations within group and in meeting individual needs. Emphasis given to social significance of these procedures.

517-4 Methods and Materials for Adult Programs in Home Economics. Philosophy of adult education; unit planning, methods, techniques, and resources useful in adult homemaking programs.

525-3 Interrelated Vocational Cooperative Education. (See Technical and Industrial Education 525.)

571-4 Recent Research. Review of selected research in various phases of home economics in related fields. Sources of research include colleges, universities, and governmental and industrial agencies. Offered on demand.

572-2 to 8 Special Problems. For students recommended by their chairman and approved by the head of the department and the instructor in charge for independent work or directed study.

573-1 to 6 Seminar: Research in Home Economics. Presentation of prospectus outlines, research projects, problems for research, progress reports of research by graduate students and faculty. Prerequisite: consent of instructor.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.
600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Instructional Materials

00-2 Library Research Methods. Introduction to the use of library materials in graduate research. Includes a survey of scholarly publishing and the use of reference works in various subjects.

03-4 School Library Functions and Management. Effective library services in relation to the educational objectives of elementary and secondary school programs: organization, supervision, finance, housing, equipment, standards, and evaluation.

05-4 Library Materials for Children. Study of the aids, methods, and criteria for the selection and use of books and other instructional materials for children in the elementary schools.

06-4 Library Materials for Adolescents. A study of the aids, methods, and criteria for the selection and use of books and other instructional materials for students in the high school.

07-4 Basic Reference Sources. Evaluation, selection, and use of reference sources for elementary and secondary school libraries. Principles and methods of reference service.

10-4 Public Library Administration. The administration of municipal, county, and regional libraries, both large and small, with emphasis on meeting the needs of different types of communities.

13-4 Cataloging Non-Book Materials. The classification, cataloging, preparation and circulation of all types of non-book material such as films, filmstrips, slides, realia, etc. Prerequisite: 308.

17-4 Audio-Visual Learning Methods in Education. Selection and utilization of instructional materials in the learning environment, elementary through adult levels. Audio and visual materials and procedures are emphasized with some attention given to bibliographies and reference books for teachers.

20-4 School Library Activities and Practice. Supervised practice and observation integrated with instruction in the typical activities of school librarianship; storytelling, publicity, developing units of library instruction, and work with students. Prerequisites: 308, 403, 405, or 406 and 407.

40-2 Photography for Teachers. Techniques of picture-taking and the preparation of color slides of community resources for use in classroom instruction and for school public relations.

45-4 Preparation of Teacher-Made Audio-Visual Materials. Laboratory practice in the preparation of bulletin boards, opaque materials, models, slides, recordings, feltboards, and other graphic materials. Prerequisite: 417 or consent of instructor.

48-4 Supervision and Administration of an Audio-Visual Program. Provides professional information and training for anyone who has administrative responsibilities for an audio-visual program. For teachers, coordinators, or directors. Prerequisite: 417 or consent of instructor.

50-4 Classroom Teaching with Television. Classroom utilization of open and closed circuit television. Emphasis is placed on the changed role of the classroom teacher who uses television. Evaluation of programming, technicalities of ETV, and definition of responsibilities are included. Demonstration and a tour of production facilities are provided.

57-4 Radio and Television in the Classroom. Educational programs and their value to the teacher in the classroom. Sample tapes of radio programs and microscopes are used.

58-4 The Medium of the Motion Picture. A study of the full range of expression by motion pictures including documentary, theatrical, educational, experimental, and industrial films. Representative films are screened.

60-4 Programming Automated. The principles and practice of writing both linear and intrinsic types of programmed instruction with emphasis on pictorial and performance branches. Individual experience in planning and producing programs.

65-3 Literature of the Humanities. Book selection and reference. Emphasis on literature, philosophy, music, and art. The philosophy and techniques involved in using major reference tools efficiently in the library. Prerequisite: Instructional Materials 407.

66-3 Literature of the Social Sciences. Book selection and reference in the fields of history, political science, economics and business, sociology, anthropol-

ogy, and other closely related fields. Includes basic terminology, structure literature, and problems of bibliographical control and information retrieval. Prerequisite: 407.

510-4 Mass Communications in Education. The use of mass media in the classroom. Includes radio, TV, comic books, newspapers, magazines, motion pictures.

514-4 Survey of Research and Development in Instructional Materials. Advanced readings in research in instructional materials and the practical application of findings. Prerequisites: 405, 406, 417 or consent of instructor.

523-4 Seminar on Junior College Librarianship. Problems of particular significance to the junior college librarian: organization, materials, responsibilities, standards, and evaluation.

530-4 History of Books and Libraries. The evolution of the printed book and the rise and development of modern libraries.

546-4 Integration of Audio-Visual Materials in the Classroom. Selection of materials on the basis of curricular needs. Techniques of evaluating each type of audio-visual material for use in the classroom. Structured for both the audio-visual administrator and the classroom teacher. The principles and practices of integrating audio-visual materials into the curriculum are discussed, also the problems, annotations and classification of evaluated materials. Prerequisites: 417, or consent of instructor.

547-4 School Film and Filmstrip Production. Simplified techniques for teachers and audio-visual coordinators who may need to produce school-made films and filmstrips to meet local school problems. Prerequisites: 417 and 440 or consent of instructor.

549-4 Visual Learning. Learning from pictures in the classroom, the design of still and moving pictures, pictures used in testing perception, and the place of pictures in advertising and communication. Prerequisite: consent of instructor.

554-4 Administration of an Instructional Materials Center. Based on the concept of a single agency in the school that encompasses all forms of instructional materials. It is designed to further the training of specialists in the supervision and administration of integrated audio-visual and library programs. Prerequisite: 403.

560-4 Seminar in Instructional Materials. Designed to give advanced graduate students an opportunity to investigate and discuss topics in instructional materials before the seminar group. Topics selected would depend on background and interest of individuals. Prerequisite: consent of instructor.

576-2 to 8 Problems in Instructional Materials. Opportunity for individual study of selected problems. Prerequisite: consent of instructor.

599-5 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation.

Journalism

401-3 International Journalism. A study of the history, development, current status, and implications of the press and news services of other countries and their relationship to the international communications system.

420-4 2 to 4 High School Journalism Workshop. For public school teachers.

421-4 School Publications. Designed for the prospective journalism teacher or high school publications director. Deals with practical production problems of newspapers and yearbooks.

422-3 Teaching High School Journalism. Teaching methods of journalism in secondary schools, organization and course of study, bibliography, use of journalism courses for school publications production.

432-3 Foundations of Mass Communications Theory. Construction of communication theory, development of communication models, and relationship of empirical investigations to theories of mass communication.

433-6 (3,3) Research Theory and Design. (a) Research design, sample selection, and methods appropriate to field, experimental, and survey research. (b) Research Methods. Series of research projects utilizing a variety of research methods. Class discussion precedes and follows each project.

421-4 School Publications. Designed for the prospective journalism teacher or high school publications director. Deals with practical production problems of newspapers and yearbooks.

- 42-3 The Law of Journalism.** Legal limitations and privileges affecting communications; fair comment, criticism, contempt of court, right of privacy, copyright, and legal provisions affecting advertising.
- 45-4 Specialized Writing.** Researching and writing about areas of special interest such as education, mental health, and home economics. Prerequisite: consent of instructor and chairman.
- 49-2 to 8 Practicum.** Study, observation, and participation in publication supervision. Work required on *The Daily Egyptian* newspaper.
- 49-3 Role of Advertising in our Society.** An exhaustive analysis of the literature covering such topics as: definitions and scope of advertising; advertising and the press; advertising as a social and economic force; evaluation of advertising; and advertising policies as related to the practices of specific business firms.
- 49-3 Publicity Methods II.**
- 49-3 Book Reviewing.** Theory and practice in reviewing modern books; study of newspapers and magazines devoted entirely or in part to this type of journalism.
- 49-3 Summer Workshop in News Analysis in the Classroom.** A study of the relationship of the newspaper to other high school coursework. Time spent developing ways of integrating the newspaper in the classroom.
- 49-3 Literature of Journalism.** Critical reading of selected books relating directly and indirectly to journalism. Lectures, reviews, and discussions comprise the course work.
- 49-2 Seminar in Press Freedom.** Observation of the comment function performed by the daily newspaper as related to current issues; role of the editorial writer, syndicated columnist, and cartoonist.
- 49-3 Seminar: Public Relations.** Problems in formulation of public relations policies. Emphasizes fact finding, determination of objectives, orientation of plans toward specific publics, execution, and evaluation. Prerequisite: 431.
- 49-2-4 Seminar: Mass Communication Theory.** Individual exploration of some aspect of mass communication theory. Students construct communication models of their own design and test them.
- 49-3-1 to 4 Research Problems in Journalism.** Individual work on selected problems for research.
- 49-3 Philosophy of Journalism.** A study of journalistic ethics with emphasis on concepts of freedom and responsibility and the development of journalistic standards. Consideration of the responsibility of press in modern society.
- 49-3 Studies in Journalism History.** A critical analysis of the literature in the context of the social and intellectual history of the times.
- 49-3 Seminar in Journalism History.** Analysis of and practice in scholarly writing in the field of journalism history.
- 49-0 Graduate Seminar.** Discussions of matters relating to graduate study, research, departmental and university requirements. Guest lecturers will discuss their research activities and areas of general interest to journalism graduate students. Required each quarter for all journalism graduate students.
- 49-1 to 8 Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 49-1 to 48 Dissertation.** Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Management

- 40-4 Organizational Behavior I.** The study of human problems in administration; individual, group, intergroup, and organizational behavior under dynamic environment conditions. Theory and case analyses. Prerequisite: 30, GSB 201b,c, GSD 110 or equivalent.
- 40-4 Organizational Behavior II.** A study of classical and modern theories concerning complex organizations. Particular emphasis on processes and issues of dividing work, achieving coordination, and organizational change and adaptation. Prerequisite: 340, 430, or consent of instructor.
- 40-4 The Management Process.** Analysis of management theories and the administrative process. Specific managerial activities are analyzed and discussed. Functional relationships in administered organizations are explored. Restricted to Master of Business Administration students.
- 40-4 Methods of Quantitative Analysis.** Introduction to modern mathematical techniques applicable to solving business problems. Includes differential

calculus, matrix algebra, and probability theory. Not open to students who have taken Mathematics 150a or equivalent.

452-4 Business Operations Analysis. Analysis of business operations and management problems emphasizing problem formulation, performance measures, decision criteria and various mathematical models and their application: linear programming, game theory. Prerequisite: 340; 451; or Mathematics 150 or equivalent; or consent of instructor.

460-4 Work Measurement For Wage and Salary Control. Research design and methodology for wage and salary administration in an organization: fundamental considerations in evaluating jobs and positions; compensation methods and wage incentive systems. Prerequisite: 385.

474-4 Management Responsibility in Society. Analysis of the political, social and economic environments in which the manager must function and the manner in which the executive has both adapted to and influenced his environment. Prerequisite: 340, senior standing, or consent of instructor.

479-4 Problems in Business and Economics. (Same as Economics 479.) Applications of economic theory and tools of analysis to practical business problems. Cost and demand functions are analyzed from a policy standpoint. Prerequisite: 340, Economics 215, 308, or 408, or equivalent; Marketing 301 or equivalent; senior standing; or consent of instructor.

480-4 Recent Problems in Labor Law. Social, economic, and legal evaluation of recent labor problems, court decisions, and legislation. Concern is on long run legislative impact on manpower planning, dispute settlement, and utilization of employment resources. Prerequisite: Finance 371, or Economics 371 or Government 395, or consent of instructor.

481-4 Administrative Policy. Integration and analytical application of business core courses to comprehensive business cases. Emphasis on policy issues: the identification and resolution of business problems. Methods of providing simulated experience such as business gaming will be used where appropriate. Prerequisite: 340, Finance 320, Marketing 301, or equivalent.

483-4 Advanced Production Management. Internal problems of managerial control of production including recent developments in theory and technique. Case material will be utilized for the development of analytical ability. Prerequisite: 380.

485-4 Problems in Personnel Management. Analysis of problems in personnel administration arising from the current developments in organization. Included are case problems, special reports, and personnel practices. Prerequisite: 361, 385; Economics 308 or 408.

499-1 to 8 Special Topics in Management. Utilizes special faculty resources. Prerequisite: 16 hours in business and consent of chairman.

Marketing

401-4 Problems of Retailing. Emphasis application of managerial marketing concepts to the solution of typical retailing problems. Prepared retail management cases are analyzed along with individual reports on current retailing problems. Prerequisite: 363.

438-4 Sales Management. Developing and training a sales force. The different types of sales forces. Managing sales functions: determining salesmen's territories, quotas, compensation. Budget preparation. Development and implementing the merchandising plan. Prerequisite: 363.

439-4 Industrial Marketing Management. Designed to give an over-all view of the field of Industrial Marketing. Additional emphasis to be placed on decision criteria. Prerequisite: 363.

450-4 Introduction to Managerial Marketing. Designed to give an over-view of the field of marketing and the field of marketing policy decisions. Cases are used to illustrate theory covered. Prerequisite: Restricted to Masters of Business Administration students.

452-4 Physical Distribution Management. Integration of physical distribution activities of the firm into a system. Transportation and location as elements of the system. Inventories and service as constraints upon the system. Planning, operation, organization, and management of the system. Prerequisite: 363, Economics 215.

463-4 Advertising Management. A study of advertising from the viewpoint of business management. Problems of integrating advertising into market

programs and related advertising issues are emphasized. Prerequisite: 363.

190-4 Marketing Research and Analysis. A nonmathematical development of the basic procedures, methods, and theory underlying analysis of primary and secondary market data. Prerequisites: 325, or 450 and statistics.

193-4 Marketing Policies. A comprehensive and integrative view of marketing policy formulation. Marketing decisions analyzed and discussed. Prerequisite: 301, 363, and 390.

Mathematics

100-3 History of Mathematics. An introduction to the development of major mathematical concepts. Particular attention given to the evolution of the abstract concept of space, to the evolution of abstract algebra, to the evolution of the function concept, and to the changes in the concept of rigor in the development of mathematics from 600 B.C. Prerequisite: 320a or consent of instructor.

110-16 (4,4,4,4) Statistical Analysis. For students in fields using statistical methods but who are not required to take calculus. Includes (a) elements of probability, estimation, and testing hypotheses; (b) the general linear model (multiple linear regression, analysis of variance, analysis of covariance) and nonparametric statistics; (c) design of experiments; (d) sample survey techniques. May not be used to satisfy requirements for a mathematics concentration. Three lectures and 2 laboratory hours per week. Must be taken in either a,b,c,d or a,b,d,c sequence. Prerequisite: GSD 108c or 114b.

119-6 (3,3) Algebraic Structures. A study of the properties of such basic algebraic structures as groups, rings, fields. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

121-6 (3,3) Linear Algebra. The theory of determinants and systems of linear equations; vector spaces, linear independence, bases, dimension; linear transformations, change of base, similarity; quadratic and Hermitian forms, orthogonal, and unitary transformations; triangular and diagonal form; eigenvalues and eigenvectors; normal matrices; nilpotent and idempotent matrices, the spectral theorem. Must be taken in a,b sequence. Prerequisite: 252b.

125-3 Theory of Numbers. Selected topics from number theory. Prerequisite: 325 or consent of instructor.

126-6 (3,3) Mathematical Logic. A formal development of the classical propositional calculus and functional calculi of first and second order from the primitive basis. Consistency and completeness. Validity and satisfiability. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

128-6 (3,3) Boolean Algebra and Switching Theory. An introduction to Boolean algebra with applications to switching circuits, set theory, and logic; Boolean functions and canonical forms; Boolean rings and algebras; linear graphs; partially ordered sets and lattices; theory of simplification and design of combinational and sequential circuits. Must be taken in a,b sequence. Prerequisite: 320a or consent of instructor.

130-4 Projective Geometry. Introduction to the fundamental concepts of projective geometry. Topics usually include the study of conics, polar systems of conics, homogeneous coordinates, cross-ratio, harmonic sets, duality, projectivities, and involutions. Prerequisite: 252a or consent of instructor.

133-6 (3,3) Introduction to Topology. Topological spaces, continuity and homeomorphisms, construction of topologies, separation, compactness, connectedness, completeness. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

140-2 to 4¹ Modern Algebra for Teachers. An introduction to algebra as a logical system, including groups, rings, and fields. Prerequisite: consent of instructor.

142-2 to 4¹ Survey of Geometry. A survey of geometry, including projective geometry, topology, etc. Prerequisite: consent of instructor.

144-2 to 4¹ Sets, Functions, and Relations. Basic ideas of sets, set algebra, elementary logic, relations and functions, graphing. Prerequisite: consent of instructor.

145-2 to 4¹ Fundamental Concepts of Calculus. A careful study of the basic

¹ These courses are open to candidates for the Master of Science in Education degree in mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of mathematics or the director of the institute.

concepts of calculus, offered as part of the special graduate program for secondary school teachers. Prerequisite: consent of instructor.

452-9 (3,3,3) Advanced Calculus. Fundamental concepts of analysis: limits, continuity, differentiation, and integration. Major topics include partial differentiation, vector analysis, Riemann-Stieltjes integrals, multiple integrals, infinite series, improper integrals, uniform convergence, Fourier series, arc length and surface integrals. Must be taken in a,b,c sequence. Prerequisite: 252b.

455-9 (3,3,3) Advanced Mathematics for the Physical Sciences. Introduction to complex variable theory with applications, operational calculus (Laplace and other transforms), vector field theory, and partial differential equations. May be taken individually or in any sequence. Prerequisite: 305b or consent of instructor.

460-4 Modern Geometry. Advanced topics in Euclidean geometry by the synthetic method. Topics include the nine-point circle, Simson line, theorem of Ceva and Menelaus, coaxal circles, harmonic section, poles and polar lines, similitude, and inversion. Prerequisite: 20 hours of college mathematics.

475-9 (3,3,3) Numerical Analysis. Introduction to approximation methods including finite differences and interpolation; numerical differentiation and quadrature; least squares approximation; numerical solution of linear and non-linear systems; numerical integration of systems of ordinary and partial differential equations. Emphasis upon error analysis throughout. Must be taken in a,b,c sequence. Prerequisites: 305a or 252b and consent of instructor.

480-9 (3,3,3) Probability. Introduction to probability theory. Includes the algebra of probabilities; discrete and continuous distributions, limit theorems, generating functions, and some elements of stochastic processes. Must be taken in a,b,c sequence. Prerequisite: 252b.

483-9 (3,3,3) Introduction to Mathematical Statistics. A mathematical development of the elements of statistical theory. (a) Probability distributions, generating functions, and limit theorems. (b) Statistical inference: estimation, tests of hypotheses, general linear hypothesis. (c) Design of experiments—mathematical model approach. Must be taken in a,b,c sequence with the exception that 480a, 421a, and consent of instructor may replace 483a. A student will not be allowed university credit for both 480a and 483a. Prerequisite: 252b.

501-9 (3,3,3) Real Variables. A basic course in mathematical analysis. (a,b) The real number system; fundamental theorems in limits and continuity; open, closed, compact, and connected sets in Euclidean and metric spaces; the Riemann and the Riemann-Stieltjes integrals and functions of bounded variation; infinite series; uniform continuity; uniform convergence of series and improper integrals; arcs and curves; implicit function theorem; multiple integrals. (c) The general theory of measure and integration from an abstract point of view. Additive classes of sets, Borel sets, measurability, measure and outer measure; integrable functions, convergence theorems; absolute continuity and the Radon-Nikodym theorem; Fubini's theorem. Must be taken in a,b,c sequence. Prerequisite: 452c.

505-9 (3,3,3) Theory of Ordinary Differential Equations. Existence and uniqueness theorems; general properties of solutions; linear systems; geometric theory of nonlinear equations; stability and control theory; self-adjoint boundary problems; oscillation theorems. Must be taken in a,b,c sequence. Prerequisite: 501b and 421a or consent of instructor.

507-9 (3,3,3) Partial Differential Equations. Classification of partial differential equations; separation of variables; elementary solutions of the heat and wave equations; potential theory; n -dimensional parabolic operators. Must be taken in a,b,c sequence. Prerequisite: 452c.

510-4 Foundations of Mathematics. A critical survey of the logical basis of mathematical systems. Deductive processes, mathematical proof theory, axiomatics, nature of model systems, principles of theory construction, views concerning the nature of mathematics. Prerequisites: 252b or consent of instructor.

520-9 (3,3,3) Modern Algebra. Topics from group theory, ring theory, and field theory; including Sylow theorems, solvable groups, nilpotent groups, rings with descending and ascending chain conditions, elementary divisor theory for R -modules, Galois theory, and cyclotomy. Must be taken a,b,c sequence. Prerequisite: 419 or consent of instructor.

522-3 to 18 Advanced Topics in Algebra. Group representations, homological algebra, algebraic geometry, algebraic numbers. Prerequisite: 520b.

528-9 (3,3,3) Theory of Automata. Sequential machines: finite vs. infinite

complete vs. incomplete, deterministic vs. stochastic; submachines; strong connectivity; equivalence of states and machines; state minimization; experiment theory; realization and decomposition. Monadic algebras and automata: representation by equivalence and congruence relations; regularity of sets of sequences; representation by semigroups; source, primary and cycle; automata homomorphisms, characterization of automorphisms on automata; automata-representation of groups; quotient automata. Must be taken in a,b,c sequence. Prerequisite: 428b.

530-9 (3,3,3) Point Set Topology. Topological spaces; denseness, category; open, closed sets, Borel sets; separation axioms; subspaces; continuity; lattice of topologies; countability axioms; connectedness, compactness, local properties; regularity to complete normality. Hilbert space, metrizable spaces; extension theorems; well-ordering; product spaces. Must be taken in a,b,c sequence. Prerequisite: 433b or consent of instructor.

531-6 (3,3) Algebraic Topology. Abstract complexes and polyhedra; chains and cochains; homology and cohomology of polyhedra; simplicial functions; simplicial approximation; induced homomorphisms; Eilenberg-Steenrod axioms; singular homology theory. Must be taken in a,b sequence. Prerequisites: 530a and 520a.

532-3 to 18 Advanced Topics in Topology. Materials to be selected from special areas of topology; such as topological groups, topological dynamics, and uniform spaces. Prerequisite: 530b.

536-3 Differential Geometry. Curvature, torsion, the Frenet formulas, and intrinsic equations of curves in three-dimensional Euclidean space; applications to kinematics. Curves on a surface; first and second fundamental forms; normal sections and Meusnier's theorem; mean and total curvature. Prerequisite: 452c.

540-4¹ Groups and Linear Transformations. A study of groups with their connection with the movements of regular plane figures, matrices, vectors, determinants with their interpretation and use in analytic geometry, and ruler and compass constructions. Prerequisite: 440 or equivalent.

543-4 Probability for Teachers. An introduction to the basic concepts of probability theory. Major topics include algebra of events, probabilities in a finite sample space, conditional probabilities and stochastic independence, random variables and their distribution, mathematical expectation, standard deviation, covariance, special distributions. This course is open to candidates for the Master of Science in Education degree in mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of the Department of Mathematics or the director of the Institute.

545-4¹ Intermediate Analysis for High School Teachers. A rigorous development of differentiation and integration of continuous real functions. Topics include sequences, series, limits, real continuous functions, integrable functions on a closed interval. Prerequisite: consent of instructor.

548-2 to 4¹ Trends in School Mathematics. For secondary school mathematics teachers dealing with current developments in mathematics instruction at the elementary and secondary levels. Prerequisite: consent of department.

550-1 to 10 Seminar. Supervised study and preparation of reports on assigned topics. Reports presented for class discussion. (a) Algebra. (b) Geometry. (c) Analysis. (d) Probability and Statistics. (e) Mathematics Education. (f) Logic and Foundations. (g) Topology. Prerequisite: consent of instructor.

551-9 (3,3,3) Functional Analysis. The theory of linear transformations between infinitely dimensional topological vector spaces, including Banach and Hilbert spaces, with various applications. The basic notion for the study is that of a functional or continuous scalar-valued linear transformation. Must be taken in a,b,c sequence. Prerequisites: 501c and 421b.

552-3 to 18 Advanced Topics in Analysis. Abstract harmonic analysis, uniform asymptotic distribution model of sequence, several complex variables, summability methods. Riemann surfaces. Prerequisite: 501c.

555-9 (3,3,3) Complex Variables. Classical and modern analytic function theory, including Cauchy-Riemann equations, Cauchy-Goursat theorem, conformal mapping, normal families, Riemann mapping theorem, calculus of

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residues, analytic continuation, Riemann surfaces, entire functions. Must be taken in a,b,c sequence. Prerequisite: 452c.

560-6 (3,3) Calculus of Variations. An introduction to the basic concepts and techniques of the calculus of variations including the classical necessary conditions for an extremum of a functional, general end point conditions, the second variation, fields, sufficiency conditions, and applications. Must be taken in a,b sequence. Prerequisite: 452c.

580-9 (3,3,3) Mathematical Methods of Statistics. A presentation of probability and statistical inference based on an axiomatic and employing advanced mathematical concepts. Topics include the theory of measure and integration in R_n , foundations of probability, random variables and distributions in R_n , sampling distributions, tests of hypotheses, theory of estimation. Must be taken in a,b,c sequence. Prerequisite: 452c.

592-2 to 4¹ Research in Mathematics Education. Critical study of research papers in the field of secondary mathematics education. Training in research and writing techniques as they pertain to the secondary mathematics program. Prerequisite: consent of chairman.

595-1 to 10 Special Project. An individual project, including a written report (a) in algebra; (b) in geometry; (c) in analysis; (d) in probability and statistics; (e) in mathematics education; (f) in logic and foundations; (g) in topology.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward the Master of Arts degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Microbiology

401-1 Seminar.

403-5 Medical Bacteriology Lecture. A general survey of the mechanisms of infection, epidemiology, and immunity and the specific application of these principles to the symptomatology, diagnosis, treatment, and control of the more common bacterial infections of man. Prerequisite: 302.

404-2 Medical Bacteriology Laboratory. Procedures for the collection and handling of medical specimens for microbial examination and for cultivation and identification of the pathogenic organisms by their morphological, biochemical, and serological characteristics. Five hours laboratory. Prerequisite or corequisite 403.

421-3 Microbiology of Foods Lecture. The relationships of micro-organisms to the preparation and preservation of foods with consideration of the laws governing sanitation, chemical preservatives, and fair dealing of the food producer. Three hours lecture. Prerequisite: 301.

422-2 Microbiology of Foods Laboratory. Methods for preservation, sanitation, inspection, and microbiological examination of foods. Four hours laboratory. Prerequisite: or corequisite 421.

423-3 Industrial Fermentation. The application of the chemical activities of microorganisms to the industrial production of beverages, foods, antibiotics and various commercial chemical products. Prerequisite: 301 and organic chemistry.

425-3 Biochemistry and Physiology of Microorganisms. The chemical basis of physiological functions in microbial cells. Prerequisites: 301 and organic chemistry.

426-3 Biochemistry and Physiology of Microorganisms. 4 hours laboratory. Prerequisite: 301 and organic chemistry.

441-3 Virology Lecture. General properties; classification and multiplication of bacterial and animal viruses; lysogeny; immunological and serological reactions; relation of viruses to cancer; and consideration of selected viral diseases of animals. Four hours lecture. Prerequisite: 302.

442-3 Virology Laboratory. Tissue culture methods, multiplication and assay of animal and bacterial viruses, purification, electron microscopy, interference immunity. Six hours laboratory. Prerequisite: or corequisite 441.

451-3 Immunology Lecture. Antigens, antibodies, and antigen-antibody reactions.

¹These courses are open to candidates for the Master of Science in Education degree, mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of mathematics or the director of the institute.

- ons in vitro and in vivo, natural and acquired immunity. Four hours lecture. Prerequisite: 302.
- 52-3 Immunology Laboratory.** Natural defense mechanisms and immune response, preparation of antigens and antibodies, serologic reactions, conjugated antibodies, electrophoresis, anaphylaxis. Six hours laboratory. Prerequisite: or corequisite 451.
- 60-3 Genetics of Bacteria and Viruses Lecture.** Genetic mechanisms, mutation, transformation, recombination, transduction, lysogeny, phenotypic mixing, and reactivation phenomena. Three hours lecture. Prerequisite: 302.
- 61-3 Genetics of Bacteria and the Viruses Laboratory.** Genetic mechanisms, mutation, transformation, recombination, transduction, lysogeny, phenotypic mixing, and reactivation phenomena. 6 hours laboratory. Prerequisite: or corequisite 460.
- 62-3 Fungal Genetics Lecture.** Mendelian and molecular genetics of neurospora and yeast. Mutant induction, sexual crosses, tetrad analysis, linkage, and mapping. Prerequisite: Biology 305.
- 63-3 Fungal Genetics Laboratory.** Six hours laboratory. Prerequisite: or corequisite 462 and consent of instructor.
- 70-1 Seminar.**
- 72-4 (2,2) History of Genetics.** Critical examination of the development of genetic thought. Prerequisite: consent of instructor.
- 73-2 Cytology of Microorganisms.** Problems involved in the behavior of chromosomes at meiosis with special consideration of genetical data. 2 hours lecture.
- 74-5 Methods of Microbiological Research.** The recognition and plan of attack upon unsolved problems in microbiology. 3 hours lecture and 4 hours laboratory.
- 75-1 to 15 Research.**
- 75-3 Biochemistry and Physiology of Microorganisms.** A continuation of 425. 6 hours lecture.
- 76-3 Biochemistry and Physiology of Microorganisms.** A continuation of 426. 6 hours laboratory. Prerequisite: 426.
- 78-1 to 10 Readings in Microbiology.** Supervised readings for qualified graduate students.
- 79-6 Advanced Virology.** Interactions between bacterial and animal viruses and their host cells; sequential synthesis of macromolecular components of viruses; synthesis of interferon; experimental carcinogenesis; genetic recombination among viruses. Three hours lecture, 6 hours laboratory. Prerequisite: 425.
- 82-3 Molecular Virology.** Interaction at the molecular level between tumorigenic and nontumorigenic DNA and RNA viruses and host cells, biochemical analysis of the growth cycle, uncoating, synthesis of virus-specified messenger RNA, enzymes and structural proteins, replication of viral nucleic acid, and maturation. 3 hours lecture. Prerequisite: 541.
- 82-3 Molecular Genetics.** Fundamentals including discussions of current research on replication, transcription, translation, mutation, suppression, repression, and their interaction and interdependence. Prerequisite: 425.
- 50-3 to 9 Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 60-3 to 48 Dissertation.** Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Music

- 4-9 (3,3,3) Music Literature.** (a) Symphonic: A study of the development of the symphony and the symphonic poem. (b) Choral: The literature of the larger vocal forms such as the cantata and oratorio. (c) Chamber Music: Study of chamber music from the Renaissance to the present.
- 4-2 to 6 Collegium Musicium.** Practicum in the preparation and performance of music from early times to the classical period. Prerequisite: Music major and/or consent of the department.
- 4-1 to 3 Music Education Practicum.** A shop-laboratory course dealing with selection, adjustments, maintenance, and repair of musical instruments. Prerequisite: consent of instructor.
- 4-2 Stage Band Arranging.** The study and analysis of jazz harmony, melody, and rhythm as applied to modern instrumentation. Workshop wherein arrangements are written and played. Prerequisite: 309a.

431-2 Organization and Development of the High School Stage Band. The relationship of the stage band to the overall music program; instrumentation sources of music; types of presentations; rehearsal techniques; study of the effective application of dynamics, phrasing, intonation, and balance for improved performance. Prerequisite: 430.

440-1 to 4 Private Applied Music.

a. Violin

b. Viola

c. Violoncello

d. String Bass

e. Flute

f. Oboe

g. Clarinet

h. Bassoon

i. Saxophone

j. Percussion

k. Piano

l. French Horn

m. Trumpet

n. Trombone

o. Tuba

p. Baritone

q. Voice

r. Organ

s. Harpsichord

t. Harp

Applied music for graduate credit is offered at the 400 and 500 levels in the areas listed above. Credit is given at 1 to 4 hours per quarter on each level. May be repeated each quarter of graduate study. Students with majors in music education usually take 4 hours per quarter at the 500 level; majors in music education and all minors usually take 2 hours at the 400 level. Prerequisite for 440 and 540: audition or consent of instructor.

441-6 (2,2,2) Counterpoint. (a) 16th Century Counterpoint. Species counterpoint and creative writing in the style of Palestrina and his contemporaries. Prerequisite: 205c or consent of instructor. (b) 18th Century Counterpoint. Analysis and creative writing in the contrapuntal-harmonic technique of Bach and his contemporaries. Prerequisite: 205c or consent of instructor. (c) Canon and Fugue. Analysis and creative writing of the larger imitative forms. Prerequisite: 441b.

444-6 (2,2,2) Intermediate Composition. Required of undergraduates with concentration in theory-composition, culminating with original works in contemporary idioms. Taught by individual instruction. Prerequisites: 312c and consent of department.

451-3 Teaching of General Music, Secondary School.

453-3 Choral Materials and Techniques. Demonstration and performance of choral rehearsal procedures; developing tone, diction, blend, and balance; concert production; performance of selected choral materials appropriate for junior and senior high school. Prerequisite: consent of instructor.

454-3 Instrumental Materials and Techniques. Demonstration and performance of instrumental music rehearsal procedures; developing tone, articulation, blend, and balance; concert production; performance of selected choral materials appropriate for junior and senior high school. Prerequisite: consent of instructor.

455-2 to 6 Elementary Music Education Workshop.

461-2 Teaching Techniques and Materials for the Beginning and Intermediate Levels. Designed to meet the needs of applied students in which the problems of private studio teaching and college level teaching are discussed.

462-2 Teaching Techniques and Materials for the Advanced Student. Designed to meet the needs of applied students in which the problems of private studio teaching and college level teaching are discussed. (Continuation of Music 461.)

465-9 (3,3,3) Development and Teaching of Strings. Place and function of string education in the elementary and secondary schools. Techniques of heterogeneous and homogeneous string teaching. Developing and sustaining interest in the string program. Resource aids. Prerequisite: senior standing.

468-2 to 12 Music Productions. Study of the techniques involved in staging operas and musicals.

471-6 (3,3) Ethnomusicology. (Same as Anthropology 471.) A survey of the method, and form in ethnomusicology, with concentration on selected geographical areas. (a) Oceania, Asia, and Africa. (c) Middle East, Europe, and the New World.

481-2 to 6 Readings in Music Theory.

482-2 to 6 Readings in Music History and Literature.

483-2 to 6 Readings in Music Education.

499-1 to 12 Independent Study. The capable student engages in original investigations with faculty specialists. May be repeated for credit. Prerequisite: consent of instructor.

501-3 Introduction to Graduate Study in Music. Basic bibliographical and

historical research techniques in music theory, literature, and education.
 02-6 (2,2,2) **Analytic Techniques.** Analysis of representative works chosen from the Baroque, Classical, Romantic, and Modern eras.

03-3 to 4 **Objective Research Techniques in Music Education.** Theory, techniques, and procedures of evaluating music aptitude and achievement; survey of current research investigations in music education. A minor original research project is required.

04-3 **Music of the Middle Ages and Renaissance.** Sacred and secular monody from its beginnings; the rise of polyphony; the development of instrumental and vocal forms in the Middle Ages and Renaissance.

05-3 **Music of the Baroque Period.** Opera, oratorio, cantata, and instrumental music in the period 1600 to 1750; the development of vocal and instrumental forms culminating in the works of Bach and Handel.

06-3 **Music of the Classical Period.** Development of opera, the symphony, the sonata, and chamber music in the 18th and early 19th century with particular emphasis on Haydn, Mozart and Beethoven.

07-3 **Music of the Romantic and Impressionistic Periods.** Development of opera, the symphony, the symphonic poem, the sonata, and chamber music in the 19th and early 20th centuries. Rise of nationalism and impressionism.

08-3 **Music of the Twentieth Century.** The heritage of 20th century music; study and analysis of musical philosophies of contemporary composers.

09-3 **The History and Philosophy of Music Education.** A study of the historical and philosophical evolution of music education and the identification of current forces, issues and trends influencing the profession.

12-3 **History of Opera.** The development of opera as a form, with a detailed study of operas since 1600.

15-3 **20th Century Literature.** A survey of contemporary music in Russia, Western Europe, and the Americas in its relation to sociology, political, and cultural developments.

18-3 **Pedagogy of Music Literature.** Principles of teaching music literature and music appreciation courses at the college level.

22-3 **Seminar: Music History and Literature.** Advanced study in special periods of music history-literature.

31-2 to 9 **Advanced Composition.** Composition in the larger forms for solo and ensemble performance. Prerequisites: 312c, 342c, and consent of instructor. Required of all theory-composition majors 3 hours per quarter; elective credit for majors in other areas.

35-3 **Contemporary Idioms.** Techniques of composition developed during the 20th century by composers of Europe and America.

39-1 to 4 **Private Applied Music.** (See Music 440).

45-3 to 9 **Pedagogy of Music Theory.** An orientation of the philosophies of theory to the problems of pedagogy. Required of all theory-composition majors.

49-3 **Administration and Supervision of Music.**

51-2 to 4 **Organization and Administration of Music—Secondary.**

53-3 **Seminar in Choral Materials and Techniques.**

54-3 **Seminar in Choral Materials and Techniques.**

55-2 to 6 **Advanced Conducting.** Problems in score reading and interpretation. Laboratory conducting of larger ensembles.

56-2 to 4 **Seminar in Music Education.** Trends, current practices, philosophies of music education.

57-1 to 12 **Instrumental Ensemble.**

57-1 to 12 **Vocal Ensemble.**

58-2 to 12 **Opera Workshop.** An intensive course in opera for voice majors, including the study and public performances of scenes and entire operas.

59-6 **Graduate Recital.**

59-3 to 9 **Thesis.**

Philosophy

40-4 **Philosophy of Biology.** Leading concepts of biological sciences: species, evolution, life, organism and part, etc. Abstract ideas of biology are related, wherever possible, to specific experiments recorded in scientific literature. Prerequisites: 300 or 320, and three laboratory or field courses in the biological sciences or consent of instructor.

415-3 Logic of the Social Sciences. Logical and epistemological examination of the social studies as types of knowledge. Basic problems in philosophy of science with major emphasis upon social science: relationship of theory to fact, nature of induction, nature of causal law, testability, influence of value judgments, etc. Intended for students with considerable maturity in a social science or in philosophy.

420-4 Advanced Logic. A careful study of symbolic and discursive systems of logic: Aristotle, Spinoza, Boole, Whitehead, and Johnson. Prerequisite: 320 and consent of instructor.

428-3 Logic of the Exact Sciences. Critical study of the technical and philosophical problems associated with formal logic and its uses as a tool for modern construction, for formalizations, reconstructions, and as an image or ration of thought. Prerequisite: 426 or consent of instructor.

441-4 Philosophy of Politics. (Same as Government 441.) Some of the central problems of modern political life, such as sovereignty, world government, authority and consent, the relations of economics and social studies to political theory. Prerequisite: GSC 102 or 340 or consent of instructor.

443-4 Philosophy of History. Classical and contemporary reflections on the nature of history and historical knowledge as the basis for dealing with the humanities. Prerequisite: consent of instructor.

460-4 Advanced Philosophy of Art. The definition of art, its relations to science, culture, and morals; the various types of art defined. Familiarity with at least one of the fine arts is assumed. Prerequisites: GSC 207 or 360, and six courses in music, painting, sculpture, literature, or drama.

477-4 Latin American Philosophy. A survey of philosophic thought in Latin America from colonial times through 19th century positivism and the reaction against it, up to recent trends. Reading of original texts in English translations. Discussions and reports.

478-4 Seminar in Latin American Thought. (See Spanish 478.)

481-6 (3,3) 19th Century European Philosophy. (a) Kant, Schopenhauer, and Hegel. (b) Nietzsche, Bergson, the Utilitarians, and latter day idealists. May be taken singly and in any sequence.

482-3 Recent European Philosophy. Phenomenology, Positivism, Linguistic Analysis, and Existentialism.

490-2 to 12 Special Problems. Hours and credits to be arranged. Courses for qualified seniors and graduates who need to pursue certain topics further than regularly titled courses permit. Special topics announced from time to time. Students are invited to suggest topics for individual study and papers or for group study. Prerequisite: consent of instructor.

497-12 (4,4,4) Honors. Topic for each quarter will vary. Enrollment restricted to undergraduates. Prerequisite: consent of department.

500-2 to 4 Seminar in Metaphysics. Study of recent writers and current problems in metaphysics with the intent of familiarizing the student with the traditional problems of the area.

501-2 to 4 Seminar in the Philosophy of Religion. Analysis of a selected problem in philosophical theology or the phenomenology of religion, or of the work of a particular thinker. Recent seminars have been on Paul Tillich and Henry Nelson Wieman.

515-3 Theory of Nature. A critical examination of the presuppositions of the Western view of nature as indicating the need for a revision of causal determinism and the reintroduction of freedom into the spatio-temporal world.

530-2 to 4 Seminar in Theory of Knowledge. Examination of a contemporary writer or problem in epistemology. Special emphasis is given to the problem of the reliability and structure of scientific knowledge.

540-3 Philosophy of Journalism. (See Journalism 540.)

555-4 Philosophy of Higher Education. (See Higher Education 555.)

570-3 Seminar in American Idealism.

581-2 to 4 Seminar in Plato. A thorough study of several of the dialogues. Lectures on the system of Plato as a whole, discussions and reports on the readings.

582-2 to 4 Seminar in Aristotle. The philosophic ideas of Aristotle. Intensive reading of several texts, illustrating widely varied portions of his thought.

585-3 Seminar in British Empiricism.

586-2 to 4 Seminar in Spinoza. Analysis of the *Improvement of the Understanding* and the *Ethics*. Lectures relating Spinoza to the medieval tradition and to his contemporaries. Discussions and reports.

87-3 Seminar in Hegel.

88-2 to 4 Seminar in Kant. The three great Critiques in their relation to the development of Kant's total philosophy. Intensive study of one of the Critiques.

89-2 to 12, 590-2 to 12 General Graduate Seminar. For students having special interests in the history of philosophy and the original systematic development of philosophic ideas. Prerequisite: consent of instructor.

91-1 to 5 Readings in Philosophy. Supervised readings for qualified students. Consent of instructor required.

99-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

00-3 to 48 Dissertation.

Physical Education

00-4 Evaluation in Physical Education. Historical background of measurement in physical education; selection and evaluation of contemporary testing devices; structure and use of tests; administering the testing program; and interpretation and application of results. Fulfills the tests and measurements course requirements for the Master of Science in Education degree.

02-2 Organization and Administration of Intramural and Extramural Activities. Planning intramural programs of sports; planning and coordinating extramural activities commonly associated with physical education.

03-4 The Adaptation of Physical and Recreational Activities to the Handicapped Individual. Recognition of postural deviations; devising and planning programs for the physically atypical.

04-2 to 4 The Teaching of Sports. Teaching methods, officiating, organization, safety precautions, and selecting equipment for sports.

06-4 Basic Concepts of Physical Education. The place of physical education in the school program, and the concepts underlying the program. (Required of all students not presenting the undergraduate courses 354 or 340.)

07-4 Scientific Basis of Athletic Training. Study of the factors which affect maximum human performance in athletic competition. The knowledge and application of scientific principles in preparing the athlete for maximum performance, in shielding him from possibly damaging sequelae, and in restoring him to maximum performance after injury. Consideration of the kinesiological, physiological, and behavioral factors in athletics. Designed to increase the effectiveness of physical education personnel in teaching and coaching athletics.

08-2 to 4 Physical Fitness—Its Role and Application in Education. Improvement of programs and teaching techniques involved in the development of various aspects of physical fitness. Units on postural status; body weight control; tension factors, causes, and control; exercise tolerance; and general body mechanics and control.

06-4 Current Theories and Practices in the Teaching of Dance. (Same as theater 416.) History and evolution of dance; place of dance in education.

00-4 Physiologic Effects of Motor Activity. The general physiological effects of motor activity upon the structure and function of body organs; specific effect of exercise on the muscular system. Prerequisite: Physiology 209 or equivalent.

04-2 to 8 Contemporary Dance Workshop. Dance technique and theory, composition, improvisation, and production. Advanced study of the problems of choreography and production in their presentation as theater. Public performance is required. Prerequisite: one year of technique and theory or equivalent.

05-2 to 4 Individual Research. The selection, investigation and writing of a research topic under supervision of an instructor. (a) Dance, (b) kinesiology, (c) measurement, (d) motor development, (e) physiology of exercise, (f) history and philosophy.

00-4 Techniques of Research. Critical analysis of research literature; study of research methods and planning research studies. Prerequisite: 400 or concomitant registration in 400.

01-4 Curriculum in Physical Education. Principles and procedures for curriculum construction and revision; criteria for selecting activities and judging outcomes and the place of the physical education course of study within the total curriculum.

502-4 Foundations of Motor Skills. Application of physiological, kinesiological and mechanical principles to intelligent control of large-muscle activities. Recommended background: a course in kinesiology.

503-4 Seminar in Physical Education. The course content and its procedure center around group discussions of controversial issues that currently exist in physical education and provide opportunities for practice in seeking unbiased solutions to professional problems.

504-4 Problems in Physical Education. Planning, conducting, and reporting original research studies. Prerequisite: 500 or equivalent.

508-3 Administration of Interscholar Athletics. Existing problems in interschool athletics, with particular attention to secondary school athletic programs.

509-4 Supervision of Physical Education. The functions of supervision in physical and health education; basic principles and methods of supervision. Techniques and methods for increasing the effectiveness of the program at the elementary and high school levels.

510-4 (2,2) Motor Development. (a) Early patterns of motor behavior and the development of physical skills in childhood. (b) The development of physical abilities during adolescence. Individual differences in motor proficiency and factors affecting the acquisition of motor skills. Concepts of motor learning with inferences for improving instructional practices.

511-2 Analysis of Human Physical Movement. Basic human movements performed by individuals of different ages will be analyzed, and understanding of motor development at varying levels of skill in sports and dance will be analyzed.

513-4 Perceptual Motor Learning of Physical Skills. Principles of learning applied to motor performance. Variables that affect learning of physical skills. Prerequisite: consent of instructor.

520-4 Metabolic Analysis of Human Activity. Metabolic principles pertinent to human physical performance with emphasis on sport, exercise, and occupational activity analysis. A detailed study of oxygen utilization, oxygen debt, mechanisms of oxygen transport as they relate to physiological homeostasis in localized and total body motor activity. Emphasis on the laboratory study of aerobic and anaerobic performance. Prerequisite: 420 or equivalent.

525-1 to 6 Readings in Physical Education. Supervised reading in selected subjects. Prerequisite: consent of instructor and chairman of department. Open only to last-quarter seniors and graduate students.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-2 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Physics

401-3 Mechanics. Rigid body mechanics, normal coordinates, mechanics of continuous media, and advanced principles. Prerequisites: 301, Mathematics 407.

404-6 (3,3) Physical Electronics. Kinetic theory and statistical mechanics with applications to electronic conduction in solids, vacuum, and gases, electron emission and ballistics; Bose-Einstein and Fermi statistics, electron theory of metals; semiconductors; quantum physical phenomena of the solid state. Prerequisites: 304, 305, 401 or consent of instructor.

405-3 Electronics. Advanced theory and application of vacuum tubes and semiconductor devices as circuit elements in power supplies, oscillators, amplifiers, and shaping circuits. Prerequisites: 305 and 309 or consent of instructor.

410-6 (3,3) Introduction to Electromagnetic Wave Theory. A theoretical study of electromagnetic wave generation, propagation, and detection, with applications to microwaves and modern optics. Prerequisite: 305, 310.

415-12 (3,3,3,3) Modern Physics. Elements of wave mechanics, special relativity, atomic, molecular, and nuclear physics. Prerequisites: 301, 305, Mathematics 407 or consent of instructor.

418-1 to 4 Modern Physics Laboratory. Advanced laboratory work with pulsed and continuous lasers and optical detectors, nuclear magnetic resonance, nuclear spectroscopy, vacuum techniques, mass and beta spectroscopy, semiconductor physics.

20-2 to 5 Special Projects. Each student is assigned to a definite investigative topic. Adapted to advanced undergraduate students. Prerequisites: 301, 405.

47-5¹ Topics in Classical Physics. Assists experienced teachers to improve their understanding of classical physics and the strategy of presenting it. Emphasis on demonstration of phenomena as basic strategy in the introduction of new material. Attention given to the design of demonstration apparatus. Related laboratory experience is an integral part of the course. Prerequisite: consent of department.

48-5¹ Topics in Modern Physics. Assists experienced teachers to extend their understanding of modern physics. Lectures and demonstrations aim at improvement of the means of presenting the ideas of modern physics. Related laboratory experience is an integral part of this course. Prerequisite: consent of chairman of department.

49-3¹ (1,1,1) In-Service Institute for Teachers of Physics. A series of lectures, demonstrations, discussions, and films to assist teachers of high school physics in meeting their classroom problems and responsibility. Prerequisite: consent of chairman of department.

50-12 (4,4,4) X-Ray Diffraction and Lattice Dynamics. (See Applied Science 504.)

51-9 (3,3,3) Classical Mechanics. Variational principles and Lagrange's equations; rigid body motion; special relativity; canonical equations, small oscillations including non-linear problems; perturbation methods; classical theory of field. Prerequisite: 401.

52-9 (3,3,3) Mathematical Methods of Physics. Elements of theory of analytic functions; differential equations and special functions of mathematical physics; solutions of boundary value problems by Hilbert space expansion. Prerequisite: Mathematics 407 or equivalent, or consent of instructor.

53-2 to 5 Special Projects. Each student assigned a definite investigative topic requiring resourcefulness and initiative. Prerequisite: consent of instructor.

54-9 (3,3,3) Electromagnetic Theory. Maxwell's Formalism of classical electromagnetism, application of electrostatics, magnetostatics, electrodynamics and radiation problems. Prerequisite: 305.

55-9 (3,3,3) Quantum Mechanics. Wave mechanics, matrix mechanics, transformation theory of quantum mechanics; angular momentum, perturbation theory, scattering theory. Prerequisites: 415, Mathematics 407 or consent of instructor.

56-9 (3,3,3) Advanced Quantum Mechanics. Introduction to quantum field theory, with emphasis on the quantum theory of radiation; covariant quantum electrodynamics; special topics, depending on the interests of students. Prerequisites: 531 and consent of instructor.

57-9 (3,3,3) Nuclear Physics. Fundamental properties and systematics of nuclei, scattering theory, the nuclear two body problem, nuclear models, electromagnetic properties of nuclei, particle radioactivity, nuclear reactions, the optical model. Prerequisite: consent of instructor.

¹ Open to teachers of high school physics, to National Science Foundation institute participants, and to others who have received the consent of the chairman of the Department of Physics or the director of the institute. May point toward the Master of Science in Education degree with approval of the Department of Secondary Education.

58-9 (3,3,3) Atomic and Molecular Spectra. Detailed quantum mechanical treatment of atomic and molecular spectroscopy. Prerequisite: consent of instructor.

59-9 (3,3,3) Statistical Mechanics. Principles of classical and quantum equilibrium statistics; fluctuations; applications to specific problems of physics. Prerequisite: consent of instructor.

60-9 (3,3,3) Solid State Physics. Fundamental concepts in solid state physics from advanced viewpoint, with illustrations drawn from current research. Prerequisite: consent of instructor.

61-1 to 4 Graduate Seminar. Lectures on special topics to be given when a demand arises. Prerequisite: consent of instructor.

62-3 to 6 Selected Topics in Physics. Topics of special interest. Prerequisite: consent of instructor.

63-2-1 Colloquy in Molecular Science. Required each quarter of all resident

students who have been admitted to advanced study in molecular science. Weekly conference on current research and recent literature of the field. 599-1 to 9 Thesis.

Physiology

410-15 (5,5,5) Advanced Anatomy. Dissection of the human body. Primarily for majors in physiology and other biological sciences. Not a premedical course. 2 hours lecture, 6 hour laboratory.

414-4 Anatomy and Physiology of Speech and Hearing Mechanisms. The anatomy and physiology of the vocal apparatus. Primarily for majors in speech pathology. 3 hours lecture, 2 hours laboratory.

415-8 (4,4) Experimental Animal Surgery. (a) Preparation of animals for surgery. Anesthesia, instruments, care of animal quarters, selected exercises. (b) Special surgical exercises. 2 hours lecture, 4 hours laboratory. Part b may be elected independently of a only by permission of the chairman.

417-6 (3,3) Principles of Pharmacology. Action of drugs and other chemical substances upon the living organism. Physiological and biochemical events resulting from the action of drugs. Pharmacodynamics, chemo-therapy, toxicology, and therapeutics. Prerequisites: basic courses in chemistry and biological sciences. 2 hours lecture, 2 hours laboratory.

430-12 (4,4,4) Cellular Physiology. The nature and mechanism of the living cell. Chemical and physical aspects of vital activity. Required for graduate majors in physiology. Recommended for students interested in biochemistry and biophysics. 3 hours lecture, 2 hours laboratory.

433-4 Comparative Physiology. Fundamental physiological processes and the manner in which they vary in various groups of animals. Recommended for majors in physiology and for students in other biological science. 3 hours lecture, 2 hours laboratory.

440-3 Electron Microscopy. Lectures, demonstrations, and practical experience with the electron microscope. Fundamentals of specimen preparation. Open to students with advanced knowledge of any natural or physical science. 2 hours lecture, 2 hours laboratory.

450-4 to 16 Special Problems in Physiology—Honors. Eight hours laboratory. Required for undergraduate honors students. Prerequisite: consent of department.

456-4 to 12 Independent Research for Honors. Supervised research and investigation in different branches of physiology. Prerequisite: consent of instructor and chairman.

460-12 (4,4,4) Mammalian Physiology. Function and biochemical organization in mammals, especially man. Open to students with adequate courses in biological sciences and chemistry. (a) Blood, circulation, respiration. (b) Digestion, excretion, endocrines. (c) Muscles, nervous system sense organs. 4 hours lecture, 4 hours laboratory.

465-6 (3,3) Biophysics. Application of the analytic methods of the physical sciences to physiology. Molecular aspects of control systems governing vital processes. Prerequisite: one year of physics. 3 hours lecture.

471-9 (3,3,3) Biophysical Instrumentation. Principles of electronics, accent on solid state circuit designs that apply to biophysics. Circuit construction for biophysical instruments is included. Prerequisite: 1 year of physics and consent of instructor.

500-1 to 9 Advanced Seminar. One meeting per week, 1 credit per quarter. Formal presentation of research and/or current literature in physiology. Required of all majors each quarter in residence.

519-3 Experimental Endocrinology. Exercises to familiarize the student with advanced physiological investigation. Prerequisite: strong background in chemistry and the biological sciences. 2 hours lecture, 2 hours laboratory.

520-9 (3,3,3) Physiological Techniques. Three terms of biophysics. (a) Analysis of protoplasmic components of tissue extracts under a variety of physiological conditions using chemical and physical procedures. (b) Gas analysis and metabolic methods in physiology. (c) Instrumentation for the recording of the physiologic activity of living tissues and organs. Use of channel recorders. Prerequisite: undergraduate concentration in any of the biological or physical sciences. 2 hours lecture, 4 hours laboratory.

521-1 to 6 Readings in Current Physiological Literature. Open only by conse

44-8 (4,4) Advanced Comparative Physiology. Physiological processes among animals. Prerequisites: courses in chemistry and biological sciences. 3 hours lecture, 2 hours laboratory.

50-3 Radiation Biology. Theory and specific applications of isotopes in physiology emphasized, and opportunity given to learn how to handle radioactive materials in the laboratory. 2 hours lecture, 2 hours laboratory. Prerequisites: general physics and biochemistry or equivalent.

65-3 Biophysics. Application of the analytic methods of the physical sciences to physiology. Molecular aspects of control systems governing vital processes. 3 hours lecture. Prerequisite: one year of physics.

99-3 to 9 Thesis. 9 hours to be counted toward a master's degree.

00-1 to 48 Dissertation. Hours and credit to be arranged by chairman. Prerequisite: Admission to advanced study in molecular science.

Plant Industries

01-4 Soil Physics. Physical properties of the soil; factors affecting them, their measurements, evaluation, and their influence in determination of soil productivity. Prerequisite: 301.

02-4 Soil Morphology and Classification. Morphology and soil formation, description and identification of soil profiles, classification of soils, techniques of soil mapping, and interpretation of survey data. Field trips approximate cost \$6. Prerequisite: 301.

03-4 Soil Chemistry. Emphasis on inorganic and organic colloids in the soil, ionic exchange, oxidation-reduction processes, acidity, alkalinity, and salinity, and how each relates to plant nutrition and growth.

04-3 Turf Management. Principles and methods of establishing and maintaining turf for homes, recreational areas, and public grounds. Study of basic plant and soil materials, fertility, culture, water management, and pest control as related to turfgrasses in variable environments. Field trips cost not more than \$2. Prerequisite: GSA 201b or equivalent.

06-5 Radioisotopes, Principles and Practices. Lectures on the principles of radioisotope technology as applied to agricultural and biological sciences. Prerequisites: biochemistry, physiology, or consent of department.

07-5 (3,2) Fertilizers and Soil Fertility. (a) Lecture. The uses of fertilizer materials; effects of various fertilizers on soils and crops; fertility maintenance and soil management. Prerequisite: one course in soils. **(b) Laboratory.** The laboratory study of the chemistry and fertility of soils. Parallels the theoretical presentation given in 407a. Prerequisites: 407a or concurrent enrollment.

08-4 World Crop Production Problems. Ecological and physiological factors influencing reproduction in various areas of the world. Natural limitations on crop production. Nonagricultural factors influencing world crop output.

15-4 Plant Breeding. Principles of plant breeding emphasized together with their application to the practical breeding of horticultural, agronomic, and forest plants. Prerequisite: any course in genetics.

18-4 Weeds and Their Control. Losses due to weeds, their identification and distribution, methods of weed dissemination and reproduction. Mechanical, biological, and chemical control of weeds. "Bioactivity of herbicides." State and federal legislation pertaining to weed control herbicides. Herbicide commercialization. Field trips. Prerequisite: GSA 201b.

19-4 Forage Crop Management. Forage production and utilization; forage crop characteristics, breeding, and ecology; grasslands as related to animal production, soil conservation, crop rotation, and land use. Field trip approximate cost \$3. Prerequisite: GSA 201b.

24-5 (3,2) Soil Microbiology. (a) (Lecture). (Same as Microbiology 424.) Study of the numbers, characteristics, and biochemical activities of soil microorganisms, with particular consideration of their role in the transformations of organic matter, nitrogen, and minerals as related to soil fertility and management. Prerequisites: one course in microbiology or soils. **(b) (Laboratory).** Experiments designed to determine numbers, and to study the characteristics and biochemical activities of the soil microflora as related to fertility. Prerequisites: 424a, or concurrent enrollment, Microbiology 301.

27-4 Commercial Vegetable Production. Culture, harvesting, and marketing commercial vegetables. Field trips cost approximately \$3.00. Two-hour laboratory. Prerequisite: 264 or consent of department.

- 438-3 Advanced Studies in Vegetable Crops.** Genetics, morphological, and physiological factors influencing the production of vegetable crops. Offered in alternate years. Prerequisite: 264, Botany 320, or consent of department.
- 440-4 Plant Propagation.** Fundamental principles of asexual and sexual propagation of horticultural plants. Actual work with seeds, cuttings, graft, and other methods of propagation. Prerequisites: 264, GSA 201b, or consent of department.
- 456e-2 Agricultural Marketing Problems and Practices—Horticultural Crops.** (See Agricultural Industries 456e.)
- 506-2 Laboratory Methods for Radioisotopes.** Laboratory exercises giving the students experience in instrumentation, measurements, and the safe handling of isotopic materials. Prerequisite: 406 or consent of department.
- 507-3 Advanced Soil Fertility.** Theoretical principles of soil fertility; evaluation of research data and methods used in soil fertility research. Prerequisite: 407a.
- 518-4 Principles of Herbicide Action.** Chemistry and mode of action of herbicides. Nature of herbicidal action. Illustrates the various types of chemical weed control procedures in current use. The physiology of herbicidal action examined using the different mechanisms established for various chemical groups of herbicides. Prerequisite: 418, Botany 320.
- 520-1 to 6 Readings.** Contemporary books and periodicals on selected subjects within the fields of plant industries. Prerequisite: consent of department.
- 533-3 to 4 Growth and Development in Plants.** (Same as Botany 533.) External and internal factors as they affect development and growth of plants. Photo-periodism, and the role of growth-promoting substances. Prerequisite: Botany 320.
- 575-1 to 6 Research.** Directed research on approved projects investigating selected fields of the plant industries. Prerequisite: consent of department.
- 581-1 to 6 Seminar.** Group discussions of and individual papers on subjects and problems relating to soils, field and horticultural crops, and other phases of the fields of the plant industries. Prerequisite: consent of department.
- 590-1 to 4 Special Studies in Plant Industries.** Directed study in specialized areas of crop production, horticulture, or soils depending on the program of the student. Discussions, seminars, readings, and instruction in research techniques. Prerequisite: consent of department.
- 599-1 to 9 Thesis.** Minimum of 5 hours to be counted toward a master's degree. Prerequisite: consent of department.

Psychology

- 404-4 Theories of Perception.** An examination of the different theories concerned with an organism's sensory contact with his environment. Physiological, social, and organizational theories of perception will be considered. Prerequisite: 211b or consent of instructor.
- 407-4 Theories of Learning.** A consideration of the major contemporary learning theories and their relation to experimental data. Prerequisite: 211b or consent of instructor.
- 408-4 Theories of Motivation.** Systematic analysis of the concept of motivation with emphasis on its utility as an explanatory component of general behavior theory. Prerequisite: 211b or consent of instructor.
- 414-4 Advances in Physiological Psychology.** Reading and discussion of articles dealing with recent significant advances in the neuro-endocrine basis of behavior. Prerequisite: 314 or consent of instructor.
- 421-4 Psychological Tests and Measurements.** Principles of psychological measurement, including errors of measurement, techniques for estimating reliability and validity, techniques of test construction, and problems in assessment and prediction. The laboratory will include the use of selected instruments. Lecture and laboratory. Prerequisite: 8 hours of psychology.
- 425-4 Mathematical Psychology.** A survey of mathematical models of behavior, elementary models of learning, perception, and decision making will be examined with a view towards introducing the student to the literature on mathematical psychology. Prerequisite: Mathematics 410a, 421a, 480a or consent of instructor.
- 431-4 Psychopathology.** Classification, description, etiology and treatment of the disorders of personality organization and behavioral integration. Observation

tions in a state mental hospital. Prerequisite: 305 or consent of instructor.

40-4 Theories of Personality. A review and critical evaluation of major personality theories and their supporting evidence. Prerequisite: 305 or consent of instructor.

51-4 Advanced Child Psychology. An examination of the concepts, methods, and problems of human development with consideration of both its psychological and psychosocial aspects. Prerequisite: 211b, and 301, or consent of instructor.

59-4 Theory and Practice in the Preschool. Designed for those in nursery education and related fields. Examines variety of topics and provides lectures, demonstrations, and practicum experience in the Child Study Cooperative Nursery. Prerequisite: consent of instructor.

61-4 Advanced Social Psychology. Examines current areas of interest in the study of social behavior: language behavior, communication, social influence, attitude change, interpersonal perception, etc. Emphasis is on the individual in the social context. Prerequisite: 307 or consent of instructor.

65-4 Group Dynamics and Individual Behavior. Examination of research and theory in the area of small-group interaction. Examines such topics as group structure and function, group problem-solving, leadership, etc. Prerequisite: 307 or consent of instructor.

90-1 to 16 Independent Projects. Independent readings and projects in psychology. Prerequisite: consent of instructor and chairman.

95-1 to 18 Seminar: Selected Topics. Varied content. To be offered from time to time as need exists and as faculty interest and time permit. Prerequisite: consent of chairman.

99-4 Instrumentation in Behavioral Science. Study of methods of research instrumentation. Techniques of stimulation and of physiological and psychological response recording. Lecture and laboratory. Prerequisite: consent of instructor.

10-4 History and Systems. Study of the important antecedents of contemporary scientific psychology. Considers issues, conceptual developments, and research advances, and presents the major schools and systems. Prerequisite: consent of instructor.

12-4 Sensory Processes. A study of the structure and functions of the sense organs. Emphasis will be placed on the psychological data which describe the function of these organs. Lecture and laboratory. Prerequisite: consent of instructor.

14-8 (4,4) Physiological Psychology. Study of neural and endocrine mechanisms underlying behavioral processes. Lecture and laboratory. Prerequisite: consent of instructor.

16-4 Learning Processes. Processes by which individual behavior is changed, using procedures developed in the learning laboratory. Introduction to major concepts and data of learning. Prerequisite: consent of instructor.

22-4 Research Design and Inference III. Advanced design and analysis of psychological experiments. Analysis of variance in complex designs, analysis of covariance, and trend analysis. Prerequisite: Mathematics 410B.

23-2 Research Seminar. Evaluation of Research. A study of principles of research design from the point of view of the scholar reading the journals.

24-4 Multivariate Methods in Psychology. A detailed coverage of psychometric methods, with special emphasis on the theory and applications of multivariate regression analysis. Includes an introduction to factor analysis. Prerequisite: 522.

25-4 Mental Test Theory. Derivation of the basic psychometric equations, effects of test length and group heterogeneity on test parameters, criteria of parallel tests, weighting and differential prediction. Prerequisite: 524.

26-4 Experimental Design in Psychology. Consideration of the logic of psychological experimentation. Topics include randomization as related to experimental inference, complex designs used in experimental psychology, the use of concomitant information in experiments, faults and refinements in common psychological designs. Prerequisite: 522, Mathematics 410a,b.

30-4 Personality Theory and Dynamics. Intensive treatment and critical analysis of several representative approaches to personality. Consideration also of important personality concepts common to most theoretical approaches. Prerequisite: consent of instructor.

31-2 to 4 Advanced Psychopathology. Consideration of special topics, including psychological theories of the nature and etiology of human pathology,

- assessment of pathology, and institutional care and treatment. Includes extensive field experience in a mental hospital setting. Prerequisite: 530, 541b, and consent of instructor.
- 532-2 Experimental Approaches to Personality.** Presentation of conceptual formulations and research data from representative experimental approaches to personality. Critical evaluation of methodological approaches to personality study. Prerequisite: 530 or consent of instructor.
- 533-3 Experimental Approaches to Psychopathology.** An examination of the research literature on several issues in clinical psychopathology. Prerequisite: consent of instructor.
- 536-4 Fundamentals of Counseling.** Introduction to the common assumption dimensions, and communicative skills underlying psychological counseling. Observation utilized to supplement didactic discussion. Lecture and demonstration. Prerequisite: consent of instructor.
- 537-4 Counseling and Psychotherapy.** Systematic presentation of major approaches to counseling and psychotherapy. Consideration of salient aspects of the therapeutic situation and of the process and nature of changes during psychotherapy. Critical evaluation of both theory and practice. Consideration of research findings and problems. Prerequisite: consent of instructor.
- 538-2 Group Psychotherapy.** Presentation of major approaches to group psychotherapy. Prerequisites: 537 and consent of instructor.
- 539-4 Experimental Approaches to Psychotherapy.** A review and evaluation of empirical research related to the amelioration of maladjustment. Emphasis is on measurement and methodological problems. Prerequisite: 536, 537, consent of instructor.
- 541-4 Psychodiagnostics I.** Introduction to clinical psychology with attention to the function and clinical use of individual intelligence tests. Theories of intelligence and related research. Age scales with emphasis on infant and child testing. Point scales and tests of deterioration with emphasis on child and adult testing. Lecture and practicum. Prerequisites: consent of instructor.
- 543-6 (4,2) Psychodiagnostics II.** Basic theory and assumptions underlying projective methods. Use of projective techniques as measures of personality and as tools for clinical diagnosis and research. (a) Thematic projective techniques. (b) Rorschach and Bender-Gestalt. Lecture and practicum. Prerequisite: 541 or consent of instructor.
- 545-2 Psychodiagnostics III.** Nature and theory of questionnaires for personality assessment and psychodiagnosis. Consideration of their use in clinical research. Lecture and practicum. Prerequisite: consent of instructor.
- 547-4 Assessment Procedures in Counseling.** Use and integration of psychological test data, vocational, socio-economic, and educational information in assessment and counseling. Prerequisite: 421 or consent of instructor.
- 552-4 Experimental Child Psychology.** Consideration of relationship of methodology to child theory, typical methodological procedures and problems specific to children, and representative research topics. Prerequisite: 451 or consent of instructor.
- 554-2 Developmental Theory.** Systematic study and critical evaluation of representative theories of child behavior. Prerequisite: 451 or consent of instructor.
- 556-2 Psychological Treatment of the Child.** Investigation of personality and behavior problems. Etiological factors and methods of treatment. Prerequisite: 451 or consent of instructor.
- 561-4 Social Influence Processes.** Critical review of theoretical and empirical developments in the study of influence processes, attitude change, etc. Social and intrapersonal determinants are examined. Prerequisite: 461 or consent of instructor.
- 562-4 Observational Techniques and Content Analysis.** Examination and evaluation of research methods and measurement techniques utilized in social psychology. Prerequisite: 461 or consent of instructor.
- 564-4 Communication and Group Behavior.** Emphasis in this course is on language behavior and the psychological study of the communication process. Examines theories, methods and research in these areas. Prerequisite: 461 or consent of instructor.
- 571-4 Industrial Motivation and Morale.** A review of the factors which determine motivation and morale as well as their measurement and evaluation. Prerequisite: 320 or consent of instructor.

- 72-4 Industrial Training.** A systematic consideration of the methods of industrial training and development on the production, supervision, and design-making levels. Prerequisite: 320 or consent of chairman.
- 73-2 Selection and Placement.** Selection and validation of test batteries, use of the interview and personal history data in selection, quota, and classification problems, administration of a selection program. Prerequisite: 524 or consent of instructor.
- 74-2 Psychology of Industrial Relations.** Analysis of psychological factors involved in industrial organization, employer-employee relations, and union-management relations. Prerequisite: 571 or consent of instructor.
- 76-2 to 4 Human Engineering.** Analysis of man-machine systems, human factors in the design of display and control systems, limitations and capabilities of the human operator. Prerequisite: 512, 581, or consent of chairman.
- 79-4 Animal Behavior.** (See Zoology 579.)
- 81-4 Psychophysical Methods.** Survey of the major psychophysical methods and their applications. Lecture and laboratory.
- 90-1 to 16 Readings in Psychology.** Readings in selected topics in psychology under staff supervision. Prerequisite: consent of chairman.
- 91-1 to 36 Research in Psychology.** Research under staff supervision in selected areas of psychology. Prerequisite: consent of the chairman.
- 93-1 to 18 Practicum in Psychology.** Practicum experience in a professional setting is offered under staff supervision in the following areas: (e) Clinical psychology, (f) Counseling Psychology, (h) Industrial Psychology, (j) Child psychology, (l) Teaching of Psychology.
- 95-1 to 18 Advanced Seminar.** Seminars of varied content for advanced students. Prerequisite: consent of chairman.
- 98-2 Ethical and Professional Problems in Psychology.** Problems in the professional practice of psychology and in teaching and research. Professional ethics, relations to other professions and the public, organization and structure of the field, current trends. Prerequisite: major in psychology or consent of instructor.
- 99-1 to 9 Thesis.**
- 100-1 to 45 Dissertation.**

Recreation and Outdoor Education

- 100-3 to 4 Human Development and Behavior.** Consideration of human development from the framework of the major theories. Includes acquisition and maintenance of diverse behavior patterns. Prerequisite: advanced standing.
- 105-3 Recreation Areas and Facilities.** Principles of planning, construction, management and maintenance of shelters, utilities, sanitation structures, erosion control, and other related problems.
- 100-4 School and Community Recreation.** The role of the public schools in community recreation. Emphasis on current practices and trends in curriculum content, adult education, extracurricular activities, after-school and recreation programs, and cooperative programs with other agencies.
- 100-4 to 16 Practicum in Recreation and Outdoor Education.** Supervised practicum experience in a professional setting. Emphasis on administrative, supervisory, teaching and program leadership in various laboratory situations related to recreation and/or outdoor education.
- 100-4 Principles of Recreation.** Principles and interpretations of recreation and the basic concepts underlying the organization of leisure activity. Emphasis on cultural significance of recreation and the relationship of recreation to the totality of life.
- 100-4 Outdoor Education Workshop.** Leadership development for outdoor education and its place in the school program. Methods of utilization of natural and cultural resources for enrichment of the school curriculum.
- 100-4 Recreation Administration Workshop.** Bases for planning community programs in recreation. Administrative problems including legislation, finance and budget, office management, public relations, and personnel are considered through application of principles.
- 100-5-4 Special Population Workshop.** Basis for planning, organization, selec-

tion, evaluation, and adaption of activities to a variety of institutional and community recreation settings.

530-4 Recreation Program Workshop. Program planning, organization, and implementation of comprehensive leisure time programs in public and private recreation settings, emphasis on application of basic program principles and practice. Prerequisite: 500.

540-4 Recreation Surveys and Planning of Facilities. An analysis of scope, content, objectives, procedures, and types of recreational surveys and appraisals. Collection and analysis of data.

570-4 Seminar in Recreation and Outdoor Education. Discussion of individual projects; presentation of research problems and dissertation topics.

596-2 to 9 Independent Study. Independent study and research in the student's field of interest.

Rehabilitation

414-1 to 16 Developing Employment Opportunities. Designed to train rehabilitation personnel in the attitudes, methods and skills pertinent to placement of handicapped persons in competitive and other occupations. Prerequisites: special standing and consent of instructor.

417-4 Rehabilitation of the Economically Deprived. Analysis of employment problems of the economically deprived with attention to training, counseling and programs for rehabilitation.

420-4 Human Development and Behavior. Consideration of human development from the framework of the major theories, to include acquisition and maintenance of diverse behavior patterns. Prerequisite: advanced standing.

480-2 An Introduction to Rehabilitation. A survey of the philosophy, procedures and practices underlying the rehabilitation movement, including its history and legislation that have contributed to its rapid development.

481-2 An Introduction to Employment and Developmental Services. A review of the development and growth of employment services and special youth centers, current social needs and trends, and the organizational patterns of such centers.

485-4 Scientific Methods in the Behavioral Sciences. Scientific methods as an approach to the investigation of human behavior including consideration of various systems of behavior theory and practice.

486-4 Introduction to Behavior Modification. Overview of the field of behavior modification, its procedures, techniques, and methods. A survey of current literature examining the various populations being utilized.

490-1 to 6 Readings in Rehabilitation. Select readings supervised by the student. Prerequisite: consent of instructor.

501-6 (2,2,2) Rehabilitation Administration. (a) Programming and organizational structures, formal and informal, of public and voluntary agencies and facilities. (b) Current and progressive supervisory practices in rehabilitation agencies, communication channels, employee counseling and evaluation methods. (c) Developing community resources, involvement and utilization of public and voluntary agencies in developing a comprehensive rehabilitation program. Prerequisite: consent of instructor.

503-2 Case Management in Rehabilitation. Basic procedures in providing and coordinating available services for the handicapped in the context of a professional-client relationship. Prerequisite: consent of instructor.

511-2 to 4 Vocational Developments and Occupational Choice. The psychosocial meaning of work, vocational development and theory of occupational choice, and the analysis of the labor market now and in the future. Prerequisite: consent of instructor.

519-2 to 3 Selection, Placement, and Follow-up. A survey of current methods and criteria used in job development, selective placement, and follow-up of handicapped and deprived individuals. Prerequisite: consent of instructor.

520-4 Functional Analysis of Behavior. Analysis of operant and respondent behavior with emphasis on the contribution of intrahuman investigation to the understanding of human behavior. Laboratory required. Prerequisite: consent of instructor.

521-4 Child Behavior. Systematic examination of the manner in which children (from conception on) acquire and maintain their behavior patterns.

- the role of the environment in controlling such development. Prerequisite: consent of instructor.
- 26-4 Complex Human Behavior.** The manner in which humans acquire, maintain, and attenuate the more complex forms of behavior, particularly in the social, vocational, and educational areas of behavior. Prerequisite: 520 and consent of instructor.
- 31-2 to 4 Vocational Appraisal.** Consideration of tests and procedures used in assessing the individual's functioning abilities and the meaning work has in achieving fulfillment, which also includes the requirements of the job for purposes of aligning the two. Prerequisite: 511 or consent of instructor.
- 32-3 to 4 Assessment Procedures in Rehabilitation.** A general review of the fundamental bases of measurement, the criteria for selecting assessment devices, introduction to select standardized and time-sample instruments, and the use of these in rehabilitation. Prerequisite: introductory statistics.
- 33-4 Measurement in Behavior Change.** Dividing the types of measurement into two categories, direct and indirect, an analysis of the relative advantages and disadvantages inherent in each technique when applied to specific behavior areas. Prerequisites: 520 and consent of instructor.
- 35-4 Schedules of Reinforcement.** A study of schedules as a basis for understanding and controlling behavior, and the nature of schedule effects in relation to other behavioral variables. Prerequisite: 533.
- 36-4 Individual Assessment in Rehabilitation.** Theoretical aspects of measuring instruments for individual assessment in rehabilitation. Includes problems of administration and interpretation. Field and laboratory experiences included. Prerequisite: 532 and consent of instructor.
- 37-4 Diagnostic Procedures for Special Populations.** A detailed survey of the procedures in diagnosis and assessment of the retarded, blind, deaf, brain injured, and others. May include some laboratory assignments. Prerequisites: psychology 421 or consent of instructor.
- 39-1 to 6 Behavioral Programming.** Application of the technologies related to the arrangement of behavioral programs. Laboratory required. Prerequisite: 520 and consent of instructor.
- 41-1 to 6 Medical Aspects of Rehabilitation.** A review of human systems, distinctions leading to major diseases entities and injuries, and the implications for rehabilitation. Prerequisite: consent of instructor.
- 41-3 to 4 General Rehabilitation Counseling.** An overview of the basic counseling processes appropriate to rehabilitation settings. Includes consideration of the stylistic and interpersonal factors common to various persuasions. Prerequisite: consent of department.
- 42-4 Rehabilitation Counseling Research.** An intensive study of the heuristic aspects of theory and the resultant research in rehabilitation counseling. Also develops researchable problems. Prerequisite: 551.
- 45-2 Rehabilitation Counseling with the Mentally Retarded.** Review and discussion of the philosophy, issues, approaches, and research pertinent to the counseling function in the development of the retarded. Prerequisite: 551 concurrent registration.
- 46-4 Group Procedures in Rehabilitation.** Characteristics of intensive group experiences, and procedures in preparation for group counseling. Prerequisites: 520 and consent of instructor.
- 48-4 Programmed Instruction and Behavior.** Techniques and procedure in programming material for rapid acquisition of new behavior with particular emphasis on automated instruction and programmed texts. Prerequisite: 485, 520, or consent of instructor.
- 49-1 to 3 Psycho-Social Aspects of Disability.** An examination of the socio-emotional impact of traumatic injury or chronic illness (on human functioning) and its role in the rehabilitation process. Prerequisites: Psychology 421 and consent of instructor.
- 53-4 to 8 Aversive Control and Aggressive Behavior.** Methods of aversive control and negative reinforcement procedures. A review of the aggressive response as a consequence of aversive control. Prerequisite: 526.
- 54-4 Sexual Behavior.** The definition and measurement of sexual responses, their significance and importance for understanding complex behavior patterns. Prerequisites: consent of instructor.
- 55-4 Verbal Behavior.** Theoretical and empirical study of human verbal behavior. Emphasis on the environmental control of such behavior. Analysis

of procedures used to modify deviant and retarded verbal responses. Prerequisite: 486 or 520.

567-4 School-Related Behavior. An intensive analysis of the students' and teachers' behavior, its functional relationship, and the ways in which behavior modification techniques might create a more satisfactory environment for teaching and learning. Prerequisites: consent of instructor.

571-1 to 6 Seminar in Selected Topics. Selected topics of pertinence to rehabilitation and counseling personnel. Prerequisite: consent of department.

576-1 to 12 Seminar in Behavior Modification. Basic issues involved in the modification of human behavior in the applied areas—scientific, methodological, ethical and social issues will be evaluated. Prerequisite: consent of instructor.

578-1 to 6 Seminar in Correctional Rehabilitation Counseling. Review of major issues and research relative to rehabilitation practices in youth and correction settings. Prerequisite: consent of instructor.

585-0 to 24 Practicum in Rehabilitation. (a) Introduction to various facilities and agencies including supervised experiences in the function and administration of these services. (b) Application of behavioral methods with humans under close direction of supervisory staff. (c) Practice in developing counseling skills with individuals and groups in varied settings.

589-0 to 12 Internship in Rehabilitation. Full-time practice in a rehabilitation setting supervised by both agency personnel and university faculty. Prerequisites: 585 and consent of department.

590-1 to 16 Independent Projects. Independent development of projects and systematic readings in pertinent rehabilitation areas. Prerequisite: consent of instructor.

591-1 to 16 Research in Rehabilitation. Systematic research on factors and procedures relevant to rehabilitation. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Prerequisite: consent of instructor.

Secondary Education

402-4 Aerospace Education Workshop. Teachers learn about current developments in this area and how to incorporate aerospace information into existing curricula. They study in some detail the social, political, and economic consequences of this era. Prerequisite: consent of instructor.

407-8 (4,4) The Junior High School. (a) The place of the junior high school in the organizational pattern, with major emphasis upon the areas of organization, administration, and curriculum. (b) Workshop. Designed to: 1) enable teachers to discover and evaluate the new content, methods, and materials available for the junior high school, grades 7-9; 2) develop teacher-made functional instructional models. Must be taken in a,b sequence. Junior high school teaching experience may be substituted for (a) as a prerequisite to (b).

440-4 Teaching Reading in High School. A foundation course in how to teach reading in junior and senior high school: developmental and corrective reading programs; appraisal of reading abilities; methods and materials for instruction. Prerequisite: Guidance 305.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Technical and Industrial Education 485.)

487-4 Teaching the Natural Sciences in Secondary Schools. Objectives of science education; instruction methods and techniques appropriate for teaching science; desirable equipment, audio-visual aids, and instructional material; development of a course outline and at least one instructional unit. Prerequisite: 315 or consent of instructor.

488-3 Teaching Social Studies in Secondary Schools. Deals with objectives, scope and sequence of curriculum, methods of teaching different courses and age groups, materials and evaluation. Prerequisite: Guidance 305.

490-4 Workshop in Economics Education. (Same as Economics 490.) Designed to assist elementary and secondary school teachers in promoting economic understanding through the translation of economic principles and problems into classroom teaching materials.

495-2-4 Seminar: Problems Related to Teaching Disadvantaged Youth. Members of the National Teachers Corps and others working in classrooms with disadvantaged youth. Emphasis placed upon actual problems encountered by those enrolled. Reports and discussion based upon surveys and reactions will be featured. Prerequisite: consent of instructor.

6-4 Reading in the Secondary School. For junior and senior high school teachers who desire a foundation in reading. Emphasis placed on the basic skills, appraisal of reading abilities, materials of instruction, and methods of teaching reading in the content areas. Prerequisite: 352 or teaching experience.

7-2 to 4 Readings in Reading. Independent reading; acquaintanceship with the literature and research in reading. Conference periods. Prerequisites: 505 and consent of instructor.

8-4 Seminar: Trends in Selected Areas in Secondary Schools. For students doing advanced graduate work. Individual class members will read basic bibliography related to secondary education and read widely about trends in the area of their own teaching fields. Prerequisites: completion of half or more of the work leading to a master's degree and consent of the instructor.

9-4 to 8 Practicum in Reading. For advanced students; teaching demonstrations and evaluations. Each student works with a group of reading disability cases. Prerequisites: 521a,b,c, and consent of instructor.

10-4 to 8 Seminar: Problems in Reading. Major field content seminar: Problems and practices; comprehensive review and evaluation of research and literature. Each student pursues a problem of his own interest.

14-4 Organization and Administration of Reading Programs. For reading specialists, principals, supervisors, consultants. Recent trends in elementary and high school reading programs, providing reading instruction for total school population, materials and equipment, in-service training, role of the reading specialist. Problems of class members are studied and discussed. Prerequisites: Educational Administration 561, 505.

16-4 to 12 Internship in Reading. Culminating experience for doctoral candidates. Each student supervises reading services in his own or cooperating school. Conference periods. Prerequisites: 521a,b,c, and consent of instructor.

17-2 Supervision of Student Teachers.

18-12 (4,4,4) Diagnosis and Correction of Reading Disabilities. Causes of reading difficulties; observation and interview procedures; standardized tests, instruments, and informal inventories; analysis techniques; experiences in preparing materials for corrective purposes. Each student diagnoses and treats a reading disability case under supervision. Prerequisites: 505 or 440 concurrent registration with 550, and teaching experience.

19-9 NDEA Summer Institute for Teachers of German. (See Foreign Languages.)

20-4 Core Curriculum in the Secondary School. Designed to help students gain a functional understanding of the core concept. Techniques of selecting materials and the cooperative planning of units of work. Critical study of current practices in this field. Prerequisite: Educational Administration 460.

21-1 to 8 New Developments in Technological Education. (See Technical and Industrial Education.)

22-4 The High School Curriculum. Designed to permit students to work in groups on problems related to the high school curriculum. Such problems should originate in the schools where the students are or will be employed. The point of view maintained is that procedures should be very democratic. The instructor serves as a coordinator of activity; resource people are used freely. Prerequisite: one other graduate course in curriculum.

23-4 High School Principalship. Designed to deal with problems met specifically by the high school principal. Emphasizes his role in relation to guidance, curriculum, schedule-making, extracurricular activities, public relations, budgeting of time, etc. Prerequisite: Educational Administration 424 and consent of instructor.

24-4 Seminar in Instruction. Study and discussion of problems of instruction with attention to experimentation. Prerequisite: consent of instructor.

25-4 Extra-Class Activities. Cocurricular activities of the junior and senior high school including intramural and interscholastic functions.

26-4 Doctoral Seminar. A study of school curricula, their historical development in the United States, contemporary problems, issues, and research with a survey of the evolution of instructional methods and procedures as they are related to learning, and new curricula. Limited to doctoral students.

27-2 to 4 Individual Research. The selection, investigation, and writing of a research topic, under the personal supervision of a member of the departmental graduate staff, in one of the following areas: (a) Curriculum, (b) Supervision, (c) Language Arts, (d) Science, (e) Reading, (f) Social Studies,

(g) Problems in Secondary Education, (k) Junior High School Methodology
586-3 The Change Agent in Planned Change. An intensive diagnosis of the dynamics involved in planned change in a social system and the consultant relationship to this process. Prerequisite: consent of instructor.

589-2 Seminar in Community Development.

591-4 Workshop in Current Problems in Secondary Education. Designed primarily to help high school principals to work effectively and with the help of resource leadership on the most urgent problems confronting their schools. Discussion, reports, lectures, and final examination. Prerequisite: consent of instructor.

596-5 to 9 Independent Investigation. A field study required of each student working for the sixth-year professional certificate. The work should be done in the setting of a school system where the student is employed or where field cooperation is extended. The study will involve selecting of the problem, survey of pertinent literature, recording of results, and appropriate interpretations and summarizations.

599-3 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Secretarial and Business Education

403-3 Teaching Typewriting. The programming of activities in typewriting training, methods of instruction, skill-building principles and techniques, selection and preparation of practice materials, standards of achievement, and evaluation of pupil performance. Prerequisite: 304 or equivalent.

404-3 Teaching Shorthand and Transcription. The programming of activities in shorthand and transcription training, methods of instruction, skill-building principles and techniques, selection and preparation of practice and homework materials, standards of achievement, and evaluation of pupil performance. Prerequisite: 324a or equivalent.

405-3 Teaching General Business Subjects. Instructional methods and materials for, and the evaluation of pupil progress in, such basic business subjects as general business, consumer education, economic geography, business law.

406-4 Teaching Office Practice and Office Machines. Instructional methods and materials for, and the evaluation of pupil performance in, office practice and office machines.

408-3 Teaching Bookkeeping and Accounting. Instructional methods and materials for, and the evaluation of pupil progress in bookkeeping and accounting. Prerequisite: Accounting 251b or equivalent.

414-6 (3,3) Organization and Administration of Cooperative Vocational Business Education. (a) Philosophy and objectives of cooperative vocational programs, methods of selecting students and work stations, placing and supervising students on part-time jobs. (b) Preparation of instructional materials, job analysis, conducting related information classes, evaluating workers and work stations, advisory committees, public relations aspects of cooperative programs.

415-6 Supervised Business Experience and Related Study. Designed to prepare teachers and coordinators of in-school and cooperative vocational business education programs in accordance with the requirements of the Illinois State Plan for the Administration of Vocational Education. First week (15 hours) devoted to classroom study of the principles and problems of coordinating in-school and cooperative vocational business education programs; next five weeks (200 hours) devoted to supervised occupational experience; seventh week (15 hours) devoted to classroom analysis and evaluation of on-the-job experiences of the members of the class in relation to their future work as coordinators and vocational teachers. Each student applies for and obtains his own position with the assistance and approval of the instructor. While employed, each student looks for and analyzes relationships between his work experiences and the in-school or cooperative work experience program he will later conduct.

417-4 Applications and Fundamentals of Data Processing in Business Education. Acquaints business teachers with data processing applications in school business classes. Emphasis on vocabulary development, unit re-

equipment, concepts of programming, and fundamentals of computer applications. Approximately one-third of the course will be spent in machine operation.

26-4 Office Management. The principles of management as applied to office problems. Emphasis on the role of the office in business management; office organization; physical facilities of the office; office services, procedures, standards, and controls; records management.

27-4 Records Administration. The requisites for records administration. The value of files, their creation, control, retention, and disposition. Applications of such records as medical, legal, educational. Prerequisite: 407.

35-3 Principles and Philosophies of Vocational and Technical Education. (See Technical and Industrial Education 485.)

40-4 Principles and Problems of Business Education. A study of the fundamentals of business education; its relation to business, to general and vocational education, and to guidance programs; its history, current status, and trends; special emphasis on objectives and curriculum problems.

42-4 Research in Business Education. A study of research findings and techniques as exhibited in representative investigations in business education. Emphasis on reading and interpreting research, using research findings in solving instructional problems, and uncovering potential topics for future research. Prerequisite: Guidance 422b.

43-4 Tests and Measurements in Business Education. The selection, construction, administration, and interpretation of tests and test scores in business education subjects. Principal emphasis on teacher-made tests, especially the performance type, with secondary attention to published tests in the field.

45-1 to 6 Workshop in Business Education. Major issues in business teacher education. Ordinarily offered during one or two weeks of the summer session.

48-4 Administration and Supervision in Business Education. History and philosophy of administration and supervision in Business Education with consideration of problems arising at local, state, and national levels; and at secondary, college, and university levels. Supervisory problems will include curriculum construction and evaluation, classroom supervision, promotional policies, selection of textbooks, purchase and maintenance of equipment, physical arrangements, and other areas according to need of students.

49-4 Improvement of Instruction in General (Basic) Business Subjects. Designed for the experienced high school teacher who is interested in the study of curriculum and teaching problems in basic business subjects. The course will include teaching procedures, review of materials, formulation of tests and evaluation. The organization of teaching units and projects will be emphasized.

50-4 Improvement of Instruction in Secretarial Subjects. Designed for the experienced high school teacher who is interested in the study of curriculum and teaching problems in secretarial subjects. The course will include teaching procedures, review of materials, formulation of tests and evaluation. Prerequisite: 403 or 404 or 406.

55-3 Interrelated Vocational Cooperative Education. (See Technical and Industrial Education 525.)

55-2 to 5 Readings in Business Education. Supervised readings in selected subjects. Prerequisite: consent of instructor.

55-2 to 5 Individual Research in Business Education. Selection and investigation of a problem, use of relevant sources and techniques, collection, evaluation, and interpretation of data; and the writing of a report on the investigation. Prerequisite: consent of instructor.

55-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Sociology

4-4 Social Change. Processes of social change in the modern world; culture and conflict of norms; individual and social problems arising from conflicting systems of social values and cultural norms. Prerequisite: GSB 201b or 301.

4-4 Sociological Research. Application of the scientific method to sociological problems. The role of theory. Principles of good research design, measurement, sampling and analysis. Prerequisite: graduate status or consent of instructor.

415-3 Logic of the Social Sciences. (See Philosophy 415.)

424-4 Collective Behavior. The behavior of people in large groups; collective interstimulation and emotions; crowds, audiences, and publics; mass stimulation and mass response. Prerequisite: 321 or 322, or consent of instructor.

426-4 Social Factors in Behavior and Personality. How group situations and values affect behavior and shape personality; development of concepts, roles, concepts, attitudes, values; theories of motivation; self-concepts; conflict; social values in relation to individual motivation. Prerequisite: 321 or Psychology 305, or consent of instructor.

427-4 Personality and Social Adjustment. Basic mechanisms of adjustment in behavior; concepts and criteria of personal integration and social adjustment; varieties of adjustive and non-adjustive behavior; theories of personal organization and disorganization; selected problems. Prerequisite: 321 Psychology 305 or consent of instructor.

435-4 Social Stratification. A comparative study of social class systems, with emphasis on the American systems. Relationships of class position to behavior in family, religion, politics, etc. Prerequisite: GSB 201b or 301.

438-4 Sociology of Occupations and Professions. Natural history and institutional aspects of occupations in our society, cultural context of occupations in both primitive and modern society, preparation for jobs, human values in work, promotion and discharge, mobility, retirement. Prerequisite: GSB 201b or 301.

449-4 Sociology of Aging. The social implications of an aging population; social adjustments to the aging process; personal adjustments to the roles and statuses of later maturity; a consideration of retirement and public assistance programs for older people. Prerequisite: GSB 201b or consent of instructor.

450-4 Social Thought I: Before 1800. The ideological basis of Western society. The classical foundations. Trends of thought from the Renaissance to the Enlightenment. Prerequisite: consent of instructor.

451-4 Social Thought II: The Sociological Movement. From Romanticism to Realism; rise and development of scientific social thought. Prerequisite: consent of instructor.

453-4 Social Movements. A sociological study of modern social movements; social and cultural backgrounds, forms of expression and organization; social structure of social movements, their role and function in modern society. Prerequisite: GSB 201b or 301.

454-4 Sociology of Science. Emphasis on the origins and growth of science in historical perspective, reciprocal relations between science and society in the twentieth century, science as a social system, differentiation within and relations between disciplines, and implications of the social organization of scientific research and finding. Prerequisite: 301 or consent of instructor.

460-4 Sociology of Medicine. Man and his adaptation to illness, the sick role, the doctor patient relationship, the organization of medical care and health institutions in the United States, and the role of the sociologist in the health fields. Prerequisite: 301 or consent of instructor.

470c-4 Urban Planning. (See Government 470.)

471-4 Principles of Demography. Techniques in analyzing and evaluating data on human population; composition, birth and death rates, life tables, migration data, estimates of future trend. Practical uses of demographic techniques. Prerequisite: consent of instructor.

472-4 The American Correctional System. A survey of the correctional system covering probation, institutional treatment, and parole: their historic development, organizational structure, program content, and current problems. Prerequisite: 372 or consent of instructor.

473-4 Juvenile Delinquency. Nature of juvenile delinquency; relationships to theories of deviant behavior; efforts at prevention and control. Prerequisite: 302 or consent of instructor.

481-4 Processes in Social Work. Theory, rationale, and practice of case work, group work, social welfare organization, and the roles of supervision, administration, and research in relation to each. Case material study and discussion with field observation and practice. Prerequisite: 375 or consent of instructor.

482-3 Social Work in Selected Agencies. Study of representative literature on casework in family, psychiatric, medical, school, military, child welfare, and correctional settings, and others. Case material study and discussion with field observation and practice. Prerequisite: 481 and consent of instructor.

- 3-4 Current Problems in Corrections.** An exploration of contemporary problems in the control and treatment of sentenced offenders and a review of research trends in corrections. Prerequisites: 472 and consent of instructor.
- 6-1 to 5 Independent Study in Community Development.** Individual study and projects designed to fit the needs of each student. Prerequisite: consent of instructor.
- 7-4 Community Development.** The concepts of community development and analysis of the social-psychological forces and processes involved in citizen study, planning and action directed toward the fuller development of communities in a democratic society. Prerequisite: 4 hours of sociology or consent of instructor.
- 9a-4 Probation, Classification, and Parole.** An introduction to the structure and function of those elements of the correctional process primarily concerned with the evaluation, treatment, and control of offenders with particular attention to the casework components of the process. Prerequisite: 481 or consent of instructor.
- 9e-2 to 4 Independent Study in Corrections.** Supervised readings or independent investigative projects in the various correctional aspects of crime control, institutional management, and specific correctional programs. Prerequisite: consent of instructor.
- 8-1 to 4 Honors Independent Research.** Advanced research study of a selected problem. Not for graduate students. Prerequisite: consent of department.
- 1-4 Survey of Sociological Theory.** The development of sociology as a science of society, from synthetic philosophy to analytic sociology. Prerequisite: 451 or consent of instructor.
- 2-4 Seminar in European Sociological Theory: 1800-1910.** The theoretical systems of selected European sociologists studied from the original writings. Prerequisite: 15 hours of sociology or consent of instructor.
- 3-4 Seminar in European Sociological Theory: 1910 to the Present.** A continuation of 502. Prerequisite: 15 hours of sociology or consent of instructor.
- 5-4 Seminar in American Sociology.** A survey of development of American sociology from its beginnings in the late 19th century to the present. Prerequisite: 501 or consent of instructor.
- 5-4 Seminar in Contemporary Sociological Theory.** An analysis of recent sociological theories, including a survey of current approaches to the construction and application of systematic theoretical models. Special attention will be given to "structural-functional" analysis and to the theoretical adequacy of selected theory-oriented empirical research areas. Prerequisite: 15 hours of sociology or consent of instructor.
- 5-2 Supervised Research.** Under guidance of instructor, students conduct sociological research project. Prerequisites: 412 and 526.
- 5-4 Methodological Foundations of the Social Sciences.** Social science methodology; the nature of social facts and phenomena, the formation of concepts, the application of logic in the social sciences. Prerequisites: 407, and Philosophy 420 or consent of instructor.
- 5-4 Seminar in Social Psychology.** Survey of theoretical systems; progress toward integrated body of behavioral theory. Prerequisite: 426.
- 5-4 The Sociology of Small Groups.** The study of the small group as a small-scale social system. The interrelationship between selected patterned properties of groups such as interaction, emotion, norms, beliefs, values, and methods as the group encounters and attempts to deal with basic problems of group development. Prerequisite: 426 or consent of instructor.
- 5-4 Quantitative Methods in Sociology I.** Elementary logic and argumentation; sets, relations and functions; graph theory; problems in concept formation and measurement in sociology. Prerequisite: college algebra.
- 5-4 Quantitative Methods in Sociology II.** Elements of finite probability theory; Bayesian analysis; mean, variance, and distribution of random variables; covariance and correlation; the binomial distribution; introduction to simple stochastic processes as models of social processes. Prerequisite: 526 or consent of instructor.
- 5-4 Quantitative Methods in Sociology III.** The logic of choosing and interpreting a statistic; association; inference and estimation; sample size; multi-variate association and correlation; Fortran II and the uses of the computer in sociological research. Emphasis will be given to problems of association. Prerequisite: 527 or equivalent.

529-4 Sociological Measurement. Organizing empirical data; choosing and interpreting a statistic; bi-variate association and correlation; inference and estimation. Prerequisite: consent of instructor or college algebra.

530-4 Research Design. Types of research design. Formulation of a research problem. Ecological research methods. Case studies, types of experimental designs. Management of research projects. Types of sampling. Prerequisite: 527 or equivalent.

531-4 Research Analysis. Content analysis. Classification, editing, coding, tabulation, and graphing. Analysis of descriptive research. Analysis of laboratory research. Errors and bias in research. Presentation of research findings. Prerequisite: 530 or consent of instructor.

532-4 Urban Social Structure. Theories of urban social structure and change, with emphasis on the comparative analysis of ecological and normative processes of integration and disintegration in modern urban communities.

533-4 Ecology of Human Communities. Spatial and temporal organization of population and institutions with special reference to the organization of rural and metropolitan communities. Emphasis on basic research methods and current sources of data in respect to type, structure, and growth of communities. Prerequisite: 15 hours of sociology or consent of instructor.

534-4 Seminar in Intergroup Relations. Cross-cultural study of inter-ethnic and inter-faith relations, with special attention to conflict, accommodation, acculturation and assimilation. Prerequisite: 15 hours of sociology or consent of instructor.

537-4 Sociology of Law. An analysis of the role of law in society. Special emphasis will be given to the relationships between law and social organization, social control, social value systems, and social change; consideration will be given to research in the field. Prerequisite: 15 hours of sociology or consent of instructor.

538-4 Seminar in Industrial Sociology. Selected aspects of industrial organization and related problems including such topics as: functional and dysfunctional deviations from ideal bureaucracy, promotion policies, labor relations, job aptitudes, job satisfactions, and public relations. Prerequisites: 15 hours of sociology and consent of instructor.

539-4 Sociology of Bureaucracy. Analysis of the structural characteristics and conditions for the emergence of bureaucratic and quasi-bureaucratic forms of organization. Attention to such problems as the bases of authority, stabilizing mechanisms, systems of formal and informal relations, rationality and paradox in bureaucratic organization; impact of bureaucratic organization upon character structure and its role in the formation of classes and elites. Prerequisites: 15 hours of sociology and consent of instructor.

542-4 Seminar on the Family. The family as a field of sociological study. Assessment of significant historical and contemporary writing. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

543-4 Seminar in Family Variability. An analysis of the structure, organization and function of the family in several contemporary and primitive societies. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

544-4 Seminar in Family Research. A detailed analysis of significant research in the field of the family. Special attention to methods employed; they relate to the specific problems investigated. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

545-4 The Family and Social Change. The significant social factors responsible for changes in the family. Analysis of representative writings from several periods. Prerequisite: 15 hours of sociology including 340 or consent of instructor.

561-4 Alcohol and Society. Analysis of the determinants of ranges of variation in drinking patterns, normal or pathological, viewed cross-culturally in the context of complex society. Special consideration will be given to the following: the ecology of drinking and alcoholism, drinking patterns and social structure, drinking centered subcultures and institutions, as well as the genesis and patterning of deviant drinking (alcoholism), responsive mechanisms and systems of control. Prerequisite: consent of instructor.

562-4 Deviance and Disorganization. Comparative study of the role of social, cultural, and psychological factors in the genesis of specific social pathologies exhibiting marked variation in group rates. Pathologies such as suicide, homicide, and alcoholism will be taken as illustrative. The strategic significance

the study of such phenomena for theories of social and personal disorganization will be considered in detail. Prerequisite: consent of instructor.

3-4 Research Problems in Deviance and Disorganization. For students who are concerned to develop viable research projects in the areas of social disorganization and deviant behavior. Students formulate and present original research prospectuses for critical evaluation. Consideration given to questions of theoretical relevance, research design, and appropriate techniques. Prerequisite: consent of instructor.

4-4 Social Factors in Mental Disorders. An examination of the role of social organization and structure in the emergence of mental disorders. Consideration given to pertinent theoretical and research contributions. Prerequisite: consent of instructor.

3-4 Community Organization and Disorganization. Nature of the community and community generating processes. Appraisal of consensus and allocation of power. Illustrative community case studies. Prerequisite: consent of instructor.

2-4 Seminar in Criminology. Critical study of important research and theoretical analyses. Prerequisite: consent of instructor.

3-4 to 12 Supervised Field Work in Corrections. Experience in state and federal institutions, probation and parole departments, juvenile courts, delinquency control programs, and public or voluntary agencies. Students registering will be required to attend orientation sessions prior to actual placement; enrollment should be discussed considerably in advance of experience to facilitate arrangements with agencies. Prerequisite: consent of instructor.

5-2 to 8 Individual Research in Community Development. Research designed to meet the professional objectives of the individual student. Prerequisite: major in community development.

5-12 (4,4,4) Seminar in Community Development. (a) Principles and technologies applicable to solving social problems in the context of community development. Laboratory period for field experience. (b) An intensive diagnosis of the dynamics involved in planned change in a social system and consultant's relationship to this process. (c) Focuses on a range of community development and community action models which deal with selected social practices necessary to the community development technician. Must be taken in a,b,c sequence. Prerequisite: 487 or consent of instructor.

5-2 to 6 Individual Research. Supervised research projects. Open only to graduate students with a major in sociology. Prerequisite: consent of instructor and chairman of department. Credit according to achievement.

5-2 to 12 Readings in Sociology. Supervised readings in selected subjects. Prerequisite: consent of instructor and chairman of department.

5-2 to 9 Thesis. Prerequisite: consent of chairman.

6-1 to 48 Dissertation. Prerequisite: consent of chairman.

Special Education

4-4 Techniques and Interpretation of Hearing Tests. (See Speech Pathology and Audiology 406.)

4a-4 Problems and Characteristics of the Emotionally Disturbed Child. Diagnosis, screening, classroom management, placement considerations, goals and the effective use of ancillary services. Emphasis on the understanding of adaptive behavior through principles of learning and behavior dynamics. Prerequisite: 414 or consent of instructor.

4b-4 Problems and Characteristics of the Mentally Retarded. Objectives, curriculum, methods, and materials of instruction for slow learners. Emphasis on the principles of learning as they can be applied to this group. Observations. Prerequisite: 414.

4c-4 Problems and Characteristics of the Gifted Child. Designed to help teachers in the identification of and programming for gifted and talented children. Prerequisite: Psychology 301 or 303 or consent of instructor.

4d-4 Problems and Characteristics of the Acoustically Handicapped Child. Consideration of psycho-social and educational aspects of deafness. History and attitudes of society. The impact of auditory impairment on language development, education and adjustment. Prerequisite: Psychology 301 or 303, or consent of instructor.

4e-4 Assessment and Remediation of Learning Disabilities. (Same as Guid-

ance 411.) Theories of special tests and remedial programs designed for children with specific learning disabilities of a perceptual or coordinative nature and who may demonstrate related adjustment problems. Prerequisite: 414 and consent of instructor.

413a-4 Directed Observation of Emotionally Disturbed Children. Student observation and participation in group and individual work with emotionally disturbed children. Often taken concurrently with 410a. Prerequisite: consent of instructor.

413b-4 Directed Observation of Mentally Retarded Children. Student observation and participation in group and individual work with mentally retarded children. 410b often taken concurrently. Prerequisite: consent of instructor.

413d-4 Directed Observation and Practice with Hard-of-Hearing Children. Student observation and participation in group and individual work with hard-of-hearing children. Often taken concurrently with 515. Prerequisite: consent of instructor.

414-4 The Exceptional Child. Physical, mental, emotional, and social traits of all types of exceptional children. Effects of handicaps in learning situations. Methods of differentiation and techniques for rehabilitation. Individual case studies used; observations and field trips. Prerequisite: Psychology 301 or 303 or consent of instructor.

415-4 Education of Acoustically Handicapped Children. Comparison of language development in hearing and acoustically handicapped children. Survey of established systems of teaching language to the deaf. Principles and techniques in developing concepts, vocabulary, and basic English structures: receptive and expressive oral and written language. Prerequisite: consent of instructor.

416-4 Introduction to Audiology. (See Speech Pathology and Audiology 416.)

419-4 Communication Problems of the Deaf and Hard of Hearing. (See Speech Pathology and Audiology 419.)

420a-4 Methods and Materials for Teaching Emotionally Disturbed Children. Offered in conjunction with practice teaching, dealing with methods and materials needed in teaching emotionally disturbed children.

420b-4 Methods and Materials for Teaching Mentally Retarded Children. Usually offered in conjunction with practice teaching, dealing with methods and materials needed in teaching educable mentally retarded in special education programs. Prerequisite: 410b and consent of instructor.

420d-4 Methods and Materials for Teaching Acoustically Handicapped Children. Methods, materials and techniques of teaching reading and elementary subjects to acoustically handicapped children in special education programs. Prerequisites: 410d and consent of instructor.

421-4 Speech for Acoustically Handicapped Children. A survey of methods in teaching oral language skill to acoustically handicapped children. Emphasis on use of visual, tactile, and kinesthetic sensory avenues in developing intelligible articulation. Voice and sentence rhythm, consideration of auditory training techniques in relation to speech development. Prerequisite: Speech Pathology and Audiology 200.

428-4 Speech Correction for the Classroom Teacher. (Same as Speech Pathology and Audiology 428.)

496-2 to 8 Readings and Independent Study in Special Education. Study of a highly specific problem area in the education of exceptional children. (Enrollment only to selected seniors and graduate students. Prerequisites: 414 and consent of staff.)

501-4 Special Research Problem. For majors and minors in the field of special education. Choosing and conducting research activities. The student to select a topic for research and present it, upon completion, to the staff. Prerequisite: consent of staff.

513-4 Organization, Administration, and Supervision of Special Classes. Emphasis upon the functions, underlying principles, and cautions to be observed in the organization and administration of special classes. The selection and training of teachers, problems of supervision, special equipment, transportation, cooperating agencies, and legal aspects of the problem. Prerequisite: 414.

515-4 Itinerant Teaching of Exceptional Children. Consultation and interviewing techniques for use with individual exceptional children, their parents, teachers and other school or agency personnel. Methods of individual and small group instruction. Emphasis on itinerant service for emotionally disturbed and hard-of-hearing children through separate concurrently scheduled lectures and demonstrations. Prerequisite: 410a,b, or d.

7-4 The Atypical Child and Social Agencies. A survey of social agencies contributing to the welfare and care of exceptional children. Emphasis given services rendered and to methods of contact and cost. Visits made to agencies and institutions. Specialists invited to appear before the class. Prerequisite: 414 or consent of instructor.

8-10 to 20 Workshops in Special Education. Promotes better understanding of the psychological and educational problems of children with learning and behavioral disorders. Specialists used as consultants. Open to graduate students majoring in education, guidance, or special education. (a) Education of children with learning and behavioral disorders. (b) Education of mentally retarded children. (c) Education of gifted children. (d) Education of acoustically handicapped children. (s) Administration of special education programs. Prerequisite: 414.

7-4 to 12 Practicum in Special Education. Supervised experience in school institution programs for atypical children. Special research project. Open to graduate students only. Prerequisites: 410a,b,c, or d and consent of staff.

0a-4 Seminar: Education of Maladjusted Children. Analysis of research, trends, and programs in the education of children who are emotionally disturbed, socially maladjusted, or have learning disabilities. For graduate students in special education only. Prerequisites: 414 and consent of instructor.

0b-4 Seminar: Education of Mentally Retarded Children. Analysis of research, trends, and programs in the education of children who are mentally retarded. Open to graduate students in special education only. Prerequisites: 414 and consent of instructor.

0d-4 Seminar: Education of Acoustically Handicapped Children. Analysis of research, trends and programs in the education of children who are deaf or hard-of-hearing. Open to graduate students in special education only. Prerequisites: 414 and consent of instructor.

0-4 Seminar: Education of Children with Mental Deviations. Critical review of administrative practices, research, theories and etiological factors relevant to programs in the education of children who are mentally retarded or gifted. Implications of research in related disciplines. Application of theories to practice. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

0-4 Seminar: Education of Physically Handicapped Children. Critical review of administrative practices, research theories and etiological factors relevant to programs in the education of children who are acoustically, visually, or orthopedically handicapped or those who, for medical reasons, must receive homebound instruction. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

5-4 Seminar: Education of Children with Learning and Behavioral Disorders. Critical review of administration practices, research theories, and etiological factors relevant to programs in the education of children who are emotionally disturbed, socially maladjusted, and/or have specific learning disabilities. Implications of research in related disciplines. Application of theories to practice. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

5-5 to 9 Independent Investigation. A field study required of each student working for the sixth-year specialists certificate. The work should be done in the setting of a school system where the student is employed or where full cooperation is extended. The study will involve selecting of the problem, surveying of pertinent literature, recording of results, and appropriate interpretations and summaries.

5-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

6-1 to 48 Dissertation.

Speech

General Speech: 408-4, 429-4, 440-4, 449-4, 450-12 (4,4,4), 520-3, 530-1 to 4, 532-4, 599-2 to 9, 600-3 to 48.

Cultural Interpretation of Poetry: 423-4, 424-4, 434-4, 523-3, 530-1 to 4, 599-2 to 9.

Rhetoric and Public Address: 407-8 (4,4), 417-4, 418-4, 425-3, 500-4, 504-3, 505-4, 508-4, 510-4, 524-3, 530-1 to 4, 599-2 to 9.

Speech Education: 406-4, 427-4, 511-3, 525-4, 530-1 to 4, 599-2 to 9.

4-4 Creative Dramatics. (Same as Theater 401.) Materials, techniques, and

procedures for conducting sessions in informal drama with emphasis upon contribution to the total growth and development of the child. Includes lectures, observations, student participation, and practice.

406-4 Teaching Speech in Secondary Schools. Philosophy of speech education, and effective teaching of speech through curricular and extra-curricular work. Prerequisite: 16 hours of speech.

407-8 (4,4) History of American Public Address. Critical studies of American speakers; selected speakers and speeches which reflect the dominant social and political ideas in American history. A lecture, reading, and discussion course. Parts may be taken independently.

408-4 Psychology of Speech. Nature and development of speech, its biological psychology, and the part speech plays in personality development.

417-4 Contemporary Public Address. A critical study of speakers and speeches selected to present the characteristic ideas of leading social and political developments in national and international affairs since 1918. A lecture, reading, and discussion course.

418-4 British Public Address. Study of British speakers to c. 1920. Selection of material governed by men and issues that affected British history.

422-4 Oral Interpretation of Prose. The study of reading of prose literature emphasizing the specific problems posed for the oral reader by this form. Prerequisite: 323, GSD 200, or consent of instructor.

423-4 Oral Interpretation of Poetry. The reading of poetry and the interpretation of the thought and emotional content of the poetry to the audience. Prerequisites: 103, 223.

424-4 Oral Interpretation of Dramatic Literature. Readings, selecting, cutting, and presenting various types of dramatic literature. Each student gives a final recital program of readings. Prerequisites: 103, 223.

425-3 Techniques of Discussion Leadership. Group discussion designed to clarify the functions and concepts of the leader in democratic society.

427-4 Secondary School Forensic Program. Coaching and organizational methods for forensic programs in school and college.

428-4 Communication Theories and Models. Survey, analysis, and criticism of contemporary theories and models of human communications with an emphasis on behavioral theories and models.

429-4 Experimental Studies in Oral Communication. Principles of research design accompanied by a critical examination of research in oral communication. Prerequisite: 428.

434-4 Lecture and Lecture-Recital. Study of professional work on the public platform which is climaxed by a lecture or recital of a professional nature. Prerequisite: 12 hours of public speaking, interpretation, or theater.

435-4 Studies in Organizational Communication. Communication systems and behavior within formal organizations. Focused on theory and research of informational and directive communication as related to channels, structure, status, involvement, morale, and leadership. Prerequisite: 303.

440-4 Advanced Phonetics. Phonetic theory. Materials and methods of linguistic geography. Prerequisite: 200.

441-4 Teaching Speech in Elementary Schools. Study of oral language development in children, analysis of their speech needs, and methods of teaching speech in elementary schools with emphasis on speech improvement and development of basic speech skills.

449-4 General Semantics. Means of changing implications so that language, in spoken or written form, describes the life facts.

450-12 (4,4,4) Laboratory in Interpersonal Communication. Communication viewed as a process of relating and evaluating. Applications of and related philosophy, methodology and research to the functioning of the class itself through various speech activities. The course encompasses the common problems of communication behaviors relevant to the chief communication specialties.

500-4 Survey of Classical Rhetoric. Ancient rhetoricians and orators from Corax to Augustine, with special emphasis upon the works of Aristotle and Cicero. Lectures and special studies.

501-10 NDEA Institute in Oral Language. Provides the best possible responses in terms of staff practices and materials in order to prepare teachers to meet the oral language needs of all elementary school children.

504-4 Medieval and Renaissance Rhetoric. An examination of the trends in rhetorical theory between A.D. 100 and 1600 designed to facilitate understanding of the transition from classical to modern theory.

505-4 Modern Rhetorical Theory. An analysis of selected theories of public

Address from the seventeenth century to the present, with a view of discovering the methods and objectives of modern rhetoricians and relating them to society and its problems during the period.

07-6 (3,3) **Studies in Public Address.** The study of orators, oratory, issues and movements in terms of implications for rhetorical theory and current concepts of communication. Prerequisite: 407a,b.

08-4 **Seminar: Studies in Discussion.** Studies in group thinking and group action with a view to improving discussion and conference techniques.

10-4 **Seminar: Persuasion and Social Control.** Uses and applications of persuasion in the various fields of social activity. Mass media examined as they apply to politics, business, religion, and education.

11-4 (2,2) **Teaching the College Speech Course.** Problems, methods, and materials in the teaching of speech in college with primary emphasis on the basic course. Examination of textbooks, courses of study, curriculum making, measurement, and relationship to other fields.

10-3 **Philosophical Foundations of Speech.** A special course reviewing the philosophy of speech for graduate and advanced students. Designed to take advantage of the knowledge and background of distinguished visiting professors.

13-3 **Seminar: Problems in Interpretation.** An investigation of the more advanced problems in oral interpretation, such as creation of atmosphere, use of restraint, impersonation, and impressionism. Prerequisites: 18 hours in interpretation and theater and consent of instructor.

14-6 (3,3) **Problems in Rhetoric and Public Address.** Rhetorical theory and criticism of public address examined. Classical and contemporary theory and practice studied.

15-4 **Seminar: Speech Education.** Problems of philosophy and methods of teaching speech in the elementary and secondary schools. Prerequisite: 306 and consent of instructor.

16-3 **Seminar in Theater Arts.**

17-3 **The College Forensic Program.** Individual studies of the problems encountered in the organization and direction of the college forensic program.

12-4 (2,2) **Areas and Techniques of Research in Speech.** Study and analysis of outstanding works in the various areas of research. Lectures on research techniques and study possibilities in the field.

10-4 **Seminar: Experimental Communications Research.** Types of quantitative research and methods of observation and data collection most relevant to the study of human communication. Prerequisite: 428, 429, and two courses in statistics.

12-4 **Seminar in Non-quantitative Research Methods.** Survey and critical analysis of non-quantitative approaches to the study of communication, particularly relating to methods of observation, data collection, and interpretation. Emphasis on case and field studies. Prerequisite: 410.

9-2 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.

10-1 to 48 **Dissertation.** Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Speech Pathology and Audiology

10-1 to 4 **Independent Study in Speech Pathology and Audiology.** Activities involved shall be investigative, creative, or clinical in character. Must be arranged in advance with instructor. May be repeated for as much as 6 hours of credit.

15-12 (4,4,4) **Practicum in Speech and Hearing Therapy.** Clinical and school procedures in speech correction and audiology. One hour of class per week, and 2 hours of clinical activity or work on clinically related projects for each hour of credit. (a) Emphasizes therapeutic procedures. (b) Emphasizes diagnostic techniques. (c) Emphasizes the utilization of forms and the preparation of reports. Need not be taken in sequence, but a,b or c cannot be related. Prerequisite: junior standing in department.

16-4 **Techniques and Interpretation of Hearing Tests.** (Same as Special Education 406.) Principles and techniques of testing the hearing and interpreting those tests in terms of the individual's needs. Prerequisite: 416 or consent of instructor.

19-4 **Research Techniques in Speech Science.** A presentation of the research techniques used in speech science with particular emphasis on equip-

ment, experimental design, and study of significant research contributions to the field. Prerequisite: advanced standing or consent of instructor.

412-4 Cerebral Palsy. An investigation of the etiology, problems, and therapy of cerebral palsy. Prerequisites: 212, 414 or consent of instructor.

414-4 Anatomy and Physiology of Speech and Hearing Mechanisms. (Same as Physiology 414.)

415-4 Aphasia. An investigation of the etiology, problems, and therapy of aphasia. Prerequisite: 412, 414 or consent of instructor.

416-4 Introduction to Audiology. Provides the student with a basic orientation to the professional field of audiology, its history and its goals. Basic acoustics, the phylogeny, anatomy and physiology of the human ear, and significant pathologies of the ear are presented. Prerequisite: junior standing or consent of instructor.

419-4 Communication Problems of the Deaf and Hard of Hearing. (Same as Special Education 419.) Objectives and techniques for the teaching of reading, speech conservation, and auditory training. Prerequisite: 406 or consent of instructor.

420-4 Advanced Clinical Audiometry. Principles and procedures for advanced audiometric testing, advanced problems in bone conduction measurements, evaluation of loudness recruitment, in topodiagnostic audiometry, and non-organic hearing loss are presented. Practical techniques include speech audiometry, Bekesy audiometry, conditioned pure tone electrodermal audiometry, and use of the Zwislocki Acoustic Bridge. Prerequisites: 416 and 406 or consent of instructor.

428-4 Speech Correction for the Classroom Teacher. (Same as Special Education 428.) Etiology and therapy of common speech defects. This course may be taken by all inservice teachers, seniors, and graduate students in education.

515-1 to 4 Readings in Speech Pathology and Audiology. Supervised and directed readings in specific areas of speech pathology.

516-4 Seminar in Psychoacoustics. Advanced study of the behavioral response of the human hearing mechanism to the various parameters of the acoustic stimulus; threshold sensitivity, loudness, pitch, localization, modulation, binaural and masking. Prerequisites: 406, 416, 520.

520-4 Seminar in Physiological Acoustics. Advanced study of the physiological responses of the middle and inner ear to the acoustic stimulus. Theories of middle ear function and of cochlear function are presented in detail. Prerequisites: 416, 406.

521-1 to 4 Seminar in Articulation and Delayed Speech. Special problems in language development and articulation.

522-4 to 16 (1 to 4 each) Seminar in Organic Speech Problems. (a) Developmental anatomy and physiology. (b) Teratology, surgery, and dentistry. (c) Neuropathological bases. (d) Clinical management. Must be taken in a,b,c,d sequence or by consent of instructor. Prerequisite: graduate standing in department.

524-4 Seminar in Language Disorders. Examination of language disorders associated with childhood. Procedures for the evaluation of aberrant language development in clinical populations in contrast to the linguistic development of normal speakers. Includes study of current psycholinguistic research on factors affecting the acquisition of phonological, syntactical, and morpho-phonemic rules of English. Practicum in language diagnostics and therapeutics.

528-4 Seminar in Experimental Audiology. Basic psychophysical methods, basic operating principles of electronic equipment, and the use of laboratory sound-production and measurement equipment will be presented. Students will design and perform model psycho-acoustic experimentation. Prerequisites: 520 and 516, or consent of instructor.

529-3 to 12 (1 to 4 each) Seminar in Stuttering Behavior. (a) Emphasis on theoretical analysis, (b) emphasis on diagnostic techniques, (c) application of principles to therapy. Must be taken in a,b,c sequence or by consent of the instructor.

530-1 to 4 Research Problems in Speech Pathology and Audiology. Individual work upon selected problems for research.

531-1 to 4 Seminar in Experimental Phonetics. An investigation into the experimental approaches for the study of the phenomena of speech.

533-1 to 4 Seminar in Speech Science. Special problems in voice science and acoustic perception.

34-1 to 4 Seminar in Instrumentation. Familiarity with instruments, their uses, capabilities, and limitations, as they apply to the study of speech and hearing.

36-1 to 4 Seminar in Administration of Speech and Hearing Programs. A study of program settings, organizational procedures, and professional inter-relationships in adult speech and hearing therapy. Field trips to rehabilitation centers and related agencies.

99-2 to 9 Thesis.

00-1 to 48 Dissertation.

Technical and Industrial Education

08-3 Teaching Aids in Technological Education. Selection, development, analysis, cataloging, and use of commercial and self-made instructional aids and devices.

19-8 to 16 Student Teaching in Technical Programs. Experience in working with special and post-high school technical training programs in approved centers. The student teacher will follow the program of the supervisors of the primary specialization in both regular and extra-class activities. Prerequisite: 9 hours professional courses.

20-8 (4,4) Enterprise: The Man-Machine System. Classroom, laboratory, and library study of man-machine systems in a variety of industries and institutions, with emphasis on teaching children and youth to understand the world of work. For advanced students and experienced teachers. Must be taken in a,b sequence. Prerequisite: 20 hrs. in Technical and Industrial Education.

21-3 Principles of Enterprise Teaching. Problems and special methods of teaching in enterprise education programs. Prerequisite: 16 hours technical and industrial education courses.

22-3 Curriculum Development in Enterprise. Selection, development, and valuation of content, methodology, and hardware and software instructional systems for programs about man and technology. For advanced students and experienced teachers. Prerequisite: 20 hours technical and industrial education courses.

25-2 to 8 Practicum in Technology. Experiences in the industrial applications of technological knowledge. Cooperative arrangements with selected corporations and professional organizations provide opportunity to study technical problems in the industrial environment under the direction of specialists. Prerequisite: 12 hours in technical subjects.

30-2 to 8 Special Problems in Industry and Technology. Special opportunity for students to obtain assistance and guidance in the investigation and solution of selected technical problems. Prerequisite: consent of instructor.

35-6 to 18 Manual Arts Internship. Supervised hospital experience featuring various applications of manual arts therapeutical treatments. Prerequisite: consent of coordinator.

50-1 to 12 (1 to 4 per quarter) Advanced Skills in Technical Subjects. Modern industrial practices and techniques in various selected technical fields. For experienced persons seeking an opportunity to develop advanced techniques and to increase understanding in specialized industrial fields. Emphasis on modern industrial processes, methods, materials, and techniques used in school shops, drafting rooms, and industrial organizations. Prerequisite: basic training in area selected for study. Limited to certified teachers.

65-8 (4,4) Industrial Safety. (See Engineering Technology 465.)

80-3 Curriculum Development in Industrial Arts Education. Selection, development, and analysis of new concepts in technology, man, and enterprise or use in the schools. New methodology and apparatus for teaching are developed. For advanced students and experienced teachers. Prerequisite: 30 hrs. in TIED.

85-3 Principles and Philosophy of Vocational and Technical Education. Same as Agricultural Education 485, Agricultural Industries 485, Home Economics Education 485, Secondary Education 485, and Secretarial and Business Education 485.) Team teaching used. Gives an understanding of the nature and purposes of practical arts, vocational and technical education, their relationships and differences, and the place of each in preparing people for the world of work. Prerequisite: student teaching.

- 488-3 Analysis for Occupational Education.** Fundamentals of analyzing occupations and careers for establishing units of instruction for occupational education courses. Required for occupational teachers, coordinators, and supervisors. Prerequisite: 12 hours in teaching specialty.
- 489-3 Organization of Subject Matter.** Course and unit construction, preparation of materials for distribution to students, preparation of teacher-made tests, course evaluation and updating. Prerequisite: 488.
- 490-3 Principles of Occupational Teaching.** Methods of teaching in occupational education programs. Required for occupational teachers, coordinator and supervisors. Prerequisite: 12 hours in teaching specialty.
- 500-8 (4,4) Legislation, Organization, and Administration of Occupational Education.** (a) Historical and contemporary thought and practice re federal and state legislation for occupational education in sundry institutions. Legislators are used as resource persons. Required for supervisors. (b) Policies governing the organization and administration of programs in states and local agencies. Students write a proposal for a new program. Must be taken in a,b sequence.
- 502-6 (3,3) Measurements and Evaluations of Products and Procedure Criteria** and instrument development, testing techniques, and appraisal. Special emphasis given to the principles and methods of evaluation of progress in laboratory and shop subjects of a practical arts nature. Experience in development and construction of pertinent and effective evaluative devices. Prerequisite: one course in tests and measurement.
- 505-4 Administration and Supervision of Industrial Education.** Principles, practices, and techniques relating to supervising and administering local programs. Required for vocational coordinators and supervisors.
- 506-4 Cooperative Programs.** Problems and procedures involved in setting up and operating cooperative work-study programs. Required for vocational coordinators.
- 510-4 Planning Occupational Education Facilities.** Principles and practices in planning classrooms and laboratories for occupational education programs. How to work with administrators, staff, and paid professionals to assure judicious location and design of facilities.
- 525-3 Interrelated Vocational Cooperative Education.** (Same as Agricultural Education 525, Agricultural Industries 525, Home Economics Education 525 and Secretarial and Business Education 525.) Team teaching used. Interrelated cooperative programs as they are developed in America, and especially Illinois, are presented. Coordinators' duties and responsibilities along with the operation of interrelated vocational cooperative programs are featured. Prerequisite: student teaching.
- 540-2 to 6 Research in Technological Education.** Basic research methods and techniques in the design, investigation, and reporting of research studies relating to technology and technological education.
- 541-4 Occupational Information and Guidance.** Designed for school counselors, industrial supervisors, and teachers to give them orientation to and experience with occupational information and vocational adjustment.
- 550-4 College Teaching of Industrial and Technical Subjects.** Problems of college students and their adjustments to college-level industrial and technical subject-matter. Organization of instructional materials; methods of instructional organization and administration of college laboratory facilities; and the professional problems, ethics, and advancement of college technical teachers.
- 560-2 to 12 (2 to 8 per quarter) New Developments in Technological Education.** An intensive course designed to acquaint graduate students and teachers with the most recent and significant developments, pressing problems, and emerging trends in the industrial education and technical fields. Selected subjects will be considered by recognized authorities in the field, who will present their ideas and conduct discussions on the selected topics.
- 570-2 to 6 Special Investigations.** (Same as Applied Science 570.)
- 580-1 to 9 Seminar.** (Same as Applied Science 580.)
- 599-1 to 9. Thesis.**

Theater

- 401-4 Creative Dramatics.** (See Speech 401.)
- 402-8 (4,4) Play Directing.** (a) The principles and procedures of play direction including play selection, interpretation, and the patterning of auditions.

- and visual stimuli. (b) Continuation of 402a emphasizing rehearsal procedures, control of tempo and mood, styles of presentation and performance, and other techniques in the direction of plays.
- 403-4 Aesthetics of the Drama and the Theater.** Principles and practice of modern dramatic production in the light of modern aesthetic theory. A course attempting to formulate an aesthetic judgment of the theater.
- 404-4 Theater Management.** Theater operational procedure, including both fundamental structuring and house management. The former aspect includes administration, purchasing, and accounting practices, ticket sales, publicity, promotion, and public relations. The latter covers the management of box-office and ushering.
- 405-8 (4,4) The Scenic Imagination.** (a) A study of the purely creative side of stage production. It includes an analysis of the script and its meaning for an audience; a poetic evaluation of the setting, costumes, and lighting; and the blocking out of the stage action. (b) Theater research and documentation; an approach to sketches and models; a review of the historic forms of staging, with emphasis on the modern styles from naturalism to epic theater.
- 406-1 American Professional Theater Procedures and Practices.** An introduction to the everyday realities of a professional stage career, including problems of survival, professional ethics and protocol, personal relations, and the function of stage unions.
- 409-4 High School Theater and Its Production Problems.** Consideration of stages, machinery, equipment, light controls and instruments, production techniques, and analysis of basic needs of high school theater.
- 410-3 Children's Theater.** Creative dramatics; dramatization of children's literature; play production for elementary schools. Recommended for educational concentrations.
- 411-4 Playwriting.** The writing of a full-length play, a children's play, or a historical pageant-drama forms the basis of the course. Students may elect to write two one-act plays. Individual conferences supplement the class discussion and analysis of student writing. Prerequisite for graduate students: consent of instructor.
- 412-4 Stage Design.** The design of settings for the stage and other dramatic media. Prerequisite: 207.
- 414-4 Costume Design.**
- 415-4 Advanced Costume Design.**
- 416-4 Current Theories and Practices in the Teaching of Dance.** (See Physical Education 416.)
- 417-4 Advanced Acting.** Lectures, readings, and practical application dealing with advanced studies of characterizations and acting styles on an individual basis. Prerequisite: 217, 317.
- 432-4 Stage Lighting.** Instruments and control equipment; principles and techniques of lighting dramatic productions.
- 438-4 Contemporary Developments in the Theater.** Critical study of theory and practice in acting, directing, production, and architecture in the modern theater. The rise and development of the film, radio, and television as dramatic media.
- 4402-4 Advanced Directing.** Study of and practice in the techniques of directing period plays, verse plays, music dramas, arena productions and other types and styles of plays presenting special directing problems.
- 4403-12 (4,4,4) Advanced Technical Problems.** Solutions of problems presented by certain types of plays and modes of production. (a) Scene design. (b) Stage lighting and sound. (c) Costume design. Prerequisite: consent of department.
- 4404-4 The Comic Theater.** A study of comedic theory as applied to major types of dramatic composition. Dramatic theories of comedy from Aristotle to Freud are explored. Individual reports.
- 4405-4 The Tragic Theater.** An examination of tragic drama and criticism as related to the societies which produced such drama. Particular emphasis is placed upon the Athenian, Elizabethan and modern theater.
- 4406-4 The American Theater.** The study of the development of the drama and the theater in the United States from colonial times to the present. Prerequisite: 313 or its equivalent.
- 4409-4 The High School Theater and its Production Problems.** Consideration of stages, machinery, equipment, light controls and instruments, production techniques, and analysis of basic needs of high school theater.
- 4418-4 Theater Audience.** A course attempting to determine (1) the relations

between the drama, *mise-en-scene*, and theater audience; and (2) the psychological nature of the spectator's experience in the theater.

519-1 to 12 Theater Practicum. Practical experience in acting, directing, and associated work on campus, on area tours, and in summer stock.

526-3 to 12 Seminar in Theater Arts. Special problems of interest to advanced students. Subject is determined by the instructor. Seminar in same subject cannot be repeated. Prerequisite: consent of department.

530-1 to 4 Research Problems in Theater. Individual work upon selected problems for research.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Zoology

400-2 Animal Taxonomy. The concepts of taxonomy and their use in zoology. Prerequisite: one year of biology or consent of instructor.

401-5 Genetics. Principles of inheritance, including genetic mechanism, mutation, and selection. Prerequisites: 15 quarter hours of biological science and consent of instructor.

402-4 Natural History of Invertebrate. Observation, identification, and life histories. Designed for teachers. Not for students specializing in invertebrate zoology. Prerequisite: one year of zoology including 102.

403-4 Natural History of Vertebrate Animals. Observation, identification, and life histories. Designed for teachers. Not for students specializing in vertebrate zoology. Prerequisite: one year of zoology including 103.

404-2 to 8 Zoology Field Studies. A trip of four to eight weeks to acquaint students with animals in various environments and/or with methods of field study, collection, and preservation. Cost per individual will be approximately \$25 per week. (Only 4 hours may be used for credit.) Prerequisite: consent of department.

406-4 Protozoology. Taxonomy, cytology, reproduction, and physiology of unicellular animals including laboratory methods of culturing. Prerequisite: one year of zoology including 102 or consent of instructor.

407-5 Parasitology. Principles, collection, identification, morphology, life histories, and control measures. Prerequisite: one year of zoology including 102.

408-4 Herpetology. Taxonomic groups, identification, and natural history of amphibians and reptiles. Prerequisite: one year of zoology including 103.

409-5 Histology. Microscopic structure of organs and tissues with emphasis on mammalian forms. Prerequisite: 202.

410-5 Vertebrate Paleontology. History of vertebrate animals in terms of their morphological change, geological succession, and ecological relationships. Prerequisite: 202 or Geology 301.

413-5 The Invertebrates. Structure, development, and natural history of invertebrates, except insects and parasites. Prerequisite: one year of zoology including 102.

414-4 Fresh-Water Invertebrates. Taxonomic groups, identification, and natural history of the regional fauna. Prerequisites: one year of zoology including 102.

415-4 Limnology. Lakes and other inland waters, the organisms living in them, and factors affecting these organisms. Prerequisite: one year of zoology, including 102.

441-4 Developmental Biology. Principles of development and organization. Prerequisites: 300 and one course in cellular physiology, or consent of instructor.

459-4 Game Birds. Natural history and management. Prerequisite: one year of zoology including 103.

461-4 Mammalogy. Taxonomic groups, identification, and natural history of mammals. Prerequisite: one year of zoology including 103.

463-4 Wildlife Management. General survey of management techniques. Prerequisites: one year of biological science, consent of instructor.

465-4 Ichthyology. Taxonomic groups, identification, and natural history of fishes. Prerequisite: one year of zoology including 103.

466-4 Fish Management. Sampling, dynamics, and manipulation of fish populations, age and growth of fishes, and habitat improvement. Prerequisite: one year of biological science, consent of instructor.

467-4 Ornithology. Classification and recognition of birds and the study of

their songs, nests, migratory habits, and other behavior. Cost of field trips is \$5 to \$10 per student. Two lectures and 4 laboratory hours per week. Prerequisite: one year zoology including 103.

471-4 Entomology. Structure, classification, and life histories of insects. Two lectures and 4 laboratory hours per week. Prerequisite: 102.

508-4 Helminthology. Identification, structure, physiology, and life history of parasitic worms. Prerequisite: consent of instructor.

512-3 Animal Geography. Principles of the distribution of the animals of the world. Prerequisite: consent of instructor.

514-4 Advanced Entomology. Morphology, physiology, systematics, and distribution of insects. Prerequisite: 471.

520-5 Advanced Invertebrates. The nature and life of invertebrate animals with emphasis on comparative form, function, behavior, and occurrence. Prerequisite: consent of instructor.

521-4 Advanced Limnology. The physical, chemical, and biological factors affecting organisms in streams. Emphasis on the effects of pollution. Prerequisite: 415 and consent of instructor.

525-5 Cytology. (Same as Botany 525.) Microscopic study of protoplasm, including mitosis and meiosis; discussions of cytological behavior. Prerequisite: consent of instructor.

540-3 Factors in Animal Reproduction. Genetic and physiological factors in determination, differentiation, and modification of sex in animals. Prerequisite: consent of instructor.

542-3 Osteology. Modification of the vertebrate skeleton as a result of growth, functional adaptation, and phylogenetic relationship. Prerequisite: consent of instructor.

561-4 Game Mammals. Natural history and management. Prerequisite: consent of instructor.

566-4 Fish Culture. Production of game, food, and bait fishes. Design of facilities, chemical and biological variables, spawning techniques, diseases and nutrition. Prerequisite: consent of instructor.

577-3 Population Ecology. Principles of population dynamics as related to animals. Prerequisite: consent of instructor.

578-4 Population Genetics. Genetic structure of populations, factors causing changes, and principles governing rate and direction of change. Prerequisite: consent of instructor.

579-4 Animal Behavior. (Same as Psychology 579.) The biological basis for the actions and responses of animals. Prerequisite: consent of instructor.

580-4 Advanced Systematics. The implication of systematics, including the theory and dynamics of classification, speciation, population genetics, and evolution. Prerequisite: consent of instructor.

581-3 Readings in Current Zoological Literature. Prerequisite: graduate status in a biological science.

582-6 (1,1,1,1,1,1) Graduate Zoology Seminar. Special topics in zoology. Consult department for each term's topic.

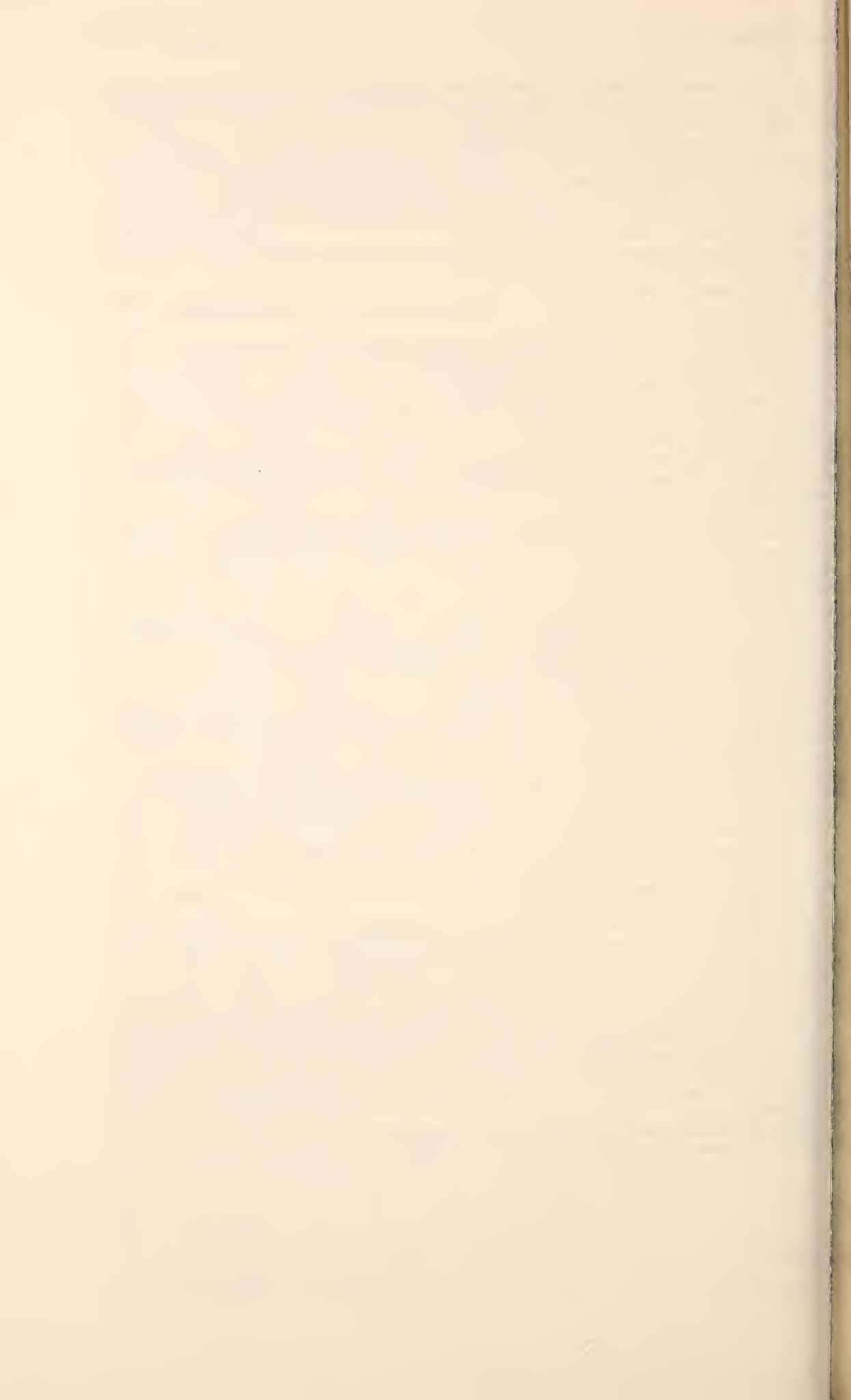
583-3 (1,1,1) The Teaching of Zoology in College. Methods, practices, and objectives in teaching zoology. Designed as part of the apprenticeship program for preparation of college teachers. Prerequisite: graduate status in a biological science.

585-7 to 21 (Each Section 1 to 3) Seminar. (a) Seminar in animal behavior. (b) Seminar in developmental biology. (c) Seminar in ecosystems. (d) Seminar in wetland ecology. (e) Seminar in wildlife ecology. (f) Seminar in ornithology. (g) Seminar in parasitology. Prerequisite: consent of instructor.

596-2 to 12 Special Research. Investigations in zoology other than those for degrees. Only 3 hours may be credited toward a degree. Prerequisite: consent of instructor.

599-2 to 9 Research and Thesis. For master's degree.

600-3 to 48 Research and Dissertation. For Doctor of Philosophy degree.



4 / Faculty

Graduate Instruction at Southern Illinois University is the responsibility of the faculty. Although the Graduate Faculty is not organized into departments, its members are normally affiliated with specific disciplines. Preceding the Graduate Faculty is a list of faculty members elected to the Graduate Council for the year 1969-1970.

The Graduate Council

John Andresen, Professor and Chairman of the Department of Forestry
William Bennewitz, Associate Professor of Mathematics
Gordon Bliss, Associate Professor of Teacher Education
David Christensen, Professor of Geography and Assistant Dean of the College of Liberal Arts and Sciences
Milton T. Edelman, Professor of Economics and Chairman of the Council
Marvin E. Johnson, Professor of Technology and Assistant Dean of the School of Technology
Harold M. Kaplan, Professor and Chairman of the Department of Physiology
K. Leasure, Professor and Chairman of the Department of Plant Industries
Don A. Livingston, Associate Professor of Business Administration
Allan McCurry, Associate Professor of History
John M. H. Olmsted, Professor and Chairman of the Department of Mathematics
Charles E. Richardson, Professor of Health Education
John A. Richardson, Professor of Art
Milton Russell, Associate Professor and Chairman of the Department of Economics
Eric Sturley, Professor of Mathematics
Howard Webb, Professor and Chairman of the Department of English

College of Liberal Arts and Sciences

Anthropology

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Associate Professors Milton Altschuler, Jerome S. Handler, Bruce B. MacLachlan
Assistant Professors D. Lee Guemple, Joel Maring, Roy Wagner, Jon D. Muller

Botany

Professors William C. Ashby, William D. Gray, Robert H. Mohlenbrock (*Chairman*), L. V. Olah, Jacob Verduin, John W. Voigt
Associate Professors Margaret Kaeiser, Oval Meyers, Jr., Aristotel Pappelis, Walter E. Schmid
Assistant Professors W. Hardy Eshbaugh, Lawrence Matten, Donald R. Tindall

Chemistry

Professors Richard T. Arnold (*Chairman*), Roger E. Beyler, James BeMiller, Elbert H. Hadley, Robert W. MacVicar, Cal Y. Meyers, Boris Musulin, Kenneth Van Lente, John Wotiz
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Research Professor Harry T. Moore

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Visiting Professor T. W. Baldwin

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Assistant Professor Sam Hilliard, John Rooney

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Associate Professors Jen-Ho Fang, William C. Hood, John E. Utgaard (*Acting Chairman*)

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Wallace, John Wharton
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anne Webb, Kent Werner

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Visiting Professor Hazel Thompson

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Instructors E. Robert Ashworth, Dale H. Besterfield

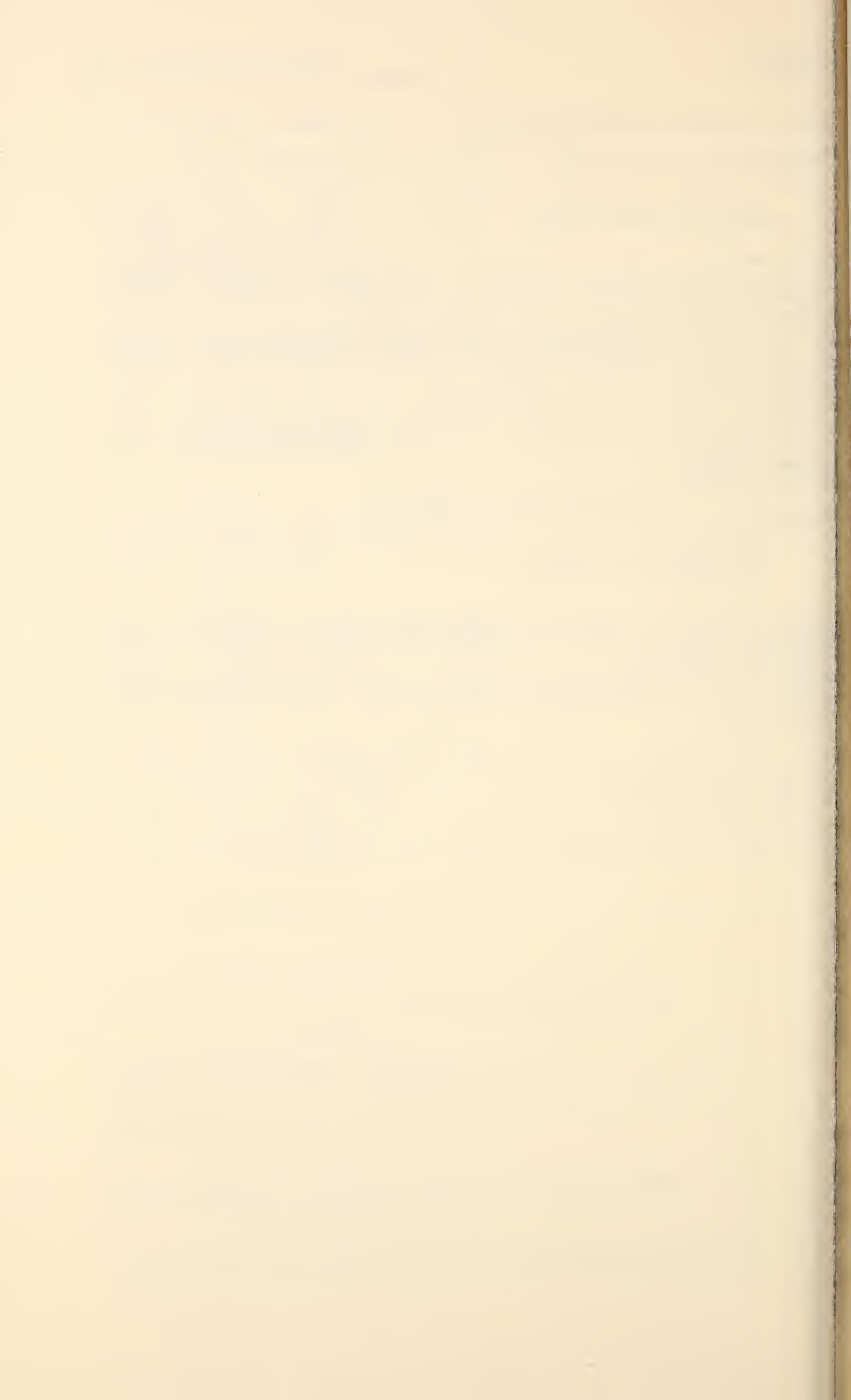
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Associate Professors John E. Grenfell, B. L. Hopkins, Joseph P. Miranti, Richard M. Sanders

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