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GRADUATE SCHOOL CALENDAR FOR 1966-67

1966 FIRST SEMESTER

Sept. 11, 12, 13, Sun., Mon., Tues.	New Student Days
Sept. 14, 15, Wed., Thurs.	Registration
Sept. 16, Fri.	Beginning of classes
Oct. 3, Mon.	Last day to register in a course
Oct. 14, Fri.	Last day for submitting graduation cards
Oct. 15, Sat.	Hobo Day, University of North Dakota
Oct. 17, Mon.	No classes
Oct. 18, Tues.	Last day for make-up exams for removal of incompletes
Nov. 11, Fri.	No classes, Veteran's Day Recess
Nov. 14, Mon.	Mid-semester report due
Nov. 21, Mon.	Last day a course may be dropped without a grade
Nov. 23, Wed.	Classes close at 12:30, Thanksgiving recess
Nov. 28, Mon.	Classes resume
Dec. 22, Thurs.	Last day of classes before Christmas recess

1967

Jan. 4, Wed.	Classes resume
Jan. 20, 21, 23, 24, 25, Fri., Sat., Mon., Tues., Wed.	Semester exams
Jan. 27, Fri.	Grades due at noon
Jan. 28, Sat.	Graduation 10:00 a.m.

1967 SECOND SEMESTER

Jan. 30, Mon.	Registration at 1:00 p.m.
Jan. 31, Tues.	Registration
Feb. 1, Wed.	Beginning of classes
Feb. 15, Wed.	Last day to register in a course
Mar. 1, Wed.	Last day for submitting graduation cards
Mar. 2, Thurs.	Last day for make-up exams for removal of incompletes
Mar. 22, Wed.	Mid-semester reports due
Mar. 22, Wed.	Last day of class before Easter recess
Mar. 28, Tues.	Classes resume
Mar. 29, Wed.	Last day a course may be dropped without a grade
May 26, 27, 29, Fri., Sat., Mon.	Semester exams
May 30, Tues.	No classes, Memorial Day recess
May 31, Wed.	Semester exams
June 1, Thurs.	Semester exams
June 3, Sat.	Grades due at noon
June 4, Sun.	Eighty-first Annual Commencement 7:15 p.m.

1967 SUMMER SESSION

June 6, Tues.	Registration
June 7, Wed.	Beginning of classes
July 4, Tues.	Independence Day, a holiday
July 28, Fri.	Summer Session closes at 5:00 p.m.
July 29, Sat.	Graduation 10:00 a.m.

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GRADUATE FACULTY

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The Graduate School

GENERAL INFORMATION

An act of the Territorial Legislature, approved in 1881, provided for the establishment of what is now South Dakota State University. The institution granted its first Master of Science degree in 1891, its first Master of Education degree and its first Doctor of Philosophy degree in 1958. All graduate work was supervised by a committee until 1957, when the Graduate School was established.

A Graduate Council having seven members elected from the Graduate Faculty assists the Dean in the administration of the affairs of the school. This council is composed as follows: The Graduate Dean (chairman); two members from the area of biological science; two members from the area of physical science; two members from the area of social science; and one member from the area of education.

The Graduate Faculty is composed of the college president, academic deans, heads of departments in which graduate courses are given and other faculty members chosen, on the basis of their training and experience, in accordance with the policies of the Graduate School. All matters of policy and standards are acted on by the Graduate Faculty. In addition, Graduate Faculty members are authorized to serve as advisers to graduate students or on their examining committees and to teach courses for graduate credit.

This bulletin deals only with the graduate programs of the institution. For descriptive material regarding undergraduate programs and for general information concerning South Dakota State University, refer to the General Catalog issued by the Office of Admissions and Records. Information concerning summer school programs is published in the Summer Session Bulletin which may be obtained from the Graduate Office or from the Office of Admissions and Records.

ADMISSION TO THE GRADUATE SCHOOL

All students taking work beyond the Bachelor's degree, whether or not they intend to work for an advanced degree, are classified as graduate students. Before enrolling in any course, they must have been admitted to the Graduate School. (The exception to this is the case where a student with a Bachelor's degree enters school to work toward an additional Bachelor's degree. In this case, admission is obtained through the Office of Admissions and Records.)

To make application, a form supplied by the Graduate Office must be submitted to that office at least one month prior to the opening of the term in which the applicant first expects to enroll as a graduate student. With the application, the following must also be provided:

1. One official transcript of undergraduate coursework.* This applies to graduates of South Dakota State University as well as to graduates of other institutions. If some graduate work has been taken at another institution, one official transcript must be supplied for this also, even though the applicant may not wish to apply some of this work toward a degree here. For those making application prior to obtaining their Bachelor's degree, an incomplete transcript will be filed with the application. A completed transcript must then be filed during the first term in which the student takes graduate work.
2. A matriculation fee of \$5.00 (five dollars).*

*Graduates of South Dakota State University who do not intend to work toward an advanced degree need furnish no transcript. Applicants who have at any time previously attended South Dakota State University need pay no matriculation fee.

3. A report of physical examination. This is required of those who wish to use the Student Health Service and of all applicants from foreign countries.
4. In addition to the above, students from foreign countries must also send the following with their applications:
 - a. Two letters of recommendation from persons acquainted with the applicant expressing their opinion of the applicant's ability to do satisfactory graduate work in the chosen field. These letters may be sent directly to the Graduate School office by the person writing them, or they may accompany the application in a sealed envelope.
 - b. A statement as to whether financial assistance will be required from this institution.
 - c. Evidence that the applicant has knowledge of the English language adequate to allow for the satisfactory accomplishment of the work required of graduate students at this institution. A report of examination by the United States Consular Office is suggested here.

Note: Students from foreign countries should file their applications at least four months in advance of the beginning of the first term in which they expect to register.

After an application for admission and supporting documents are received, they are reviewed by the department or committee concerned. Using the recommendations from the department or committee, the Dean of the Graduate School acts on the application. He then notifies the applicant, the department or committee concerned, and the Office of Admissions and Records of his decision.

Admission to the Graduate School requires that the applicant be a graduate of or a candidate for a degree from South Dakota State University or other institution of higher learning. The institution must be one of recognized standing whose requirements are substantially the same as those of the department(s) of South Dakota State University in which the advanced degree will be taken. Other requirements and conditions are given below.

Admission Without Conditions

To be admitted without conditions, the applicant must have already earned the Bachelor's degree, must have satisfactorily completed all undergraduate prerequisites for the major and minor fields of study, and must have an average grade of "B" (3.0 based on A=4, B=3, C=2, D=1) or better for the last two academic years of undergraduate work for which grades are submitted.

Admission with Conditions

Admission with conditions may be granted under the following circumstances:

1. Applicants in the last semester of their senior year of undergraduate study may request admission to the Graduate School. In such cases, the admission is conditional until the Bachelor's degree is granted.
2. Applicants who lack the prerequisite courses may be admitted with the condition that they make up these courses without graduate credit to the satisfaction of the major department. This condition must be removed as early as possible in the graduate program.
3. Applicants whose grades for their last two undergraduate years do not average "B" or better but do average over C+ (2.25) may be admitted with the condition that they maintain an average of "B" (3.0) or better throughout their work for the advanced degree, and provided there is good evidence that the student is capable

of doing satisfactory graduate work. In such cases, failure of the student to meet this condition at any point in the graduate program is sufficient ground for dismissal or reclassification as a Special Student (see below).

4. Applicants whose grades average C+ (2.25) or less for the last two years of undergraduate study or whose undergraduate records are difficult to evaluate, or who for some other reason do not meet the college or departmental requirements are admitted, if at all, on a Special Student basis only.

Special Students

A Special Student in the Graduate School is defined as one whose admission does not authorize work toward the Master's or Doctor's degree. Special Students may take courses at either the graduate or undergraduate level, provided they have the necessary prerequisites. While they may seek help from any faculty member concerning their coursework, they are not assigned an adviser. They may not register for thesis credits and do not submit a plan of study.

Applicants are admitted as Special Students in the following situations:

1. When they enter the Graduate School in order to broaden their academic background, not intending at the time of application to work toward an advanced degree.
2. When the applicant fails to meet the requirements for admission to work toward an advanced degree.

Note: Applicants from foreign countries are not admitted as Special Students.

In either case, removal from the Special Student status and permission to work toward an advanced degree may be requested by a student provided he or she can be admitted under the regulations for admission (see above) to work toward an advanced degree, or provided about 10 credits of graduate work have been completed with all grades "B" or better. Usually not more than 10 credits earned as a Special Student may apply toward an advanced degree.

The responsibility for requesting the change in status described above lies with the student. Furthermore, when such a change is made, the requirements for an advanced degree in effect at the time the change is approved are applicable.

Graduate Record Examination

While there is no general requirements for the submission of the results of a Graduate Record Examination prior to admission, the various departments may require that they be taken by certain applicants either in support of their application or during their first term in graduate study.

Graduate Credit for Seniors

Seniors at South Dakota State University within 10 credits of completing their undergraduate curriculum may take courses for graduate credit provided they receive the permission of the Dean of the Graduate School. To qualify for such permission, the student must have a grade point average for all undergraduate work of 2.5 or better and must not enroll for more than 18 credits (10 credits during summer school) of coursework. Forms for requesting permission to register for graduate courses are available at the Graduate Office.

Being granted permission to take courses for graduate credit while still a senior does not constitute admission to the Graduate School.

Graduate Study by University Staff

Any full-time member of the research, instructional, or extension staffs may

carry a course load not to exceed 7 credits per semester with a total of not more than 10 credits for the academic year. An additional 2 credits may be carried during the summer session when the staff member is on full contract.

Permission to enroll in coursework must be obtained from the head of the department and the Dean and/or Director concerned. A form which is supplied by the college office must be completed and presented to the Office of Admissions and Records on registering.

Staff members holding the rank of Assistant Professor or above may not work toward a degree from this institution.

Post-Doctoral Study

Post-doctoral students or eminent scholars who desire temporarily the privileges of the research facilities, staff council, library or seminars at the institution, and who are not candidates for a degree, may pursue study upon recommendation of the head of the department and Dean and/or Director concerned and approval of the Dean of the Graduate School and the President.

REGISTRATION

Details of the procedure for registering are printed in the semester schedule available to students prior to each registration. Graduate students report to the Graduate Office as the first step of their registration, at which time they receive further instructions.

Normal and Maximum Credit Loads

The normal credit load per semester during the academic year is 15 credits for the full-time student. During the four week summer session the maximum load is 4 credits. During the eight week summer session it is 8 credits (maximum of 9). Workshops are included in these normal and maximum loads.

The maximum credit load for graduate assistants is as follows:

	Maximum credits student may carry during the:	
	Academic Year	Summer Session
One-fourth time assistant	30	5
One-half time assistant	22	3
Three-fourths time assistant	15	3

In calculating credit loads, audit courses are included at full value. Undergraduate courses taken are also included at full value.

TUITION AND FEES

Academic year:

Matriculation fee (new students only)	\$ 5.00
Tuition per semester (residents)	99.00
Tuition per semester (non-residents)	233.00
General University fee per semester (Includes laboratory fees, health fee, Student Union fee, and fees for other services. Union fee (\$10.50) optional for graduate assistants on contract)	35.25
Student Association fee per semester (optional for graduate assistants on contract)	14.70

Summer Sessions:

Matriculation fee (new students only)	\$ 5.00
Tuition—8 week session (residents)	\$ 8.00 per credit hour
4 week session (residents)	8.00 per credit hour
Tuition—8 week session (non-residents)	12.00 per credit hour
4 week session (non-residents)	12.00 per credit hour
General University fee of \$1.00 per credit with a minimum of \$3.00.	
Student Association fee	4.00

Additional information concerning fees is given below:

Matriculation fee: A matriculation fee of \$5.00 is charged all students, including graduate students, who have not previously registered at South Dakota State University. This \$5.00 matriculation fee must accompany all applications for admission, except when the applicant is a former student of this institution.

Student Association or Activity fee: Includes admission to athletic events, plays, concerts, debate, use of tennis courts, swimming pool, and golf course.

Part-Time Tuition and Fees:**Regular Session:**

1-8 credits—\$7.00 per credit resident; \$15.00 per credit non-resident.

9 credits or above—full tuition.

General University fee of \$35.25 charged all students enrolled for 9 credits or more.

Summer Session:

\$8.00 per credit resident; \$12.00 per credit non-resident.

General University fee of \$1.00 per credit with a minimum of \$3.00.

These fees also apply for workshops, short courses and other special courses of less than normal term length and which carry college credit.

Late registration fee: A late registration fee of \$10.00 is charged all students who enroll and pay their registration costs after the time announced for that purpose.

Fees for auditing courses: The fee for auditing courses is \$10.50 for 1 to 9 credits and \$19.50 for 10 or more credits. Registration as an auditor requires the consent of the department concerned. Such registration carries permission to listen only, and no examinations or credit are given. Any course once audited by a student cannot be taken by that student for credit.

Additional Fees for Graduate Students

Before the thesis for the Master of Science or the Doctor of Philosophy degree is presented to the Graduate Office in final form, a \$2.00 payment must be made to cover in part the cost of binding the two library copies.

Before the Doctor of Philosophy degree is granted the candidate must pay a fee of \$25.00 to cover the cost of microfilming the thesis and publishing the abstract in "Microfilm Abstracts."

OTHER INFORMATION

Fellowships and Assistantships

Occasionally fellowships are available to graduate students at this institution. Information concerning them may be obtained by writing the Dean of the Graduate School.

Graduate assistants are employed annually by several departments of South Dakota State University. Assistantships are handled by the departments themselves and those interested in them are asked to write directly to the head of the department in which they intend to take their major.

Housing for Graduate Students

Inquiries concerning available housing for families and for single men should be directed to the Student Housing Office on the South Dakota State University campus. Single women should direct their inquiries to the Dean of Women.

Cost of Living

The cost of living, including tuition and fees, for the average single graduate student is estimated at \$1600.00 to \$2000.00 per academic year (9 months). This does not include travel to and from the student's home.

Graduate Courses During the Summer Sessions

Many departments offer graduate courses during the summer. For information concerning the courses to be offered, write the Office of Admissions and Records or the Graduate Office and request a Summer Session Bulletin.

Credit Restrictions for Workshops

While any number of credits may be earned in workshops, no more than 2 such credits may be applied toward an advanced degree.

Credit Restriction for Problems Courses

No more than 4 credits in problems courses may be counted toward the completion of the Master of Science or Master of Education degree program. No more than 6 credits of problems courses (beyond the Bachelor's degree) may be counted toward the completion of the Doctor of Philosophy degree program.

Correspondence Courses

Correspondence courses are not given at the graduate level at this institution. Neither is transfer credit allowed for correspondence courses taken elsewhere.

Grades for Thesis

While graduate students usually register for thesis credits during several semesters, no grade is given in thesis until after the final oral examination. Thesis advisers give an incomplete grade (I) each term in which the student enrolls for thesis credits. After completion of the final oral examination, the thesis adviser gives one grade for all thesis credits by the usual method of notifying the Office of Admissions and Records of the removal of the incomplete grade.

Filing a Graduation Card

Not later than four weeks after registration day for the term at the end of which a student expects to receive the advanced degree, a graduation card must be filed by the student with the Graduate Office. Failure to file this card will result in a delay in granting of the degree.

Cap, Gown, and Hood Rental

Caps, gowns, and hoods for Commencement may be rented from the Student Association Bookstore located in the Student Union building.

Attendance at Commencement

All students to be granted the Master's or Doctor's degree are expected to participate in the Commencement exercises at which the degree is to be granted. Failure to attend will mean a delay in awarding the degree until a later Commencement exercise. In cases where attendance will require excessive expenditure for travel, or for some other good reason, the President may authorize an absence and the degree will be granted. Such authorization will be given only upon letter of request from the candidate to the President fully explaining the need for being absent. The President will notify the candidate if the request is approved.

Degrees and Fields of Study

South Dakota State University offers the Master of Science, the Master of Education, and the Doctor of Philosophy degree in many fields or areas. The general description and requirements for these degrees are given below. The student who wishes to become a candidate for an advanced degree must not only fulfill these requirements but must meet those of the major and minor departments as well.

THE MASTER OF SCIENCE DEGREE

The Master of Science degree is offered with the following majors:

Agricultural Education	Journalism
Agricultural Engineering	Language Skills (English and Speech)
Agronomy	Mathematics
Animal Science	Mechanical Engineering
Bacteriology	Pharmaceutical Chemistry
Botany	Pharmacognosy
Chemistry	Pharmacology
Child Development and Family Relations	Pharmacy
Civil Engineering	Physical Education
Dairy Science	Physics
Economics	Plant Pathology
Education	Poultry Science
Electrical Engineering	Printing Management
Entomology	Rural Sociology
Food and Nutrition	Textiles and Clothing
Home Economics	Wildlife Biology
Home Economics Education	Zoology
Horticulture	

The major fields shown above may also be selected as minor fields. In addition History and Political Science or Mechanized Agriculture (Agricultural Engineering department) may be chosen as a minor.

The Advisers

Each student in the Master of Science degree program will choose a major adviser through consultation with the head of the department in which the major is being taken. A minor adviser is also chosen when a minor field of study is elected.

The major adviser should be chosen prior to registration for the first semester of work, and the minor adviser as soon thereafter as possible.

Different departments use different systems of assigning advisers, but each department will insure adequate guidance for its students throughout the graduate work.

Residence and Credit Requirements

A minimum of 30 graduate credits beyond the Bachelor's degree is required for the Master of Science degree. The minimum residence requirement for this degree is 20 graduate credits. Residence credit is given only for graduate credit earned in courses offered by South Dakota State University.

Out-dating of Coursework

If the requirements for the Master of Science degree are not completed within a period of 6 years from the date of application, a reconsideration of the student's program will be necessary. Credits in courses more than 6 years old will be allowed only if the course is repeated, if an examination covering the material is passed, or by approval of the Graduate Council after petition adequately explaining why the student could be expected to be proficient in the course(s). The rules of the Graduate School in effect at the beginning of the seventh year following admission of the student to work toward the Master of Science degree will apply if the degree has not been granted by then.

Requirements for the Major

Of the minimum of 30 graduate credits required for the Master of Science degree, at least 19 must be earned in the major. The thesis must account for 5 to 7 of this. Not all courses need necessarily be taken in the major department, but they must be related to the major field.

Requirements for the Minor or Supporting Courses

Of the minimum of 30 graduate credits required for the Master of Science degree, at least 8 must be earned in the minor field or in supporting courses. When supporting courses are taken in lieu of a minor, they are selected from two or more departments with the approval of the major adviser.

Courses listed in the course offerings of the major field may not be applied in the minor or supporting courses.

Program of Study

During the first term of work, a graduate student should plan, with his adviser(s), the program of study for the Master of Science degree. This program, approved by the adviser(s) and the head of the major department, is submitted on the appropriate form to the Dean of the Graduate School for his approval. It may be submitted to the Dean at any time prior to admission to candidacy. The student, major adviser, and others concerned will be notified of action taken by the Dean.

Once the program of study is approved, all changes must be requested on an appropriate form furnished by the Graduate Office. To be allowed, these changes must be approved by the appropriate adviser, the department head, and the Dean of the Graduate School.

Transfer of Credits

Graduate credits earned at other institutions may be applied toward the Master of Science degree. They must, however, have been approved for transfer by the department(s) concerned and by the Dean of the Graduate School. Such transfer

is limited to 7 credits in the major and 3 credits in the minor or supporting courses. The credits must have been earned at a grade of at least "B" for each course. Outdated coursework will not be accepted for transfer.

Requests for transfer credit must be supported by an official transcript filed at the Graduate Office.

Scholastic Requirements

No credit is given toward the Master of Science degree for any course the grade for which is below "C."

All work in the major must average "B" (3.0) or better, and all work in the minor or supporting courses must average "B" (3.0) or better to satisfy the requirements for the degree.

Transfer credits are not included in the calculation of the grade point average.

Admission to Candidacy

Admission to the Graduate School does not imply admission to candidacy. A student is admitted as a candidate only after 20 graduate credits have been earned (transfer credits may apply here), provided: (1) the grade point average in the major and in the minor or supporting courses is "B" or better, (2) reasonable progress has been made in the research for the thesis, (3) an approved program of study is on file at the Graduate Office, and (4) the major adviser recommends it.

The Thesis

Any student taking a Master of Science degree must submit a thesis in approved form, as outlined in the publication, "Instructions for Theses and Research Reports," available at the Graduate Office.

The thesis must be a scholarly presentation of suitable research by the candidate on a subject related to the major field. Neither the scope of the problem nor the extent of the work on it can be prescribed in exact terms, but the effort put forth and the results obtained should leave no doubt as to justification for the graduate credit assigned to it.

The thesis must account for from 5 to 7 credits of the major. These credits are included in the minimum of 19 required in the major. Credits are not given separately for thesis research and thesis writing, but the two are a single unit. The research is not considered complete until its methods and findings have been recorded in a form acceptable to the major adviser, the examination committee, and the Dean of the Graduate School.

Three typed copies of the thesis must be filed at the Graduate Office at least 10 days (excluding Sundays and holidays) before the oral examination. Following the examination and approval of the thesis, the original and first carbon copy are returned to the Graduate Office after a \$2.00 payment is made at the Library to cover in part the cost of the binding. This must be done not later than 5 days before Commencement.

Language Requirement

There is no general language requirement for the Master of Science degree. However, individual departments may require a speaking or reading knowledge of a foreign language.

Examination

Candidates for the Master of Science degree are required to pass an oral examination covering the research, the courses included in the graduate program, and other

subject matter related to the major and minor or supporting courses. This must be done not less than 10 days (excluding Sundays and holidays) prior to Commencement. Before taking the examination, the student must have been admitted to candidacy.

The examining committee is composed of: (1) the major adviser (chairman), (2) a member of the Graduate Faculty appointed by the Dean and representing the Graduate Faculty, (3) one additional representative from the major field, and (4) one representative from the minor or supporting course field. Except for the representative of the Graduate Faculty, the major adviser selects the committee members, subject to approval by the Dean of the Graduate School.

Summary of Requirements for the Master of Science Degree

Requirements	Under direction of	When due
Application for admission	Dean of Graduate School	One month before first registration
Program of study	Adviser and Dean of Graduate School	Before admission to candidacy
Admission to candidacy	Dean of Graduate School	Usually after 20 credits of satisfactory graduate work
Filing of graduation card	Office of Admissions and Records (Filed at Graduate Office)	Not later than 4 weeks after registration for the term just prior to the Commencement
Thesis due at Graduate Office	Dean of Graduate School	Not later than 10 days before final oral examination*
Final oral examination	Major adviser and committee	Not later than 10 days before Commencement*
Corrected copies of thesis due at Graduate Office	Dean of Graduate School	Not later than 10 days before Commencement*

*Excluding Sundays and holidays.

THE MASTER OF EDUCATION DEGREE

The Master of Education degree is offered under two options (see Residence and Credit Requirements below) and with the following majors:

Agricultural Education	Biological Science*
Education	Communication*
Home Economics Education	Physical Science*
Physical Education	Social Science*

The Advisers

Each student in the Master of Education degree program will choose a major adviser through consultation with the head of the department or the chairman of the committee concerned. A minor adviser is also chosen when a minor field is selected. The major adviser should be chosen prior to registration for the first quarter of work, and the minor adviser should be chosen as soon thereafter as possible.

Different departments and areas use different systems of assigning advisers, but each department or committee will insure adequate guidance for its students throughout their graduate work.

*See Special Programs section under Courses of Instruction.

Residence and Credit Requirements

The Master of Education degree is offered under two options. Option A requires no thesis but does require a research report. Option B requires no thesis nor any research report. The residence and credit requirements for these two options are as follows:

Option A: A minimum of 32 graduate credits beyond the Bachelor's degree is required. The minimum residence requirement is 22 credits of graduate work, and 2 credits must be earned as a research problem in the major field.

Option B: A minimum of 35 graduate credits beyond the Bachelor's degree is required. The minimum residence requirement is 25 credits. No research problem is written, but a comprehensive written examination is required in addition to the final oral examination.

Under both options, residence credit is given only for courses offered by South Dakota State University.

Outdating of Course Work

If the requirements for the Master of Education degree are not completed within a period of 6 years from the date of application, a reconsideration of the student's program will be necessary. Credits in courses more than 6 years old will be allowed only if the course is repeated, if an examination covering the material is passed, or by approval of the Graduate Council after petition adequately explaining why the student could be expected to be proficient in the course(s). The rules of the Graduate School in effect at the beginning of the seventh year following admission of the student to work toward the Master of Education degree will apply if the degree has not been granted by then.

Requirements for the Major

Option A: Of the minimum of 32 graduate credits required for the degree, at least 21 (including 2 for the research problem) must be earned in the major.

Option B: Of the minimum of 35 graduate credits required for the degree, at least 24 must be earned in the major.

Requirements for the Minor or Supporting Courses

At least 8 graduate credits must be earned in the minor or in supporting courses under either Option A or Option B. When supporting courses are taken in lieu of the minor, they are selected from two or more departments with the approval of the major adviser.

Students majoring in Agricultural Education, Education, Home Economics Education, or Physical Education under the Master of Education program may not apply education courses (Agricultural Education, Education, Guidance and Counseling, Industrial Arts Education, Home Economics Education, Physical Education) in their minor or supporting courses.

Students majoring in Biological Science, Communication, Physical Science, or Social Science take their minor in Education.

Program of Study

During the first term of work, a graduate student should plan with his adviser(s) the program of study for the Master of Education degree. This program, approved by the adviser(s) and the head of the major department or the committee chairman con-

cerned, is submitted on the appropriate form to the Dean of the Graduate School for his approval. It may be submitted at any time prior to admission to candidacy. The student, major adviser, and others concerned will be notified of the action taken by the Dean.

Once the program of study is approved, all changes must be requested on an appropriate form furnished by the Graduate Office. To be allowed, these changes must be approved by the appropriate adviser, the department head or committee chairman, and the Dean of the Graduate School.

Transfer of Credits

Graduate credits earned at other institutions may be applied toward the Master of Education degree. They must, however, have been approved for transfer by the department(s) or committee concerned and by the Dean of the Graduate School. Such transfer is limited to 7 credits in the major and 3 credits in the minor or supporting courses. The credits must have been earned at a grade of "B" or better for each course. Outdated coursework will not be accepted for transfer.

Requests for transfer credit must be supported by an official transcript filed with the Graduate Office.

Scholastic Requirements

No credit is given toward the Master of Education degree for any course the grade for which is below "C."

All work in the major must average "B" (3.0) or better, and all work in the minor or supporting courses must average "B" (3.0) or better in order to satisfy the requirements for the degree.

Transfer credits are not included in the calculation of the grade point average.

Admission to Candidacy

Admission to the Graduate School does not imply admission to candidacy. A student is admitted as a candidate only after 20 graduate credits have been earned (transfer credits may apply here) provided: (1) the grade point average in the major and in the minor or supporting courses is "B" or better, (2) reasonable progress has been made in the research report in the case of the Option A student, (3) an approved program of study is on file at the Graduate Office, and (4) the major adviser recommends it.

The Research Report (Option A)

The research report is required under Option A. It is based on research done in the major field and is written in accordance with instructions outlined in the publication, "Instructions for Theses and Research Reports," available at the Graduate Office.

The research problem for this report must account for 2 credits in the major. These credits are included in the minimum of 21 required in the major. The research is not considered complete until its methods and findings have been recorded in a form acceptable to the major adviser, the examination committee, and the Dean of the Graduate School.

Three typed copies of the research report must be filed at the Graduate Office at least 10 days (excluding Sundays and holidays) before the oral examination. Following the examination and approval of the research report, the original and first carbon are delivered, bound by the Printing Laboratory, to the Graduate Office. This must be done not later than 5 days before Commencement. The bound copies will be kept in the library.

Language Requirement

There is no general language requirement for the Master of Education degree. However, individual departments may require a speaking or reading knowledge of a foreign language.

Examinations

Option A: Candidates for the Master of Education degree under Option A are required to pass an oral examination covering the research and courses included in the graduate program. This must be done not less than 10 days (excluding Sundays and holidays) prior to Commencement. Before taking the examination, the student must have been admitted to candidacy.

Option B: Candidates for the Master of Education degree under Option B are required to pass both a comprehensive written and an oral examination over the coursework in their graduate program. This must be done not less than 10 days (excluding Sundays and holidays) prior to Commencement, and the oral examination cannot be taken until the written examination has been completed and graded. Before taking either examination, the student must have been admitted to candidacy.

The examining committee under either option is composed of: (1) the major adviser (chairman), (2) a member of the Graduate Faculty appointed by the Dean and representing the Graduate Faculty, (3) one additional representative from the major field, and (4) one representative from the minor or supporting course field. Except for the representative of the Graduate Faculty, the major adviser selects the committee members, subject to the approval of the Dean of the Graduate School.

SUMMARY OF REQUIREMENTS FOR MASTER OF EDUCATION DEGREE

Requirements	Under direction of	When due
Application for admission	Dean of Graduate School	One month before first registration
Program of study	Adviser and Dean of Graduate School	Before admission to candidacy
Admission to candidacy	Dean of Graduate School	Usually after 20 credits of satisfactory graduate study
Filing of graduation card	Office of Admissions and Records (Filed at Graduate Office)	Not later than 4 weeks after registration for the term just prior to the Commencement
Research report (unbound) due at Graduate Office (Option A)	Dean of Graduate School	Not later than 10 days before final oral examination*
Final written examination (Option B)	Major and minor advisers	Prior to final oral examination and after admission to candidacy
Final oral examination	Advisers and committee	Not later than 10 days before Commencement*
Corrected copies of research report (bound) due at Graduate Office (Option A)	Dean of Graduate School	Not later than 5 days before Commencement*

*Excluding Sundays and holidays.

THE DOCTOR PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is offered with the following majors:

Agronomy	Economics
Animal Science—offered in the Animal Science, Dairy Science, or Poultry Science Department.	Plant Science—offered in the Plant Pathology Department.
Chemistry	Social Science—offered in the Rural Sociology Department.

Admission Requirements

It is generally required that applicants for the Doctor of Philosophy degree program have a Master of Science degree or its equivalent. Those not meeting this requirement will be required to enter the Master of Science program unless they have a grade point average of "B" (3.0) or better for the last two years of undergraduate study. (See also pages 13-14 of this bulletin.)

Residence and Credit Requirements

A minimum equivalent to three academic years of full-time work beyond the Bachelor's degree (90 credits including transfer and thesis credits) is required for the Doctor of Philosophy degree. Credit earned for the Master's degree may be applied. The minimum residence requirement is 50 credits earned at South Dakota State University and at least one continuous academic year of full-time work toward the degree (or the equivalent in continuous half-time or more work) after admission to work toward the Doctor of Philosophy degree. Those on full-time faculty appointment and graduate assistants may satisfy the continuous residence requirement in one academic year.

The individual areas or departments in which the Doctor of Philosophy degree is granted, or the student's advisory committee, may require more credits and residence than the minimum indicated above if they feel it is in the best interest of the student.

Outdating of Program and Coursework

If the requirements for the Doctor of Philosophy degree are not completed within a period of 8 years from the date of admission to work toward the degree, a reconsideration of the student's program will be necessary. In such case, the rules of the Graduate School governing at the beginning of the ninth year will become effective for the student.

A course taken 8 years previously cannot be applied toward the Doctor of Philosophy degree program except by permission of the advisory committee and the Dean of the Graduate School.

The Advisory Committee

Upon recommendation of the major adviser, and before the student has completed the equivalent of 40 credits (including transfer credits and those earned for the Master's degree) toward the Doctor of Philosophy degree, the Dean of the Graduate School will appoint an advisory committee for the student. This committee will be composed of at least 5 members of the Graduate Faculty, as follows:

- (1) The major adviser who acts as chairman of the committee.
- (2) A member from a department representing an area not closely related to the major or minor department or area. This member represents the Graduate Faculty, insuring that its rules and regulations are followed by the committee.

- (3) The head of the major department or of a department in the area of the major, or his representative.
- (4) The minor adviser or a representative from an area where the supporting courses will be taken.
- (5) One member other than those listed above selected by the major adviser.

Additional members of the committee may be asked for by the student or the major adviser and assigned to the committee by the Dean of the Graduate School.

The Program of Study

Within 6 weeks after appointment, the advisory committee will meet with the student to plan and approve a complete program of study and to consider a thesis topic. The program of study must be forwarded to the Graduate Office not later than 2 weeks prior to the preliminary examinations. The program submitted is subject to the approval of the Dean of the Graduate School, and until it is approved the student cannot take the preliminary examinations.

Any changes in the program of study, once it is approved, must be approved by the advisory committee and the Dean of the Graduate School.

Appropriate forms for the plan of study and changes thereto are available at the Graduate Office.

Transfer of Credits

Transfer credits earned at other institutions may be applied toward the Doctor of Philosophy degree if they were earned in residence at the institution at a grade of at least "B," and if they are approved by the advisory committee and the Dean of the Graduate School. Transfer credits cannot substitute for credits required for minimum residence (see Residence and Credit Requirements).

Requests for transfer credits must be supported by an official transcript filed with the Graduate Office.

The Major

Each student in the Doctor of Philosophy degree program must choose a major department or area of study from those listed on page 26. At least 60 credits of the 90 required for the degree must be earned in the major. Thesis, transfer, and Master's degree credits may apply here. Not all courses need be taken within a single department or area, but all courses applying to the major should be closely related to it.

The Minor or Supporting Courses

At least 22 credits of the 90 required for the degree must be earned in a minor or in supporting courses (coursework chosen from two or more fields.) Transfer credits and credits from the Master's degree program may apply here. All courses applying in the minor or supporting courses should be taken outside the major department or area.

Scholarship Requirements

No credit will be given toward the Doctor of Philosophy degree for any grade below "C," and work in each the major and the minor or supporting courses must average "B" (3.0) or better. Transfer credits will not be used in calculating grade point averages for these requirements. All courses on the program of study taken at South Dakota State University will be used in arriving at the grade point average, including those taken for the Master's degree.

Language Requirement

Reading knowledge of two foreign languages or of one foreign language and proficiency in a collateral field is required. Usually these languages are French and German, but other languages may be permitted with the approval of the advisory committee and the Dean of the Graduate School. The Foreign Languages department administers the language examinations and certifies by letter to the Graduate School their successful completion.

To take an examination, the student must first submit a request to the Foreign Languages department on a form supplied at that office. This must be done no later than the second week in the term during which the examination is to be taken. Dates of the examinations will be announced by the Foreign Languages department.

A student whose native tongue is other than English and who expects to return to his own homeland may, on recommendation of his advisory committee, be permitted to meet the language requirements by demonstrating competence in spoken and written English and a reading knowledge of one approved language other than his native language.

On recommendation of the advisory committee and the approval of the Dean of the Graduate School, a student may substitute a collateral field of knowledge for the second language. Courses in the collateral field must be taken for credit (not audited) which will not apply to the major, minor, or supporting courses. The collateral field of knowledge should be related to the major field of study, and should be concentrated in one field of study. It consists of at least 8 credits of coursework at either the graduate or undergraduate level. Such fields as mathematics, semantics, or statistics may, for example, be used to meet these requirements. All grades earned must average at least "B" (3.0) and only those credits earned at a grade of "C" or better may be counted toward fulfilling this requirement.

The foreign language and the collateral field requirements must be completed before the student is admitted to the preliminary examinations.

The Preliminary Examinations

When the student's program of coursework has been substantially completed, and after the language requirement has been met, the preliminary examinations covering coursework are taken. The first of these is a comprehensive written examination which is followed on satisfactory completion by an oral examination.

The advisory committee arranges for the examinations, which it conducts at times approved by the Dean of the Graduate School. Review of the examinations is accomplished by all members of the advisory committee and the results are reported to the Dean of the Graduate School on an appropriate form.

The preliminary examinations must be completed satisfactorily at least 6 months before the final examination is taken.

The Thesis

Thirty to fifty-five credits may be allowed for the thesis for the Ph. D. degree.

The thesis should represent at least one academic year of full-time research. Of no specific length, it should advance or modify knowledge and demonstrate the candidate's mastery of the field. The instructions in "Instructions for Theses and Research Reports," copies of which are available at the Graduate Office, must be followed in preparation of the thesis. When submitted, it is accompanied by an abstract of 600 words or less.

After the manuscript is typed and approved by the major adviser, the first three copies are delivered to the Graduate Office. This must be done at least 10 days (excluding Sundays and holidays) prior to the date of the final oral examination. After the thesis is found acceptable as to form by the Graduate Office, a copy is delivered to the members of the advisory committee for their examination.

After the final oral examination, all necessary corrections in the thesis are made and the first three copies are delivered to the Graduate Office. This must be done at least 5 days prior to Commencement. A \$2.00 fee is paid at the library to partially cover the cost of binding the first two copies (library copies). The third copy will be returned to the major department, unbound. The binding of this third copy and of any others will be handled in accordance with departmental policy.

The student must also go to the library and sign an agreement relating to the publication of the abstract and the microfilming of the thesis. At this time a fee of \$25.00 covering the cost of microfilming must be paid. This must be done at least 5 days prior to Commencement.

SUMMARY OF REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

Requirements	Under direction of	When due
Application for admission	Dean of Graduate School	One month before first registration
Selection of advisory committee	Adviser and Dean of Graduate School	Prior to completion of 40 credits of work, including Master's degree
Program of Study	Advisory committee and Dean of Graduate School	Not later than 2 weeks prior to preliminary examinations
Language examinations (and collateral field work)	Foreign Languages department and advisory committee	Prior to scheduling of preliminary examination
Preliminary examinations	Advisory committee	Near completion of coursework, and at least 6 months prior to final oral examinations
Filing of graduation card	Office of Admissions and Records Submitted to Dean of Graduate School	Not later than 4 weeks after registration for the term just prior to Commencement.
Thesis due at Graduate Office	Dean of Graduate School	Not later than 10 days prior to final oral examination*
Final oral examination	Advisory committee	Not later than 10 days prior to Commencement*
Corrected copies of thesis due at Graduate Office	Dean of Graduate School	Not later than 5 days prior to Commencement*
Arrangements for microfilming of thesis	Library	Not later than 5 days prior to Commencement*

*Excluding Sundays and holidays.

The Final Examination

The final oral examination is scheduled not sooner than 6 months following the satisfactory completion of the preliminary examinations, and after the candidate's coursework and thesis have been completed. It is conducted by the advisory committee at a time and place announced by the Graduate Office.

While the advisory committee determines the character and length of the examination, sufficient time should be devoted to a consideration of matters relating to the thesis to test thoroughly the ability of the candidate to defend the research. In addition, questions to test the candidate's general knowledge, judgment, and critical powers are usually asked.

The final oral examination must be completed at least 10 days prior to the Commencement at which the degree is to be granted.

Courses of Instruction

COURSE NUMBERING SYSTEM

The numbering system for courses which may apply to the graduate programs offered at South Dakota State University is explained as follows:

700-799 series

Courses numbered from 700 through 799 are graduate level and are open to graduate students only.

600-699 series

Courses numbered from 600 through 699 are graduate level courses but are open to undergraduate students having the necessary prerequisites. They may not be used as a requirement for the Bachelor's degree at this institution, but they may serve as electives in an undergraduate program. Not open to freshmen or sophomores.

300-599 series

Courses numbered 300 through 599 are advanced undergraduate level courses. They are not listed in this bulletin, but are listed in the general catalog. They may be used in meeting part of the requirement for graduate degrees in accordance with the following:

- (1) Total credit for courses in this series, when applied to a graduate program, will be reduced by 20%, discarding all fractions. After such conversion, these credits are defined as "converted credits," which are then considered as graduate credits in meeting the requirements for the various degrees. For example, if 8 credits are earned in this series, they would be equivalent to 6 graduate credits if applied to a graduate degree.
- (2) For the Master of Science or Master of Education degrees, no more than 7 converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting courses.
- (3) For the Doctor of Philosophy degree, no more than 10 converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting courses.
- (4) Transfer credits may not be applied here.
- (5) Converted credits may not be applied without the permission of the major

adviser or advisory committee, the minor adviser (when applicable), and the Dean of the Graduate School.

Note: When courses in the 300-599 series are applied to a graduate program, they are entered on the transcript without special notation. It is doubtful, therefore, that they could be transferred as graduate credit to another institution.

ABBREVIATIONS USED

Cr, Credit	S, Spring semester
P, Prerequisite	Su, Summer session
F, Fall semester	

4(3,2) Following course titles, this system is used to describe the distribution of credits. The number preceding the parenthesis represents the credit for the course, the first number in the parenthesis the number of lecture periods, and the second number in the parenthesis the number of hours of laboratory per week.

Other abbreviations used are explained in the text.

DEPARTMENTS AND COURSES

The departments, their individual requirements, and the courses they give are listed on the following pages.

SPECIAL MAJORS

Four special majors are offered under the Master of Education degree program. These are described below since they are directed by a committee instead of a single department.

Biological Science Major (Master of Education)

Committee Chairman: Edward C. Berry, Professor of Bacteriology

The curriculum leading to the Master of Education degree, Biological Science major, has been established to meet the needs of high school teachers whose teaching interests include botany, zoology, and bacteriology, and of those who wish to prepare themselves to teach an integrated biological science course. The candidate for this degree may choose his adviser from any of the three departments involved.

Admission to this program requires: (1) a full year of college botany, (2) a full year of college zoology which should include one term of physiology, (3) a basic bacteriology course, and (4) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the biological sciences, as approved by the committee in charge of this major.

The minor is taken in education, and the minor adviser is chosen from the Education department.

Either Option A or Option B may be used for this program.

Communication Major (Master of Education)

Committee Chairman: George H. Phillips, Professor of Printing and Journalism

The curriculum leading to the Master of Education degree, Communication major, has been established to meet the needs of high school and junior college teachers whose teaching interests include English, journalism, and speech, and those who wish to prepare themselves to teach an integrated communication skills course. The candidate for this degree may choose his adviser from any of the three departments involved.

Admission to this program requires: (1) an undergraduate major in English,

speech, or journalism, and (2) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the departments of English, Speech, and Journalism. At least 4 credits must be earned in each of these departments, and the remainder of the courses are selected in one or more of these departments and from appropriate General Studies courses.

The minor is taken in education, and the minor adviser is chosen from the Education department.

Either Option A or Option B may be used for this program.

Physical Science Major (Master of Education)

Committee Chairman: Victor S. Webster, Professor of Chemistry

The curriculum leading to the Master of Education degree, Physical Science major, has been established to meet the needs of high school teachers whose teaching interests include chemistry, mathematics, and physics, and those who wish to prepare themselves to teach an integrated physical science course. The candidate for this degree may choose his adviser from any of the departments involved.

Admission to this program requires: (1) introductory courses consisting of a year of college chemistry and a year of college physics, (2) college mathematics courses including elementary, differential, and integral calculus, and (3) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the departments of Chemistry, Mathematics, and Physics. In one of these departments, at least 10 credits must be earned. In the other two, at least 9 credits, about equally divided between the two, must be earned.

The minor is taken in education, and the minor adviser must be chosen from the Education department.

Either Option A or Option B may be used for this degree.

Social Science Major (Master of Education)

Committee Chairman: Limen T. Smythe, Professor of Economics

The curriculum leading to the Master of Education degree, Social Science major, has been established to meet the needs of high school and junior college teachers whose teaching interests include economics, history, political science, and sociology, and those who wish to prepare themselves to teach an integrated social science course. The candidate for this degree may choose his adviser from any of the departments involved.

Admission to this program requires: (1) at least 24 semester credits in the social sciences, including a basic course or sequence of courses in economics, history, political science, and sociology, and a basic course in statistics, and (2) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the departments of Economics, History and Political Science, and Rural Sociology. At least 9 credits must be earned in either economics, history, political science, or sociology. In the remaining three fields, at least 10 credits, about equally divided between them, must be earned.

The minor is taken in education, and the minor adviser must be chosen from the Education department.

Either Option A or Option B may be used for this degree.

DEPARTMENT OF AGRICULTURAL ENGINEERING

Professor D. L. Moe, Head
 Professors DeLong, Wiersma; Associate Professors Lembke, Lytle

Graduate major offered: Master of Science degree with major in Agricultural Engineering.

Graduate minors offered: Agricultural Engineering.

Prerequisites for graduate study:

For the graduate major a Bachelor of Science degree in engineering or its equivalent.

For the graduate minor prerequisites to the graduate courses elected.

Agricultural Engineering Courses (AE)**612 Engineering Phases of Crop Processing 2(2,0)**
(Offered 1966)

Detailed analytical studies of cutting and shearing, collecting, packaging, size reduction, dehydrating, hauling, cleaning, and storing of agricultural crops. Includes one or more complete crop harvest and storage problems with reference to cost, labor, power requirements, and quality of finished product. P, 412, 422. Alternate years.

613 Instrumentation 3(2,3) S

Available instruments commonly used in Agricultural Engineering research. Principles and methods of measuring temperature, humidity, pressure, and flow with indicating and recording equipment. Application and instrumentation of SR-4 strain gage pressure and force transducers.

652 Theoretical Micro-Climatology 2(2,0) F
(On sufficient demand)

Derivation and application of physical laws to air layer near the ground occupied by plants and animals. Instruments used to take measurements in layer near the ground. P, Calculus, Physics, AE 472.

702 Advanced Farm Buildings 2(2,0)
(Offered 1965)

Requirements of domestic animals for shelter and environment that shelter needs to provide for efficient and economical operation of animal enterprise;

effect of total energy exchange on productivity of animals. P, 304, 404. Alternate years.

722 Advanced Farm Land Engineering 2(2,0)
(Offered 1966)

Selected topics from fundamental concepts of model analysis; specific application to problems involving viscous and gravitational phenomenon; varied flow equation applied to gravitational flow in drain lines, open ditches and terraces; use of tractive force theory in earth channel design; principles of irrotational flow and characteristics of potential fields; use of Laplace's Equation in solving saturated flow problems. P, 423, Agron 452. Alternate years.

742 Advanced Farm Power and Machinery 2(2,0)
(Offered 1966)

Presentation of typical farm machine mechanisms; instruction in selection, design, and application of various testing instruments for research and development; testing and evaluating machine components. P, 452. Alternate years.

750 Special Problems in Agricultural Engineering
(1-3 on demand)

Graduate students who wish to pursue detailed studies in one or several areas of the Agricultural Engineering field including meteorology and climatology.

790 Thesis in Agricultural Engineering
(5-7 as arranged)**DEPARTMENT OF MECHANIZED AGRICULTURE**

Professors Moe, DeLong, Wiersma; Associate Professors Lembke, Lytle

Graduate minor offered: Mechanized Agriculture.

Prerequisites for graduate study:

For the graduate minor prerequisites to the subjects elected.

Mechanized Agriculture Courses (MA)

(May not be applied toward a Master of Science degree with a major in Agricultural Engineering)

612 Advanced Farm Machinery 2(1,3) Su
(Offered in 1967)

Operation, care, adjustment, new developments in farm machinery, with emphasis on field and farmstead machinery as related to needs of agricultural production. Alternate years. P, 212.

632 Advanced Farm Motors 2(1,3) Su
(Offered in 1966)

Operations, selection, care, adjustment, and new developments of internal combustion engines as applied to farm power units. Alternate years. P, 212.

652 Advanced Rural Electrification 2(1,3) Su
(Offered in 1967)

Operation, selection, care, adjustment, and new developments in rural electric equipment: motors, fans, controls, wiring, pumps, grain handling equipment, and home and classroom lighting. Alternate years. P, 222.

672 Advanced Farm Structures 2(1,3) Su
(Offered in 1966)

Materials for farm construction; construction methods and techniques; new developments in farm building. Alternate years. P, 423.

AGRICULTURAL EXTENSION (AgExt)

Professor J. T. Stone, Director of Extension
 Professors Lyle, Wilson

No major or minor is offered in Agricultural Extension. The following course may be used in the program of study for certain advanced degrees:

600 Special Problems in Extension 2-6 Cr.

Individually assigned investigative problems in Extension. Individual conferences with laboratory and/or field work. Arrangements with Extension staff must be made prior to registration.

DEPARTMENT OF AGRONOMY

Professor L. O. Fine, Head

Professors Brage, Derscheid, Kinch, Ross, Shank, Stone, Wells, Westin; Associate Professors Buntley, Carson, Moore, Price, Rumbaugh, Shubeck, White

Graduate majors offered: Master of Science degree with a major in Agronomy (Soils or Crops).

Doctor of Philosophy degree with a major in Agronomy (Soils or Crops).

Graduate minor offered: Agronomy.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree including not less than 12 credits in either soils or crops courses.

For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Agronomy Courses (Agron)**613 Biometry 3(3,0) F**

Principles of statistical methods as applied to biological data with special reference to experimental design, reduction of experimental data and tests of significance and their interpretation. P, Math 113.

633 Advanced Genetics 3(3,0) F

Procedures in genetic studies, cytoplasmic influences, gene physiology, mutagenesis, chromosomal changes, linkage, and of steps toward genetic code. P, Z 303.

672 Soil Mineralogy 2(2,0) F (Offered in 1966)

Soil minerals and their identification. P, 216, 243. Alternate years.

703 Cytology 3(2,2) S (Offered in 1967)

Physio-chemical nature of cell inclusions with reference to their role in heredity. P, 422, 633. Alternate years.

713 Cytogenetics 3(2,2) S (Offered in 1966)

Nature and behavior of chromosomes in relation to heredity, with consideration of cytogenetic studies. P, 422, 633. Alternate years.

723 Advanced Plant Breeding 3(3,0) S

(Offered in 1966)

Basic principles of quantitative variation in crop plants; method of analysis of effects due to genetic and environmental sources; and programs of improvement. P, 422, 613. Alternate years.

742 Advanced Soil Fertility 2(2,0) F

(Offered in 1965)

Chemistry of soil-plant relationships; advanced theory and practice in use of fertilizers. P, 323. Alternate years.

743 Advanced Soil Physics 3(3,0) F

(Offered in 1966)

Hydraulic conductivity, unsaturated water flow, moisture tension, release characteristics, structural relationships to practical problems and intrinsic soil properties; colloidal content and relationship to above phenomena. P, 453, Math 333. Alternate years.

753 Advanced Soil Chemistry 3(3,0) S

(Offered in 1967)

Advanced chemical considerations of soil constituents in dynamic environment of soil; conditioning effects of climate and other environmental factors; characteristics, reactions, and importance of clay mineral and colloidal complex. P, 443. Alternate years.

763 Advanced Weed Physiology and Control

3(3,0) F (Offered in 1966)

Physiological and ecological principles of weed control including methods of elimination. Chemistry and applications of herbicides. P, 233, Ch 134, Bot 424. Alternate years.

772 Advanced Soil Morphology and Genesis

2(2,0) S (Offered in 1967)

Classification and nomenclature of soil; factors governing and processes active in soil development; soil geography. P, 414, 462. Alternate years.

773 Design and Analysis of Experiments 3(3,0) S

(Offered in 1966)

Organization and integration of research projects with application of statistical methods and experimental design. Use of analysis of variance and covariance, various components, multiple and curvilinear regression for data reduction and interpretation. P, 613. Alternate years.

780 Advanced Crops or Soils Problems 1 or 2 FSSu

Laboratory or field research with relevant literature reviews, conferences and reports. P, consent of instructor.

781 Agronomy Seminar 1(1,0) FS

Reports and discussions of current investigations in Agronomy (two credits required for M.S., three for Ph.D.).

790 Thesis (as arranged)**DEPARTMENT OF ANIMAL SCIENCE**

Richard C. Wahlstrom, Head

Professors Dinkel, Embry, Kamstra, Kohler; Associate Professors Bush, Lewis, McCarty, McCone, Seerley

Graduate majors offered: Master of Science degree with a major in Animal Science.

Doctor of Philosophy degree with a major in Animal Science.

Graduate minor offered: Animal Science.

Research toward the graduate degrees in this department may be pursued in the areas of animal breeding, animal nutrition, animal physiology, meat technology, or range management.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree including not less than 12 credits in Animal Science.

For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Animal Science Courses (AS)**600 Research Problems 1-3 FSSu**

Investigation of problems in following areas with results submitted as technical paper:

- (1) Animal breeding
- (2) Livestock production
- (3) Meats
- (4) Nutrition
- (5) Range management

601 Wild Lands Seminar 1(1,0) S

Guest lectures and review of current research and action programs in use of wild lands. P, 323 and senior standing. Limit 2 credits.

602 Wool Technology 2(1,2) S (Offered in 1967)

Factors relating to wool production and marketing. Grading wool, properties of wool and wool technology. P, 413. Alternate years.

612 Advanced Livestock Feeding 2(2,0) F

Application of recent research findings in feeding of swine, cattle, and sheep. P, 243, 251.

613 Reproductive Physiology 3(2,2) S

(Offered in 1966)

Anatomical and physiological bases of reproductive phenomena of domestic animals; factors influencing and methods of improving reproductive efficiency. P, Z 203, 303, 204 or 414, or consent of instructor. Alternate years.

614 Meat Technology 4(2,4) S (Offered in 1966)

Basic physical, chemical, microbiological, and histological characteristics of meat and effects of various processing methods on meat products and by-products. P, 213. Alternate years.

702 Experimental Procedure 2(2,0) S

Research methods and planning of experimental work, necessary records, interpretation of results, and presentation of material. P, Agron 613 or equivalent.

703 Animal Nutrition 3(3,0) S (Offered in 1967)

Principles of nutrition in relation to growth, reproduction, lactation, fattening, and work. P, Ch 615. Alternate years.

712 Advanced Animal Breeding 2(1,2) S

(Offered in 1966)

Methods of data analysis for developing efficient breeding plans. Calculation and use of correction factors, heritability estimates, genetic correlations, selection indices, and inbreeding charts. P, 324, Agron 613 or equivalent courses. Alternate years.

713 Population Genetics 3(3,0) S (Offered in 1967)

Genetic structure of populations and forces affecting this structure. P, 324 or equivalent. Alternate years.

722 Animal Nutrition Laboratory 2(0,6) S

(Offered in 1967)

Laboratory methods course involving demonstration and practical work in techniques used in animal nutrition research. P, Ch 615. Alternate years.

751 Graduate Seminar 1(1,0) FS

Reports and discussion of current research in animal science. Maximum of 2 credits for M.S. and 4 credits for Ph.D.

761 Nutrition Seminar 1(1,0) FS

Reports and discussion of current research in nutrition. Maximum of 2 credits.

790 Thesis in Animal Husbandry (as arranged)

DEPARTMENT OF BACTERIOLOGY

Professor G. W. Robertstad, Head
Professor Berry; Associate Professor Pengra

Graduate majors offered: Master of Science degree with a major in Bacteriology.
(See also Master of Education degree program with a major in Biological Science, page 31.)

Graduate minor offered: Bacteriology.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with 24 credits of bacteriology.
For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Bacteriology Courses (Bac)**603 Virology 3(1,4) F**

Nature and behavior of viruses, animals, and bacteria. P, advanced courses in bacteriology.

623 Systematic Bacteriology 3(1,4) S

Lectures on nomenclature, Bergey's Manual, monographs on special groups and laboratory demonstration. Family, generic, and species characters. P, advanced courses in Bacteriology and senior rank.

701 Graduate Seminar 1(1,0) FSSu

P, graduate student. Two credits maximum.

702 Bacteriological Problem 2(0,2) FSSu

Problem is to be a research type of investigation of

some microbiological phenomenon. Available only to M.Ed. biological science majors.

704 Bacterial Metabolism 4(2,4) SSu

Biological oxidations, bacterial fermentation mechanisms, metabolism of nitrogenous compounds, aerobic respirations, enzyme inductions, and laboratory techniques involved in the study of these processes. P, Bac 212 and Ch 615.

714 Industrial Microbiology 4(2,4) S

Fermentations of industrial significance, including some common spoilage epidemics in industrial processes. Pilot plant studies of solvent, alcohol, and antibiotic production.

790 Thesis in Bacteriology (5-7 as arranged)**DEPARTMENT OF BOTANY**

Associate Professor D. J. Holden, Head
Professor Miller; Associate Professor Taylor

Graduate majors offered: Master of Science degree with a major in Botany.
(See also Master of Education degree program with a major in Biological Science, page 31.)

Graduate minor offered: Botany.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree, including 24 credits in plant sciences, 16 of which must be in botany.

For the graduate minor a Bachelor's degree, including 16 credits in plant sciences, 10 of which must be in botany.

Botany Courses (Bot)**604 Growth and Development 4(1,6) S**

(Offered in 1966)

Relation of light, temperature, water, wind, growth regulators, nutrients and other factors to various stages of plant growth and development. P, 424, Ch 134. Alternate years.

614 Advanced Plant Physiology 4(1,6) S

(Offered in 1967)

Role of organic and inorganic compounds in plant nutrition. Emphasis on photosynthesis, respiration, metabolism, and other cellular processes. P, 424, Ch 134. Alternate years.

624 Morphology of Non-vascular Plants 4(2,4) F

Life histories and evolutionary relationships of principle orders of lower plants. P, 103.

634 Morphology of Vascular Plants 4(2,4) S

Life histories and evolutionary relationships of principle orders of vascular plants. P, 103, 104.

653 Aspects of Morphogenesis 3(0,6) S

Determinative differentiation in growing points of plant axis. P, 413 or 634.

701 Graduate Seminar 1(1,0) FS

Reports and discussions of original and contemporary research. P, graduate standing.

703-713 Advanced Taxonomy 3(2,2) FS

Detailed study of families of higher plants; professional methods of taxonomic research and publication. P, consent of instructor.

790 Thesis in Botany (5-7 as arranged)

DEPARTMENT OF CHEMISTRY

Professor Victor S. Webster, Head

Professors Halvorson, Johnson, Klug, Olson; Associate Professors Brandwein, Emerick, Greb, Whitehead

Graduate majors offered: Master of Science degree with a major in Chemistry.

(See also Master of Education degree program with a major in Physical Science, page 32.)

Doctor of Philosophy degree with a major in Chemistry.

Graduate minors offered: Chemistry.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree with a major in professional chemistry.

For the graduate minor a Bachelor's degree including prerequisites to the graduate courses elected.

Chemistry Courses (Ch)

- 610 Special Problems** *(0,*) FS
Research problems in chemistry. P, consent of instructor. Limited to a total of 4 credits.
- 613 Organic Analysis** 3(1,6) F (Offered in 1966)
Separation of mixtures, identification of organic compounds and quantitative analysis of common elements found in organic compounds. P, 320, 420. Alternate years.
- 615 Principles of Biochemistry** 5(3,6) F
Chemistry of biological processes of plants and animals. P, 134.
- 623 Organic Preparations** 3(1,6) F (Offered in 1965)
Preparation of typical organic compounds with emphasis on yield and purity of product. P, 320, 420. Alternate years.
- 633 Modern Chemistry for High School Teachers**
3(5,4) Su (8 weeks)
Review of modern concepts of chemistry. P, 115, 134, 214 or equivalent.
- 642 Instrumental Analysis** 2(1,3) F
Operation and use of instruments in analysis. P, 320, 420.
- 643 Advanced Inorganic Chemistry** 3(3,0) S
(Offered in 1967)
Continuation of chemistry 413. P, 413, registration in 420. Alternate years.
- 653 Descriptive Inorganic Chemistry** 3(2,3) F
(Offered in 1966)
Laboratory work will include preparation and purification of typical inorganic compounds. P, 115 or 124. Alternate years.
- 711-721 Seminar** 1(1,0) FS
Required of all graduate majors in chemistry.
- 713-723 Advanced Physical Chemistry** 3(3,0) FS
(Offered in 1965-66)
Selected topics in physical chemistry. P, 420. Alternate years.
- 714 Vitamins and Hormones** 4(4,0) F
(Offered in 1965)
Chemical structure and functions of vitamins and hormones in living organisms. P, 615. Alternate years.
- 722 Stereochemistry of Carbon Compounds** 2(2,0) S
(Offered in 1967)
Isomerism due to spatial arrangement of atoms or groups. P, 320. Alternate years.
- 725 Advanced Biochemistry** 5(5,0) S
(Offered in 1967)
Selected topics on carbohydrates, lipids and proteins. P, 615. Alternate years.
- 732 Biochemical Techniques** 2(0,6) S
Research techniques of modern biochemistry pertaining to separation, isolation, purification and measurement of compounds of biological importance. P, 615.
- 733-743 Advanced Organic Chemistry** 3(3,0) FS
(Offered in 1966)
Selected topics in organic chemistry. P, 320. Alternate years.
- 742 Plant Biochemistry** 2(2,0) S (Offered in 1966)
Biochemistry of plant life processes, structural materials and growth regulating substances. P, 615. Alternate years.
- 753 Chemistry of Enzymes** 3(2,3) F
Kinetics, modes of action and properties of enzymes and enzyme systems. P, 615.
- 763 Intermediary Metabolism** 3(3,0) S
Intermediary metabolism of carbohydrates, proteins and fats in animals, plants and microorganisms. P, 615.
- 790 Thesis in Chemistry** (as arranged)

DEPARTMENT OF CHILD DEVELOPMENT AND FAMILY RELATIONS

Associate Professor J. R. Richardson, Acting Head

Graduate major offered: Master of Science degree with a major in Child Development and Family Relations.**Graduate minor offered:** Child Development and Family Relations.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Child Development and Family Relations, or Home Economics, Sociology, or Psychology, plus the prerequisites to courses to be pursued in child development and family relations.

For the graduate minor a Bachelor's degree including prerequisites to the courses elected.

In addition to the courses listed below, graduate majors in Child Development and Family Relations will be required to spend a minimum of one semester in residence at the Merrill-Palmer Institute in Detroit, Michigan, as a part of their academic training.

Child Development and Family Relations Courses (CD)**612 American Woman 2(2,0) S** (Offered in 1966)

Recent literature regarding changing role of woman, her developmental tasks and unique contribution she has to make in dynamic 20th century America. P, 323 or equivalent. Alternate years.

630 Seminar in Human Development and Family Relations 1-2(1-2,0) (On sufficient demand)

Reports and discussions of current literature, including research methodology in area of human development, personality, family relations, marriage and family counseling. Maximum of 4 seminar credits may be applied on advanced degree. P, consent of instructor.

680 Special Problems in Human Development and Family Relations 2-4 credits as arranged

Individual study for qualified students. P, consent of instructor.

760 Early Childhood Education, Administration and Practicum 2-4 credits as arranged

(On sufficient demand)
Practical experience in administration of pre-school, kindergarten program. P, 223, 302, 312, 323, 333.

790 Thesis in Human Development and Family Relations (5-7 as arranged)**DEPARTMENT OF CIVIL ENGINEERING**

Professor E. E. Johnson, Head

Associate Professors Alger, Andersen, Dornbush, Hargett, Koepsell, Shoukry

Graduate major offered: Master of Science degree with a major in Civil Engineering.

Graduate minor offered: Civil Engineering.

Prerequisites for graduate study:

For the graduate major a Bachelor of Science degree in engineering or its equivalent.

For the graduate minor prerequisites to the graduate courses elected.

Civil Engineering Courses (CE)**610 Special Engineering Problems 1,3**

Elective course for special or detailed study or investigation. P, senior standing in Civil Engineering.

633 Hydraulic Design 3(2,3)

Irrigation structures, hydro-electric power facilities, flood control, and special hydraulic design topics. P, 423.

642 Advanced Soils Engineering 2(1,3)

Application of basic soil mechanics to engineering problems. Stability, compaction, embankments, seepage, drainage, and stabilization. P, 444.

643 Advanced Hydraulics 3(2,3)

Similitude and models, dimension analysis, flow in closed conduits and open channels, sediment transportation, and related laboratory topics. P, EM 323.

683 Pavement Design 3(3,0) S

Stresses in and design of flexible and rigid pavements including subgrades, bases and sub-bases. P, 453.

713 Advanced Hydraulic Engineering 3(3,0)

Multiple purpose river development, advanced topics in applied hydraulics. P, 423.

723 Prestressed Concrete 3(3,0)

Theory and design of prestressed concrete including pretension and post-tensioning. P, graduate standing.

733 Advanced Indeterminate Structures 3(3,0)

Analysis of structural members of non-uniform section. Arch analysis, multilevel frameworks, column analogy, moment distribution and energy methods. P, graduate standing.

734 Advanced Structural Design 4(2,6)

Design of rigid frames, effect of plastic behavior, details for complex structures, analysis of flat plate floor systems. Design comparisons. P, graduate standing.

742 Plastic Design 2(0,6)

Modes of failure, plastic hinges, design rules and applications. P, graduate standing.

743 Elastic Stability 3(3,0)

Buckling of columns and plates. Lateral buckling of beams; stability of rings. P, graduate standing.

752 Waste Water Treatment Plant Design 2(0,6)

Water supply sources, design of treatment plants, cost estimates of water supply systems. P, graduate standing.

753 Waste Water Treatment Plant 3(1,6)

Design of waste collection and disposal facilities, waste treatment plants, cost estimates of waste disposal and treatment systems. P, graduate standing.

763 Advanced Sanitary Engineering 3(3,0)

Advanced engineering topics related to sanitary engineering and public health, including housing, air conditioning and ventilation, air pollution, hospital and institutional sanitation, stream sanitation,

waste disposal, radiological health and industrial hygiene.

773 Highway Administration and Economy 3(3,0)

Highway administration, highway and transportation costs, road user benefits, cost benefit ratio.

783 Advanced Transportation Engineering 3(2,3)

Planning and designing of railroads, highways, water and air transportation facilities and coordination of transportation facilities.

790 Thesis (5-7 as arranged)

Independent investigation of special problem and written thesis.

DEPARTMENT OF DAIRY SCIENCE

Professor D. F. Breazeale, Head

Professors Baker, Dracy, Totman (Emeritus), Voelker; Associate Professors Bartle, Spurgeon

Graduate majors offered: Master of Science degree with a major in Dairy Science.

Doctor of Philosophy degree with a major in Animal Science.

Graduate minor offered: Dairy Science.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with major work substantially equivalent to that required by this department.

For the graduate minor a Bachelor's degree including prerequisites to the graduate courses selected.

Dairy Science Courses (DS)**604 Microbiology of Manufactured Dairy Products 3(4,2) F (Offered in 1966)**

Role of microorganisms in manufacture and spoilage of manufactured dairy products. P, 314. Alternate years.

613 Advanced Dairy Processing Methods 3(0,6) S (Offered in 1966)

Operations in ultra-high temperature processing of dairy products; manufacture of special types of cheese; preparation of dairy spreads; process cheese making; and other specialized dairy processing. P, consent of instructor. Alternate years.

614 Advanced Technical Control of Dairy Products 4(2,4) S (Offered in 1967)

Chemical changes that occur during manufacture and storage of dairy products; specialized tests to detect these changes and degree thereof; significance of such changes. P, consent of instructor. Alternate years.

623 Physiology of Lactation 3(3,0) S

Anatomy and physiology of mammary glands. Factors affecting quality and quantity of milk. P, Z 414 or 204.

624 Microbiology of Cultured Dairy Products 4(2,6) F (Offered in 1965)

Role of microorganisms in manufacture of lactic acid cultures, cheese and butter. P, 414. Alternate years.

701 Seminar 1(1,0) S

Problems in dairy production, dairy manufacturing, and related sciences.

761 Nutrition Seminar 1(1,0) FS

Reports and discussion of current research in nutrition. Limited to 2 credits.

790 Thesis in Dairy Science (as arranged)**DEPARTMENT OF ECONOMICS**

Professor Loyd Glover, Head

Professors Helfinstine, Lundy (Emeritus), Myers, Smythe, Thompson; Associate Professors Antonides, Berry, Schultz, Ullman, Van Vlack

Graduate majors offered: Master of Science degree with a major in Economics.

Doctor of Philosophy degree with a major in Economics.

Graduate minor offered: Economics.

Prerequisites for graduate study:

Prerequisites are a Bachelor's Degree with a background in the social sciences, and statistics.

Additional background, which would be helpful to the student pursuing a graduate degree in economics, would include mathematics, history, philosophy and English. An early exposure to foreign languages may be important to those contemplating further graduate work.

Economics Courses (Econ)

602 Economic Ethics 2(2,0) S (Offered in 1966)

Current economic practices examined in light of basic ethical principles. P, 6 hours in economics with one course in philosophy preferably ethics, recommended. Alternate years.

603 Production Economics 3(3,0) F (Offered in 1965)

Theory of the firm and industry, with applications in agriculture, manufacturing, and trade. Input-output relations for economic decision-making using continuous models (marginal analysis) and discontinuous models (linear programming). P, 433 or equivalent, consent. Alternate years.

604 Introduction to Econometrics 4(4,0) S (Offered in 1966)

Application of mathematical economic theory and statistical procedures to economic data; empirical testing of economic theorems. P, 314. Alternate years.

612 Resource Economics 2(2,0) F (Offered in 1965)

Economic analysis applied to problems in conservation and development of natural resources. Effect of programs on land-use. Land institutions, tenure, administration of public lands, water allocation, zoning, and alternative resource philosophies and policies. P, 213. Alternate years.

613 Economics of Modern Capitalism 3(3,0) F (Offered in 1965)

American economy as an organic entity; ownership and control of economic organizations; influence of power in economic groups; production, merchandising, pricing and financial strategies of economic groups. Positive and negative roles of government in economic regulation. P, 213. Alternate years.

622 Statistical Methods III 2(2,2) S (Offered in 1967)

Sampling as technique in social science research, including history of sampling, design and planning of surveys, different types of sampling techniques and methods of estimation, precision of estimates, and efficiency of sampling designs. P, 353. Alternate years.

623 Advanced Farm Management 3(3,0) S (Offered in 1967)

Review of management principles, including decision making and problem recognition; obtaining control of resources; organizing farm; obtaining and evaluating outlook information; administering farm or ranch; effects of income taxes; farm incorporation; father-son arrangements; field trips to well-organized farms and ranches. P, 213 or 234 or consent. Alternate years.

632 Advanced Economic Analysis 2(2,0) F (Offered in 1966)

Selected branches of microeconomics, including welfare theory and partial and general equilibrium. P, 433. Alternate years.

633 Pricing in Agriculture and Business 3(3,0) F

Principles of price determination with reference to special characteristics of agricultural products and markets; methods of price analysis and forecasting; theory of price stabilization and price discrimination and effect on income; analysis of programs and proposals to control agricultural prices by controlling production, market supplies, and foreign demands. P, 213.

643 International Trade 3(3,0) S (Offered in 1967)

Factors affecting international flow of trade and balance of payments; trade controls and their influence on agricultural and domestic economy; significant current developments in trade and finance. P, 213. Alternate years.

653 Comparative Economic Systems 3(3,0) F (Offered in 1965)

Organization, operation, and comparison of various types of economic systems, such as free private enterprise system, socialism, communism, and fascism. P, 213. Alternate years.

663 National Income Accounts and Analysis 3(3,0) S (Offered in 1967)

Examination of common statistical measurements of general economic activity, and their significance in current business analysis and for economic forecasting and planning. Causes and control of business cycle. P, 203.

673 History of Economic Thought 3(3,0) S

Survey of economic theory; different schools of economic thought and economic environments which produced them. P, 433 or consent.

683 Agricultural Marketing 3(3,0) S (Offered in 1966)

Economic analysis of marketing problems, functions and institutions; costs and efficiency in processing and marketing; industrial structure and government roles in processing and marketing. P, 433 recommended. Alternate years.

690 Special Problems 1-3(1-3,0) FS

Advanced work or special problems in agricultural cooperation, agricultural finance, farm management, land economics, marketing, public finance, statistics. Open to qualified seniors and graduate students by consent.

693 Economic Development 3(3,0) F (Offered in 1965)

Conditions necessary for capital formation and economic development, with examination of development problem in selected area in U. S. and other countries. P, consent. Alternate years.

701 Seminar in Economics 1(1,0) F

A maximum of 3 credits may be applied toward an advanced degree.

702 Research Methods 2(2,0) F

Methods, problems and principles involved in research work and sources of data for prospective research workers in economics.

703 Advanced Macroeconomics 3(3,0) S

(Offered in 1967)

Modern and advanced macroeconomic models, with a view toward understanding of progress of economic growth and maintenance of high level of income and employment. Alternate years.

711 Current Theory 1(1,0) FS (Offered in 1967)

One outstanding book in current economic theory studied intensively each semester. Alternate years.

713 Market Structure Theory 3(3,0) S

(Offered in 1967)

Marketing structures: locational cost, and institutional. How markets are related in form, time and place. Theoretical and statistical tools applicable to the analysis of marketing problems and situations. P, 433. Alternate years.

723 Economic Policy 3(3,0) F (Offered in 1966)

Relation of economic policies to basic values, technical and institutional limitational factors; role and limitations of expert and theoretical analysis. Alternate years.

790 Thesis in Economics (as arranged)**DEPARTMENT OF EDUCATION**

Professor Stanley Sundet, Head

Professor Wiseman (Emeritus); Associate Professors Foreman, Gadda, Herold, Scholten, Whitmore, Anderson

Graduate majors offered: Master of Education degree with a major in Education or in Agricultural Education.

Master of Science degree with a major in Education or in Agricultural Education.

(See also Special Programs section on pages 31 to 33.)

Graduate minors offered: Agricultural Education. Education.

Prerequisites for graduate study:

For the graduate major in Education a Bachelor's degree including completion of the curriculum at this institution (or its equivalent) for High School General Certificate for South Dakota.

For the graduate major in Agricultural Education a Bachelor's degree including completion of the curriculum at this institution (or its equivalent) for approval as a teacher of Vocational Agriculture in South Dakota, 9 credits in general education, and a course in elementary psychology.

For either of the above majors, 8 credits of sciences and mathematics are required, and at least one year of successful teaching experience in public schools is recommended.

Note: Anyone who does not meet the above qualifications because of unusual circumstances may be approved for graduate study if he meets the approval of the head of the Education Department and the Dean of the Graduate School.

For the graduate minor a Bachelor's degree and prerequisites for the graduate courses elected.

Agricultural Education Courses (AgEd)**600 Seminar in Agricultural Education 1-2(1,0) or (2,0)**

Specific problems dealing with instruction in vocational agriculture, project work, course of study, farm enterprise analysis, local survey. Reading and problem work. P, 453, 454, 458.

702 Adult Education in Vocational Agriculture 2(2,0) Su

Young farmer and adult farmer work. Emphasizes needs and techniques in administering and conducting adult education programs in vocational agriculture; course planning, instructional procedures, followup and evaluation of adult classes. P, graduate student in agricultural education.

712 FFA and Supervised Farming Programs 2(2,0) Su

Emphasizes needs, scope, and techniques in building supervised farming and Future Farmer programs. Stresses integration of these programs with high school vocational agriculture curriculum. P, graduate student in agricultural education.

722 Curriculum in Vocational Agriculture 2(2,0) Su

For teachers and administrators of vocational agriculture. Survey of scientific studies and literature in field; principles and procedures in course building as applied to vocational agriculture. P, graduate student in agricultural education.

Education Courses (Ed)

602 Principles of Vocational Education and Practical Arts 2(2,0) Su

Overview of vocational and practical arts education, their place in community school; organization and characteristics of instructional programs in agricultural, homemaking, business and industrial education. For teachers, administrators and guidance personnel. P, senior in education.

613 Educational Statistics 3(3,0) FSu

Emphasis on meanings and interpretations and applications. Deals with data from educational and psychological measures. Exercises on tabulating and calculating various statistical measurements and graphic representations. Required of most candidates for graduate major in education. P, graduate standing. Open to seniors.

630 Workshop in Education 1-3 Su

Workshop sessions, in several areas of education: Methods, curriculum, guidance, administration, supervision and others. Generally requires 30 hours of work per credit in workshop sessions, lectures, and outside assignments. Concentrated course. Credit at rate of one credit per week. No more than 4 credits may be earned in workshop. P, experienced teachers, consent of instructor.

640 Education Seminar 1-3(1-3,0)

Review of scientific investigations of problems of education. Problems for investigation and research assigned to students. P, open to seniors and graduate students in education by permission of instructor.

J 642 Institutional Public Relations 2(2,0) SSu

(See Journalism Section.)

650 Problems in Education 1-3

Selected studies to meet needs of advanced students. P, senior standing, for seniors and graduate students desiring to do individual studies. Limited to 3 credits in graduate program. Consent of instructor.

651 Advanced Driver Education 1(1,0) Su

Traffic accident problems; survey of research studies in driver education and protection; sources of materials; measurement of driver attitudes. May be conducted as regular course or as short course involving full week (40 hours) of instruction. P, 442.

GS 672 Improvement of Reading 2(2,0) SSu

(See General Studies Section.)

702 Research Methods in Education 2(2,0) FSu

Main objectives are: (a) understanding standard and new research procedures in education (b) acquaintance with up-to-date research on present-day educational problems (c) understanding and using evaluation standards for education research. Required of most graduate majors in education.

712 School Supervision 2(2,0) FSu

Required of School Superintendents and School Principals by State Department of Education for re-

spective administrative certificates. Procedure for improvement of instruction in secondary and elementary school subjects.

722 Organization and Administration of Elementary Education 2(2,0) SSu

Principles and modern practices of organizing and administering work of elementary schools. Required by State Department of Public Instruction of school superintendents and elementary school principals. P, Ed 752.

732 Elementary School Curriculum 2(2,0) SSu

Nature and principles of curriculum in elementary schools. Newer trends and modern curriculum development procedures.

742 Secondary School Curriculum 2(2,0) SSu

Nature and principles of curriculum in secondary schools. Newer trends and modern curriculum development procedures.

752 Public School Administration 2(2,0) FSu

Organization, administration and services of school systems in state, county, and local districts. Constitutional and statutory provisions. Work and responsibilities of State Board of Education, State Department of Public Instruction, County and Local Boards, and of superintendents and principals. Some attention to financial matters.

762 School Law 2(2,0) FSu

Legal character of Public Schools; legal powers of school boards, administrators, and teachers; legal aspects of parent-child-school relationships. Emphasis will be placed on South Dakota School Law. Alternates with Ed 772. P, Ed 752.

772 School Buildings and Grounds 2(2,0) SSu

Managements, care and operation of school plant. Needs and evaluation of existing facilities, new buildings and remodeling. Not a technical course in design and materials. Alternates with Ed 762.

782 School Finance 2(2,0) SSu

Business aspects of school administration. Organization and work of school board, equipment and supplies, janitor service, and school finances including budgeting procedure and insurance. P, 752.

790 Thesis in Education (5-7 as arranged)

792 Research Problems in Education and Agricultural Education 2(2,0)

Individual work. Problem selected, analyzed and data gathered and tested statistically. Reported in approved research form. Required of all graduate students in education qualifying for Master of Education degree under Option "A." P, graduate standing in education. Ed 613, 702, and 10 graduate education credits.

Guidance and Counseling Courses (GC)

602 Guidance and Counseling Workshop 2 credits Su

Selected problem areas in counseling and guidance. Needs and interests of class members will determine, to an extent, course content. Case study and

case conference techniques will be included. Nationally known guidance authority will be scheduled as speaker. Outstanding guest speakers and consultants will participate in general sessions.

603 Group Testing 3(3,0) FSu

Standardized and informal instruments commonly used for measurement and evaluation in elementary and secondary schools. Theory and practice of administration, scoring and interpretation. P, Ed 613 or consent of instructor.

702 Administration of School Guidance 2(2,0) FSu

Principles of guidance; organizing school guidance program, tests and testing; guidance library and materials; interviewing and counseling. For those seeking administrative certificate.

712 Occupational and Education Information 2(2,0) SSu

Using, reviewing, and evaluating occupational information. Sources and types of materials and occupational filing plans. Securing occupational information. P, Ed 412.

722 Mental Health and Personality Development 2(2,0) SSu

Nature of personality; mental and emotional health and recognition of deviations in children and adults. Emphasis on mental health problems and positive program for personal mental health.

732 The Exceptional Child 2(2,0) FSu

Critical consideration of physical, social, emotional, and intellectual qualities which characterize children who deviate from normal to such an extent as to require special educational consideration. Special attention given to study of desirable provisions in educational program of gifted children.

743 Counseling Theory and Practice 3(3,0) FSu

Theories, methods, and application of the counseling process at all levels. P, 15 semester credits in guidance and counseling and consent of instructor.

752 Seminar in Guidance and Counseling 2(3,0) SSu

Research relating to guidance and counseling. Students will investigate specific problems. P, 20 semester credits in guidance and counseling and consent of instructor.

763 Counseling Laboratory and Supervised Practice 3(3,0) SSu

Counseling interviews and activities under supervision of one or more members of college staff will be conducted in counseling laboratory and field. In addition to laboratory and field experience, type-written report analyzing experience must be submitted to supervisor. P, advanced graduate majors in guidance and counseling and consent of Department.

Industrial Arts Education Courses (IAE)**612 Metal and Wood Finishing 2(2,0) Su**

Use of lacquers, varnishes, paints, synthetic finishes for wood and metal. Finishing of metal through machining and heating. Applicators such as brushes, air guns, and compressed containers. Use of all types of stains, solvents, fillers and sealers. P, minor in IAE.

622 History of Industrial Arts 2(2,0) Su

Development of industrial arts from Russian Military Craft School through fireside crafts of the Scandinavian countries. Introduction of manual training into curriculum of education in United States and changes that resulted in our present course of exploration in various trades of today. P, minor in industrial arts.

Psychology Courses (Psy)**602 Adolescent Psychology 2(2,0) FSu**

Physical, intellectual, emotional, and social development of adolescents and their adjustment in home, school and community. P, four credits in psychology, and consent of instructor. (May be counted as education credit.)

703 Individual Mental Testing 3(3,0) SSu

Intensive training in administration and scoring of individual mental tests: Stanford-Binet and Wechsler scales. P, Ed 613, GC 703; consent of instructor. Master's degree candidate in GC. Class limited.

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor W. H. Gamble, Head

Professors Cheadle, Storry; Associate Professor Whitman

Graduate major offered: Master of Science degree with major in Electrical Engineering.

Graduate Minor offered: Electrical Engineering.

Prerequisites for graduate study:

For the graduate major a Bachelor of Science degree in engineering or its equivalent.

For the graduate minor prerequisites to the graduate courses elected.

Electrical Engineering Courses (EE)**613 Electric Circuits III 3(3,0) S**

Distributed constants, transmission line theory, synthesis of L-C, R-C, and R-L circuits, approximations, transfer functions. P, 413.

622 Electromagnetic Waves 2(2,0)

(On sufficient demand)
Application of vector analysis to electric and magnetic waves and high frequency radiation. P, 323; Math 393.

644 Electronics III 4(3,3) S

Wave shaping circuits, analog computer circuits, digital computer circuits. P, 433.

652 Power System Analysis 2(2,0)

(On sufficient demand)

Methods of analysis of power system components operating together in a power system. Introduction to unbalanced system conditions. P, 462.

682 Servomechanisms 2(2,0)

(On sufficient demand)

Servomechanism principles, dynamics of servo systems, transient and frequency response, block diagram notation, requirements for stability. Nyquist stability criterion. P, 413 and consent of instructor.

710 Special Electrical Problems 1-3

(On sufficient demand)

Special problem assigned in field of power or electronics. P, graduate standing.

713 Advanced Circuit Theory I 3(3,0) F

Application of classical mathematics to circuit response with various driving functions. P, 413.

723 Advanced Circuit Theory II 3(3,0) S

Circuit and system response with emphasis on operational methods of analysis. Heaviside's method,

Laplace Transforms, Analog computer as a tool in analysis of transients. P, 713.

733 Advanced Electronics I 3(3,0) F

Pulse, switching, and timing circuits; signal-flow graphs, negative feedback circuits, microwaves, electronics systems engineering. P, 433.

743 Advanced Electronics II 3(3,0) S

Molecular and plasma electronics masers and lasers, electronics systems engineering, communication theory. P, 733.

753-763 Advanced Machinery and System Analysis I and II 3(3,0) FS

Concise and detailed study of electric machinery, control systems and their transient responses. Load flow studies, stability studies, relaying, lightning phenomena, grounding.

762 Symmetrical Components

Application of symmetrical components to simple three phase circuit, unloaded systems, loaded systems. Symmetrical component impedances. Use of networks analyzer in analysis of symmetrical components.

790 Thesis in Electrical Engineering

(5-7 as arranged)

DEPARTMENTS OF ENGLISH AND SPEECH

English: Professor Giddings; Associate Professors Brown, Nagle

Speech: Professor Stine; Associate Professor Hoogestraat; Assistant Professor Denton

Graduate major offered: The Master of Science degree in Language Skills with curricula in English or Speech.

(For the Master of Education degree with a major in communication, see page —.)

Graduate minors offered: Both the English and Speech departments offer a graduate minor in their respective fields.

Prerequisites for graduate study: For the graduate major: a minimum of 24 semester hours of undergraduate credit in the curriculum chosen, (English or Speech).

For the graduate minor: a minimum of 16 semester hours of undergraduate credit in the graduate minor chosen or consent of the department head.

Degree Requirements:

English curriculum: The required curriculum consists of English 773 and 790, Journalism 713, and electives approved by the adviser to total a minimum of 30 semester hours credit. The department requires that its graduate assistants enroll in English 721 and 731, and recommends these courses for others. The department also recommends Speech 613 for all English majors. In addition, the candidate must demonstrate a reading knowledge of a foreign language, and must submit for committee approval a thesis based on appropriate research.

Speech curriculum: The required curriculum consists of Journalism 713, 732, 672; and electives approved by the adviser to bring the combined total to 30 semester hours. Sociology 633; Speech 612 and Speech 613 are recommended. A reading knowledge of a foreign language, and satisfactory completion and approval of a thesis based on appropriate research and carrying 5 to 7 credits, are also required.

English Courses (Engl)

GS 602 Research Tools in the Humanities 2(2,0) F
Survey of research and reference materials of special value and interest to students of Humanities.

622 Development of English 2(2,0) SSu
(Offered in 1967)

Development and structure of language. Special emphasis placed on grammar, treated with historical perspective. Attention also given to etymology and semantics. Alternate years.

633 Comparative Novel 3(3,0) F (Offered in 1966)
Selected European novels from Fielding to Camus. P, 16 hours of English or consent. Alternate years.

642 Milton and the Classicists 2(2,0) S
(Offered in 1966)

Selected poems and prose of Milton, Dryden, Pope, Swift, Johnson, and Boswell, with some attention to lesser figures in the period 1725-1784. P, 16 hours in English or 20 hours in combination of language arts or consent. Alternate years.

652 The Romantic Movement 2(2,0) S
(Offered in 1967)

Chief writers in English romantic poetry and prose from 1740-1832, with emphasis on intellectual trends. P, 16 hours in English or 20 hours in combination of language arts or consent. Alternate years.

662 American Renaissance 2(2,0) S
(Offered in 1966)

Hawthorne, Emerson, Thoreau, and Whitman. P, 16 hours in English or 20 hours in combination of language arts or consent. Alternate years.

672 Realists and Early Naturalists 2(2,0) S
(Offered in 1967)

From quest of Melville through realistic and naturalistic young writers at end of 19th century. P, 16 hours in English or 20 hours in combination of language arts or consent. Alternate years.

GS 672 Improvement of Reading in the School
2(2,0) SSu

Description of normal process of development in reading skills and techniques which may be employed in remedying deviations which hinder readers in speed or comprehension. Recommended for graduate students in Language Skills and Communications programs and for undergraduate majors who plan to teach. May count as education credit.

GS 682 Diagnosis and Remediation of Reading Problems 2(2,0) Su
(See General Studies)

GS 692 Clinical Practices in Reading 2(1,3) Su
(See General Studies)

GS 702 Modern American Thought 2(2,0) F
(Offered in 1965)
(See General Studies)

710 Special Problems in Composition-Literature
1-3 credits

Special problems in several areas: writing, grammar, reading, and testing. May be repeated to total of 4 credits.

721-731 Problems of Teaching Composition 1(1,0)
FS

Analysis of problems encountered in teaching composition; evaluation of techniques in teaching writing skills. Required in Composition-Literature option of Language Skills program.

773 Literature: Criticism and Teaching 3(3,0) F
(Offered in 1965)

Tradition of literary criticism from Plato to New Criticism and application of modern principles of criticism to teaching. Required in Composition-Literature option of Language Skills program. Alternate years.

790 Thesis in Language Skills 5-7 credits

Speech Courses (Sp)

612 Persuasion 2(2,0) S (Offered in 1967)

Audiences, motivation, principles of attention and suggestion, bases of belief and action applicable in persuasive speaking. Theory and practice. P, 323. Alternate years.

613 Directing Speech Activities 3(3,0) S
(Offered in 1967)

Organizing declamation, dramatics, and forensic programs. Teaching of speech. Professional organization and journals. P, consent of department head. Alternate years.

630-640-650 Special Problems in Speech 1 to 2 cr FS
Directed research and reading. May be repeated for total of 4 credits. P, 16 credits in speech or graduate standing.

630 Oral Communication: Public Address or Speech Education

640 Theater or Interpretation

650 Speech Correction or Audiology or Practicum

790 Thesis in Language Skills (5-7 as arranged)

DEPARTMENT OF FOOD AND NUTRITION

Professor E. Hollen, Head
Professors Burrill, Schuck; Associate Professor Wills

Graduate major offered: Master of Science degree with a major in Food and Nutrition.

Graduate minor offered: Food and Nutrition.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with major work substantially equivalent to that required by this department.

For the graduate minor a Bachelor's degree including prerequisites to the graduate courses elected.

Food and Nutrition Courses (FN)

630 Special Problem in Food and Nutrition

2-4 credits as arranged

Special study in food and nutrition. P, consent of instructor.

700 Seminar in Food and Nutrition

(On sufficient demand)

Reports and discussions of current literature in various areas of food and nutrition. P, consent of instructor.

703 Recent Advances in Nutrition 3(3,0)

(On sufficient demand)

Critical analysis of recent developments in nutrition. P, 4 hours of nutrition or consent of instructor.

713 Recent Advances in Food 3(3,0)

(On sufficient demand)

Recent developments in food research and technology. P, 4 credits in foods or consent of instructor.

723 Techniques in Nutrition Research 3(1,6)

(On sufficient demand)

Laboratory experience using methods, measurements and instruments for obtaining nutritional data. P, 615 or Ch 324 or consent of instructor.

790 Thesis in Food and Nutrition

(5-7 as arranged)

GENERAL STUDIES

Courses in General Studies are offered as follows. There is no major or minor, and the various courses are taught by various departments. The courses are accepted by many departments as a part of the major or the minor, and the courses may be used as supporting courses in a degree program.

General Studies Courses (GS)

602 Research Tools in the Humanities 2(2,0) F

Survey of research and reference materials of special value and interest to students of Humanities. Acceptable for major or minor credit in Economics, English, History, Political Science, and Rural Sociology.

672 Improvement of Reading 2(2,0) SSu

Description of normal process of development in reading skills and techniques which may be used in remedying deviations which hinder readers in speed or comprehension. Recommended for graduate students in Language Skills and Communications programs and for undergraduates who plan to teach. Administered by English department.

682 Diagnosis and Remediation of Reading Problems

2(3,0) Su

General nature of causes of reading disability; principles of diagnosis and use of instruments; basic principles of individual remediation; case studies; evaluation of progress of the disabled reader; adaptation of techniques to classroom. P, Ed Psy 312. Administered by English department.

692 Clinical Practice in Reading 2(1,4) Su

Supervised experience in utilizing best techniques and materials to effect desirable solution to reading difficulties; practical experience in writing case studies, in diagnosing reading disability, proposing effective remediation, keeping records and in evaluating progress of student. P, 682 or concurrent. Administered by English department.

702 Modern American Thought 2(2,0) F

(Offered in 1965)

Analysis of selected economic, social, and philosophical ideas of late 19th and 20th centuries, their relationship to selected segments of American life and their reflection in American literature. P, consent of instructor. Offered alternate years. Taught by English department.

DEPARTMENT OF HISTORY AND POLITICAL SCIENCE

Professor D. D. Parker, Head

Professors Engberg, Hendrickson, Sewrey, Volstorff, Young (Emeritus)

Graduate major offered. (See Master of Education degree program with a major in Social Science, page 32.)

Graduate minors offered: History, Political Science.

Prerequisites for graduate study:

For the graduate minor a Bachelor's degree with minor in History or Political Science, according to the field chosen for the minor.

History Courses (Hist)

GS 602 Research Tools in the Humanities 2(2,0)
(See General Study 602.)

603-613 Modern Europe 3(3,0) FS
(Offered in 1966-67)
Survey of the political, cultural, and intellectual development of Europe, 1450-1815; detailed survey of period 1815-1919. Alternate years. P, 103.

RS 612 Social Thought (History)
(See Rural Sociology 612.)

622 History of Russia 2(2,0) S (Offered in 1966)
From earliest times to present, with special emphasis on background and history of communist regime; treats cultural and social as well as political aspects. Alternate years. P, 103.

623 Intellectual History 3(3,0) F (Offered in 1966)
Leading cultural and ideological movements of Western man. Alternate years. P, 103.

653-663 American Diplomatic History 3(3,0) FS
(Offered in 1965-66)

Rapid survey of period to 1898; more comprehensive treatment of present century of American diplomacy. Alternate years. P, 224.

670 Special Problems in History 2-3-4 credits FSSu
Selected studies to meet needs of advanced students. P, junior standing, minoring or majoring in history, and consent of instructor. May be repeated, but limit is 4 credits.

Econ 693 History of Economic Thought 3(3,0)
(See Economics 693.) Credited toward major in department.

710 Seminar in History 1-2 credits
Studies in selected history fields, arranged according to demand.

Political Science Courses (PolS)

613 International Politics 3(3,0) F
(Offered in 1966)

How nation-states behave and why they behave as they do in their relations with each other. Attention is given to contemporary U. S. foreign policy. Alternate years. P, 213 or consent.

623 International Law and Organization 3(3,0) S
(Offered in 1967)

System of rules purporting to regulate conduct of nation-states and development of machinery of international cooperation with particular reference to United Nations. Alternate years. P, 213 or consent.

632 Administrative Law 2(2,0) S (Offered in 1966)

Judicial control of administrative activity. Case method. Alternate years. P, 213 and 333.

642 Administrative Principles and Practices 2(2,0) S
(Offered in 1967)

Critical analysis of administrative principles and

practices as they pertain to government and business. Alternate years. P, 213 and 333 or consent.

662 American Political Theory 2(2,0) F
(Offered in 1965)

Development of American Political thought in relation to changing problems of democracy. Alternate years. P, junior standing and five hours of political science, or graduate standing, or consent.

670 Special Problems in Political Science (1-2-3,0)
FSSu

Selected studies of individual guided research and reading culminating in formal research paper. P, junior standing and political science minor or major, or graduate standing, or consent. Not over total of 5 hours may be taken under PolS 670 toward PolS minor. Offered each year.

710 Seminar in Political Science (1-2-3,0)

Studies in selected Political Science fields. P, graduate standing and consent based upon undergraduate record. Arranged according to demand.

DEPARTMENT OF HOME ECONOMICS EDUCATION

Professor Lilyan K. Galbraith, Head

Professor McArthur (Emeritus); Associate Professor Johnston

Graduate majors offered: Master of Science degree with a major in Home Economics Education.

Master of Education degree with major in Home Economics Education.

Graduate minor offered: Home Economics Education.

prerequisites to courses to be taken in home economics and education.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Home Economics and

For the graduate minor a Bachelor's degree including no less than 16 credits in home economics and prerequisites to the courses elected.

Home Economics Education Courses (HEd)**612 Trends in Home Economics Education 2(2,0)**
(On sufficient demand)

Trends in family life education, with emphasis on their effect on teaching in high school classes or youth groups, such as 4-H clubs. P, 432.

630 Problems in Home Economics Education 1-4
(On sufficient demand)

Investigation of problems selected from Home Economics Education fields, such as adult education, evaluation, space and equipment and trends in home economics. P, open to students with qualifications for problem.

700 Seminar in Home Economics Education 1-2
(On sufficient demand)

Review and discussion of current literature in home economics education. Required of all graduate students.

702 Supervision in Home Economics Education 2(2,0)
(On sufficient demand)

Programs in home economics studies with special emphasis on supervised student teaching: Roles of state supervisor, city supervisor, student teaching

supervisor, and student teachers analyzed. Opportunity to work on individual problems. P, teaching experience and consent of staff.

712 Curriculum in Home Economics Education 2(2,0)
(On sufficient demand)

Curriculum in secondary schools of South Dakota and other states. New ideas developed. P, 432 or equivalent.

722 Evaluation in Home Economics Education 2(2,0)
(On sufficient demand)

Methods and techniques used in evaluating programs in homemaking. Evaluation instruments developed. P, 432 or equivalent.

740 Research Problems in Home Economics Education 2-3 as arranged

Required of graduate students qualifying for master's degree without writing thesis. (See procedure on pages 22 through 25.) Problem selected in some area of Home Economics Education. Problem analyzed, data gathered, treated statistically and reported in approved form.

790 Thesis in Home Economics Education
(5-7 as arranged)**DEPARTMENT OF HOME MANAGEMENT AND HOUSEHOLD EQUIPMENT**

Associate Professor Luchsinger, Head

No major or minor is offered in this department. Graduate level courses are, however, offered and these may be applied to other degree programs in the Division of Home Economics with approval of the major adviser. They may also be used as supporting courses.

Home Management, Family Housing, and Household Equipment Courses (HM)**600 Seminar in Home Management 1(1,0)**
(On sufficient demand)

Review and discussion of current literature in various areas of home management.

612 America's Housing 2(2,0) F
(On sufficient demand)

America's housing as affected by following factors: history; philosophy; tradition; climate; geo-

graphical area; population; local, state, and federal laws; and financing. P, 372 and consent of instructor. Alternate years.

630 Special Problems 1-4 (On sufficient demand)

Opportunity offered for special study in Home Management and Equipment. P, consent of instructor.

DEPARTMENT OF HORTICULTURE

Associate Professor R. M. Peterson, Head
Associate Professors Collins, Macskam

Graduate major offered: Master of Science degree with a major in Horticulture.

Graduate minor offered: Horticulture.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in agriculture and the prerequisites to subjects pursued.

For the graduate minor a Bachelor's degree with courses in botany, entomology, and other subjects related to the work taken in horticulture.

Horticulture Courses (Ho)**600 Horticulture Problems 1-2 FS**

Special investigation for graduate students. Maximum of four hours credit. Open as elective to selected undergraduates.

732 Experimental Horticulture 2(2,0) S

Principles, methods, equipment, organization and application of horticultural research. P, graduate standing.

790 Thesis in Horticulture (5-7 as arranged)

DEPARTMENT OF MATHEMATICS

Associate Professor A. W. Kranzler, Acting Head

Professors Engebretson, MacDougal, Walder, Wentz; Associate Professors Richards, Scholten

Graduate majors offered: Master of Science degree with a major in Mathematics.

(See also Master of Education degree program with major in Physical Science, page 32.)

Graduate minor offered: Mathematics.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree with a major in mathematics or the equivalent.

For the graduate minor a Bachelor's degree with prerequisites to the subjects elected for graduate study.

Mathematics Courses (Math)**603 Numerical Analysis (3,0) S**

Finite differences, interpolation, summation of series, approximation of functions, numerical solution of systems of algebraic equations, approximate solution of ordinary differential equations, numerical differentiation and integration. P, 333.

623-633 Advanced Calculus 3(3,0) FS

Infinite series, elliptic integrals, Fourier series, multiple integrals; line, surface and space integrals, ordinary differential equations, Bessel functions, partial differential equations, vector analysis, and probability. P, 254.

643 Partial Differential Equations 3(3,0) S

Series solutions, total differential equations, si-

multaneous equations, approximate solutions, partial differential equations of first and second orders, applications. P, 333.

644 Complex Variables 4(4,0) F

Algebra of complex numbers, classification of functions, differentiation, integration, mapping, transformations, and infinite series. P, 254.

770-780 Advanced Topics in Mathematics

1-2(1-2,0) FS

Selected topics in mathematics to fit needs of graduate student. Limited to total of three credits. P, consent of staff.

790 Thesis in Mathematics (5-7 as arranged)**DEPARTMENT OF MECHANICAL ENGINEERING**

Professor J. F. Sandfort, Head

Associate Professor Eno

Graduate major offered: Master of Science degree with a major in Mechanical Engineering.**Graduate minor offered:** Mechanical Engineering.**Prerequisites for graduate study:**

For the graduate major a Bachelor of Science degree in engineering or its equivalent.

For the graduate minor prerequisites to the graduate courses elected.

Mechanical Engineering Courses (ME)**633 Quality Control and Reliability 3(3,0)**

(On sufficient demand)

Fundamentals of probability and distribution theory with applications to various branches of engineering. Application of statistical techniques to the control of quality and the development of economical inspection methods. Collection, analysis, and interpretation of operations data; control charts and sampling procedures; relations between experimental measurements, using regression and correlation theory and analysis of variance. Application of statistical methods for life and reliability analysis in product design, production, and procurement. P, 403 or consent of instructor.

643 Introduction to Operations Research 3(3,0)

(On sufficient demand)

History and organization of operations research; mathematics in industrial decisions; evaluating production alternatives; waiting lines; linear programming techniques; replacement; sequencing; incremental and total value analysis. Simulation. Input-output models. P, 403 or consent of instructor.

653 Advanced Metallurgy 3(3,0)

(On sufficient demand)

Continuation of Course 453. Methods of metallurgical examination and mechanical testing. Heat treating and surface hardening methods and techniques. Elasticity, plasticity, structure of alloys, high temperature metals. P, 453.

663 Gas Dynamics 3(3,0) (On sufficient demand)

Interaction of a body and a fluid for subsonic and supersonic flow, shock phenomena, use of Mach parameter, constant area ducts. P, 333; EM 323.

710 Special Problems 1-5 (On sufficient demand)

Provides an opportunity for study or investigation of special problem or project at graduate level. P, graduate standing.

713-723 Systems Analysis 3(3,0)

(On sufficient demand)

Analysis of industrial problems as systems, having properties of input, processing, output, feedback and control. Application of systems techniques for isolating and identifying industrial problems in areas such as production, organization, engineering, and research. Case studies to illustrate use of modern electronic digital computers in design of systems. P, graduate standing.

733-743 Advanced Machine Design 3(3,0)

(On sufficient demand)

Stress analysis, elastic energy theory, photoelasticity, curved beams, thin plates and shells, torsion, fatigue, and stress concentration. P, 434; graduate standing.

753 Advanced Engineering Thermodynamics 3(3,0)

(On sufficient demand)

Fundamental concepts of thermodynamics general thermodynamic equations, Maxwell's and Clapeyron relations, thermodynamics of chemical reaction and thermoelectricity, availability, special topics. P, 333, graduate standing.

763 Advanced Heat Transfer 3(3,0)

(On sufficient demand)

Analytical and numerical solutions of steady and transient heat conduction boundary value problems, with and without internal heat sources. Free and forced heat convection problems including boundary layer analysis. Thermodynamic fundamentals of radiation heat transfer. P, 343, graduate standing.

773 Advanced Refrigeration and Air Conditioning

2(2,0) (On sufficient demand)

Thermodynamic analysis and design of refrigeration and air conditioning processes, cycles and systems. Complex cycles. Energy transfers to air-water vapor mixtures. Special topics. P, 433; graduate standing.

790 Thesis in Mechanical Engineering

(5-7 as arranged)

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Associate Professor G. W. Omodt, Head
Professors Bailey and LeBlanc

Graduate major offered: Master of Science degree with a major in Pharmaceutical Chemistry.

Graduate minor offered: Pharmaceutical Chemistry.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.

For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmaceutical Chemistry Courses (Pha)**603 Bionucleonics 3(3,0) FS**

Theory and techniques for application of radioactive and stable isotopes to biological research.

611 Bionucleonics Laboratory 1(0,3) FS

Laboratory application of isotope technique to biological research. P, 603 which may be taken concurrently.

704 Advanced Drug Analysis 4(2,6) F

Drug analysis employing various types of industrial laboratory apparatus. Offered on sufficient demand.

712 Advanced Drug Analysis 2(1,3) S

Continuation of course 704. Offered on sufficient demand.

714 Advanced Pharmaceutical Chemistry 4(3,3) F

Chemistry of organic compounds used as therapeutic agents with emphasis on synthesis and structure-activity relationships. Laboratory synthesis of organic medicinals. Offered on sufficient demand.

715 Advanced Pharmaceutical Chemistry 5(3,6) S

Continuation of course 714. Offered on sufficient demand.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the Division of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmaceutical Chemistry

(5-7 as arranged)

DEPARTMENT OF PHARMACOGNOSY

Professor K. Redman, Head

Graduate major offered: Master of Science degree with a major in Pharmacognosy.**Graduate minor offered:** Pharmacognosy.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.

For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmacognosy Courses (Pha)

703 Microscopy of Foods and Drugs 3(2,3)

Microscopic structure and characteristics of powdered drugs and foods with methods of identification of adulterants. Offered on sufficient demand.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmacognosy (5-7 as arranged)

DEPARTMENT OF PHARMACOLOGY

Prof. G. C. Gross, Head

Graduate major offered: Master of Science degree with a major in Pharmacology.**Graduate minor offered:** Pharmacology.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.

For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmacology Courses (Pha)

713-723 Pharmacology 3(1,6)

Theories of drug action and techniques used in pharmacological research and testing. P, 534. Offered on sufficient demand.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmacology (5-7 as arranged)

DEPARTMENT OF PHARMACYAssociate Professor R. S. Knott, Head
Professor LeBlanc**Graduate major offered:** Master of Science degree with a major in Pharmacy.**Graduate minor offered:** Pharmacy.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.

For the graduate minor a Bachelor's degree with prerequisites to graduate subjects desired.

Pharmacy Courses (Pha)

612 Manufacturing Pharmacy 2(1,3)FS

Use of equipment similar, on a pilot plant scale, to that used in industry and to give experience in quantity production of formulations. P, 444.

formulation of preparations suitable for quantity production in Manufacturing Pharmacy. P, 612.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

733 Product Formulation 3(0,9) F or S

All dosage forms of medication with emphasis on

790 Thesis in Pharmacy (5-7 as arranged)

DEPARTMENT OF PHYSICAL EDUCATION

Professor A. C. Bundgaard, Head

Professor Ginn; Associate Professors Huether, Robinson; Assistant Professor Crabbs

Graduate majors offered: Master of Science degree with a major in Physical Education.

Master of Education degree with a major in Physical Education.

Graduate minor offered: Physical Education.**Prerequisites for graduate study:**

For the graduate major a Bachelor's degree with a major in Physical Education or its equivalent, and prerequisites to the courses to be pursued.

For the graduate minor a Bachelor's degree with an undergraduate minor and prerequisites to the courses to be pursued.

Physical Education Courses (PE)

- 603 Physical Education for the Elementary School** 2(2,0) Su
Analysis of activities, materials, techniques, and methods used in conduct of physical education for elementary grades. Progression in curriculum planning in areas of rhythm, games, self-testing, and tumbling. P, permission of department head. Graduate or undergraduate credit.
- 651-661-671 Workshop in Health, Physical Education, and Recreation** 1 credit Su
Workshop sessions in specific areas taught by department. Lectures, conferences, committee work and outside assignments. P, permission of Department Head. Graduate or undergraduate credit.
- 651 Health Education**
- 661 Dance Education**
- 671 Outdoor Education** Alternate years.
(Offered in 1965)
- 702 Advanced Problems in Administration of Interschool Athletics** 2(2,0) Su
Budgets, public relations problems, subsidization, objectives of athletics, staff organization, control of athletics both interscholastic and intercollegiate, and general policies of athletics. P, graduate standing, permission of staff.
- 703 Advanced Evaluation in Health, Physical Education, and Recreation** 3(3,0) FSu
Advanced techniques for evaluating outcomes of physical education. Practice in test performance and administration. Some laboratory work may be required. P, graduate standing, permission of staff.
- 713 Philosophy of Physical Education** 3(3,0) SSu
Discussion and analysis of major philosophic contributions to physical education. Formation and evaluating one's beliefs concerning physical education. P, graduate standing, permission of staff.
- 722 Problems in Health and Safety Education** 2(2,0) FSu
Methods of health instruction; problems of health service; problems in supervision of health environment; recent trends and problems in safety education. P, graduate standing. Permission of staff.
- 723 Analysis of Methods of Teaching Physical Education and Athletics** 3(2,2) FSu
Analysis of natural and formal methods. Demonstrations and study of methods applied to various activities. P, graduate standing, permission of staff.
- 732 Psychology of Physical Education and Athletics** 2(2,0) SSu
Psychological principles, theories, and laws applied to physical education and athletic situations. Interpretation of behavior in sports. P, graduate standing, permission of staff.
- 733 Physiology of Exercise** 3(3,0) SSu
Body processes as they relate to exercise; efficiency of muscular work; fatigue and exercise; age, sex, and body type as related to exercise; nervous control of muscular activity; effect of exercise on the circulatory system. P, graduate standing, permission of staff.
- 742 Advanced Problems in Organization and Administration of Community Recreation** 2(2,0) SSu
Problems related to equipment; establishing programs; budget and finance; selecting and supervising staff; public relations activities. P, graduate standing, permission of staff.
- 752 Supervision of Health and Physical Education** 2(2,0) Su
Techniques, principles, organization and philosophy of supervision in this field. P, graduate standing, permission of staff.
- 762 Basic Issues in Health, Physical Education and Recreation** 2(2,0) Su
Directed reading of recent literature in field; discussion of current problems; critical analysis of recent research. P, graduate standing, permission of staff.
- Seminar in Health, Physical Education and Recreation** 2(2,0) Su
Courses designed to offer current information on subjects of interest in field.
- 772 Scientific Basis of Physical Education** 2(2,0) Su
- 782 Mechanical Analysis of Motor Skills** 2(2,0) Su
- 773 Current Trends in Athletics** 3(2,1) Su only
For men who are experienced in the coaching profession. Lectures, demonstrations and visual aids will be used to give students the latest developments in the field of football, basketball, wrestling, baseball, and track coaching. P, one year coaching experience.

783 Research Methods in Health, Physical Education and Recreation 3(3,0) FSu

Methods and techniques of research in field, critical analysis of master's and doctor's theses; practice of research techniques. P, graduate standing, permission of staff.

790 Thesis in Physical Education (5-7 as arranged)**793 Individual Research and Study in Health Education, Physical Education and Recreation**

3 credits FSSu
Special problems by individuals. Results of study presented in special reports and term papers. P, major in this field.

DEPARTMENT OF PHYSICS

Professor H. M. Froslic, Head

Professor Duffey; Associate Professors Graetzer, Miller, Williams; Assistant Professor Sippel

Graduate majors offered: Master of Science degree with a major in Physics.

(See also Master of Education degree program with a major in Physical Science. page 32.)

Graduate minor offered: Physics.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Physics or its equivalent.

For the graduate minor a Bachelor's degree with a minor in Physics or its equivalent

Physics Courses (Phy)**633 Reactor Physics 3(3,0) S**

Fission process; moderation and diffusion of neutrons; critical equation for homogenous and heterogenous reactors; reactor control and reactivity changes. Pertinent demonstrations using subcritical reactor. P, 403 or 373, Math 333 and consent of instructor.

643 Physics of the Solid State 3(3,0) S

Electronic processes with reference to electrical properties of metals, semiconductors and insulators. P, 383 or 373, Math 333 and consent of instructor.

650 Physics Colloquium 1(1,0) 0(1,0) FS

Reports and discussions of current research within department and in field of physics. Participation primarily by staff and graduate majors. Open for undergraduate credit by special arrangement.

703 Theoretical Mechanics 3(3,0) F

Further development of Lagrangian and Hamiltonian methods, canonical transformations, rigid body motion, relativistic mechanics. P, 354.

713 Tensors and General Relativity 3(3,0)

Covariance in physics, basic tensor, algebra and calculus, affine connections, the Reimann tensor,

field equations, linear approximations, the Schwarzschild solution. P, 703.

723 Electrodynamics 3(3,0) S

Complex quantities, circuits, Maxwell's equations, waves in general, planar, cylindrical, and spherical waves, approximation methods, plasmas. P, 413.

732 Statistical Mechanics 2(2,0)

Derivations of Boltzmann distribution law, Bose-Einstein statistics, Fermi-Dirac statistics, basic theory of gas and liquid states, order-disorder phenomena, the partition function. P, 703.

763 Advanced Quantum Mechanics 3(3,0) F

Hermitian operators, matrix methods, perturbation theory, Dirac wave equation, four-fermion interactions. P, 354, 364.

783 Group Theory in Quantum Mechanics 3(3,0) S

Symmetry transformations, continuous groups, finite groups, applications to valence theory, Lorentz group, fundamental particles. P, 763.

790 Thesis in Physics (5-7 as arranged)**DEPARTMENT OF PLANT PATHOLOGY**

Professor C. M. Nagel, Head

Professor Semeniuk; Associate Professor Buchenau, Mankin, Orlob

Graduate majors offered: Master of Science degree with a major in Plant Pathology.

Doctor of Philosophy degree with a major in Plant Science.

Graduate minor offered: Plant Pathology.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a minimum of 20 credits in the biological and physical sciences including botany, zoology, and chemistry.

For the graduate minor: Bachelor's degree with prerequisites to the graduate courses selected.

Plant Pathology Courses (Path)**603 Fungus Physiology 3(2,2) F** (Offered in 1966)

Nutritional and other requirements of fungi, including plant pathogens, for growth and reproduction; their intermediate metabolism and elaboration of chemical by-products. P, 424, Ch 134 or equivalent (on demand). Alternate years.

620 Special Problems 1-2 FS

Advanced work or special problems in plant pathology. Credit arranged but limited to total of 4 credits for three terms. Open to seniors and graduate students by permission.

691 Seminar 1(1,0) S

Discussion of current research topics in plant pathology. Limited to one credit for B.S. degree and three credits for graduate degree.

723 Bacterial Phytopathology 5(2,6) F
(Offered in 1966)

Detailed study of etiology and epiphytology of representative bacterial diseases emphasizing biology and control of pathogen. Preparation and presentation of reports on pertinent topics. P, 404 or 414. Alternate years.

724 Plant Virology 4(2,4) S (Offered in 1966)

Virus diseases in plants with emphasis on nature and physical properties of virus, development of virus within host, symptom expression on plant, host range and variability between and within virus

groups. Preparation and presentation of reports on pertinent topics. P, 404 or 414. Alternate years.

634 Plant Nematology 4(2,4) F (Offered in 1964)

Nematode diseases of plants with emphasis on collection, isolation, preservation, symptomology, life histories, identification and control of plant parasitic nematodes. P, 234, Z 103, 113. Alternate years.

745 Mycology 5(2,6) F (Offered in 1964)

Advanced taxonomy of fungi. P, 424. Alternate years.

755 Mycology 5(2,6) S (Offered in 1965)

Advanced taxonomy of fungi. P, 745. Alternate years.

772 Phytopathogenesis 2(2,0) F (Offered in 1965)

Fundamentals of infection and disease development, disease susceptibility or resistance of host, and how disease affects host development. Preparation and presentation of reports on pertinent topics. P, 404 or 414, and 424. Alternate years.

783 Phytopathogen Variability 3(3,0) S
(Offered in 1966)

Variability in plant pathogens and related microorganisms as this contributes to our understanding of incidence of development of disease resistant strains of crop plants. Preparation and presentation of reports on pertinent topics. P, 404 or 414, and 424, Z 303.

790 Thesis (as arranged)**DEPARTMENT OF POULTRY SCIENCE**

Professor Wm. Kohlmeyer, Head
Professors Carlson, Morgan

Graduate majors offered: Master of Science degree with a major in Poultry Science.
Doctor of Philosophy degree with a major in Animal Science.

Prerequisites for graduate study:

For the graduate major: Bachelor's degree with prerequisites to courses selected.
For the graduate minor: Bachelor's degree with prerequisites to courses selected.

Poultry Science Courses (PS)**610 Special Topics in Poultry Science 1-3 FS**

Advanced study of one or more selected topics such as nutrition, physiology, research methodology, or marketing.

710 Graduate Research Problems 1-3 FS

Planning, conducting, summarizing, and reporting research in some phase of poultry science. P, graduate classification.

752 Poultry Genetics 2(2,0) S

Population studies in poultry breeding. Physiological expression of genetic characteristics. Heritability

coefficients. Comparison of and theoretical bases for different breeding systems. P, 353, 473.

761 Nutrition Seminar 1(1,0) FS

Reports and discussion of current nutrition research.

772 Nutritional Interrelationships 2(2,0) F

Relationships between nutrients in metabolism. Substitution and sparing effects. Comparative metabolic significance of required nutrients for different animal species. P, Ch 763.

790 Thesis in Poultry Science (as arranged)**DEPARTMENT OF PRINTING AND JOURNALISM**

Professor G. H. Phillips, Head
Associate Professor Hvistendahl

Graduate majors offered: Master of Science degree with a major in Journalism.

The Graduate major in journalism is intended to meet the needs of (1) those who

teach communications courses in high school, who have school public relations responsibilities, or who supervise school publications; and (2) professional journalists who wish to broaden their education in communications and social sciences.

Three courses outside the department of journalism are accepted toward the major, depending upon the program of the individual student. They are Sp 612 Persuasion, GS 702 Modern American Thought, and PM 632 Advanced Typographical Design. Because journalism is largely an interdisciplinary subject, most courses are open to students from other fields without prerequisites.

Master of Science degree with major in Printing Management.

The graduate major in Printing Management is intended to serve the needs of (1) teachers of printing who wish advanced work in graphic arts and (2) those in the industry who wish to prepare themselves more adequately for executive positions in management.

Courses from other departments which may be counted toward the major in Printing Management include Ec 602 Economic Ethics, ME 633 Quality Control and Reliability, Ed 602 Principles of Vocational Education and Practical Arts, and J 642 Institutional Public Relations.

(See also Master of Education degree program in Communication, page 31.)

Graduate minors offered: Journalism. Printing Management.

Prerequisites for graduate study:

For the graduate major in Journalism a Bachelor's degree with 16 credits in communication plus one year of experience in journalism or a related field (teaching of journalism or public information work will be accepted here).

For the graduate major in Printing Management a Bachelor's degree with a major in Printing Management or its equivalent.

For the graduate minor in Journalism a Bachelor's degree with 16 credits in communication, of which 3 must be in newswriting or advanced English or speech composition.

For the graduate minor in Printing Management a Bachelor's degree with 20 credits in printing and completion of an appropriate trade school course or two years of experience in the trade or in the teaching of printing.

Journalism Courses (J)

632 Supervision of School Publications 2(2,0) Su
School yearbooks, newspapers, and problems of secondary school journalism education. Open.

640 Workshop in School Publications 1 to 3 credits
Su

642 Institutional Public Relations 2(2,0) SSu
Interpreting institutional programs to the public.

662 The Magazine in America 2(2,0) SSu
History of magazines in United States. Open

672 Rights and Responsibilities of the Press 2(2,0) S
Nature and history of rights and responsibilities of the press and relations of press to individuals and society. Analysis of court cases involving first and fourteenth amendments to Constitution. Open.

713 Research Methods in Communications 3(3,0)
FSu
Survey of major research in communications, study of methods employed; elementary statistical procedures.

720 Special Problem in Journalism 1-3 credits FSSu
Individual research problem. P, J 713.

732 Theories of Communication 2(2,0) S
Survey of literature dealing with theories of information and communication. Intensive reading course. Open.

742 Seminar in Current Editorial Problems 2(2,0) S

790 Thesis in Journalism (5-7 as arranged)

Printing Management Courses (PM)

623 Education in the Graphic Arts 3(3,0) SSu
History, philosophy, and methods of education in graphic arts industries.

632 Advanced Typographical Design 2(2,0) S
Important typographers and their works; principles of graphic design, classical and modern; Morris and

the classical revival; American designers; book and periodical design.

643 Advanced Lithography 3(2,3) F
Color separation negatives; halftones; varieties of lithographic materials and processes; trouble-shooting.

- 712 **Labor in the Typographical Industries 2(2,0) F**
Intensive study of labor negotiations, contracts, labor-management relations in the industry.
- 722 **Plant Appraisal and Finance 2(2,0) S**
- 733 **Production Management 3(3,0) F**
Division of labor, lines of control, responsibility, authority, tooling, logistics.
- 743 **Production Control 3(3,0) S**
Time and motion studies; analysis of cost factors; survey of current practices in the industry.
- 752 **Trends in Graphic Reproduction 2(2,0) S**
Current problems in industry, including those being studied in laboratories and research centers; automation, electronics, photo-sensitive materials.
- 790 **Thesis in Printing Management**
(5-7 as arranged)

DEPARTMENT OF RURAL SOCIOLOGY

Professor Howard M. Sauer, Head
Professors Chittick, Malan; Associate Professors Gorrow, Riley

Graduate majors offered: Master of Science degree with a major in Rural Sociology.

Doctor of Philosophy degree with major in Social Science.

The Doctor of Philosophy degree, Social Science major, is designed for the student who desires breadth of training in the social sciences. The academic disciplines included under it are economics, history, political science, and sociology.

The student in this program selects sociology as a principal field. The major adviser is chosen from the principal field. The thesis topic, while it must be to a degree interdisciplinary with respect to social science concepts and methods, must nevertheless be one which the Department of Rural Sociology feels competent to review.

The general requirements for this degree are the same as those for other Doctor of Philosophy degrees. In addition, the following requirements apply:

- (1) The thesis comprises about 30 credits of the program.
- (2) At least 35% but not more than 50% of the coursework must be done in the principal field.
- (3) The coursework outside the principal field is approximately evenly divided among courses in other social science disciplines.

No minor is chosen for this program.

Students in this program spend an appropriate amount of time in supervised teaching of a basic course in sociology. Fulfillment of this requirement is determined by the student's advisory committee.

The advisory committee for the student is composed of the major adviser who serves as chairman, a representative of the graduate faculty, a representative from the minor or supporting courses, and at least one member from the departments involved in the major other than the principal field.

(See also Master of Education degree program with a major in Social Science, page 32.)

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with 24 credits in the social sciences of which 16 credits must be in sociology.

For the graduate minor a Bachelor's degree with 16 credits in the social sciences, at least 10 of which must be in sociology.

Rural Sociology Courses (RS)

- 612 **Social Thought 2(2,0) F** (Offered in 1965)
Brief survey of history and development of world's most important social theories and schools of social thought, evaluated in light of present knowledge. P, 153, 393. Alternate years.
- 622 **Social Disorganization 2(2,0) S**
(Offered in 1966)
Analysis of conditions and factors which result in personal and institutional disorganization, including mental disorders, suicide, alcoholism, delinquency, and disruption of family and community life. P, 153. Alternate years.
- 633 **Leadership and Group Organization 3(3,0) S**
(Offered in 1966)
Emergence and types of leadership in group situations; analysis of leader-follower roles, functions and relationships in groups, and organizations. P, 153, and consent of instructor. Alternate years.

653 Rural Social Systems 3(3,0) F (Offered in 1966)

Rural organizations and institutions as systems of social interaction having common elements which permit analysis and understanding of structure and functioning of rural society. Relevant concepts from sociological theory will be introduced in building an analytical framework. P, 153, 202. Alternate years.

672 Social Institutions 2(2,0) F

Pivotal institutional fields with special reference to major social institutions such as: religious, economic, political, educational and familial. P, 153, 393.

683 Social Change 3(3,0) S

Theories concerning factors and processes in social-cultural change. Consideration of various interpretations of social-cultural change in terms of stages, cycles, and trends. P, 153, 393.

690 Special Problems in Sociology 1-3(1-3) FSSu

Advanced work on special problems in such areas as population, marriage and family, rural sociology, criminology, social disorganization or urban sociolo-

gy. P, open to seniors and graduate students with sufficient background.

702 Research Methods in Rural Sociology 2(2,0) S (Offered in 1967)

Use of scientific method in sociological research; basic tools of research design; some special applications of statistical techniques to social data. P, 153, 393, and Econ 353 or Ed 613. Alternate years.

712 Development of Sociological Theory I 2(2,0) F (Offered in 1966)

Critical examination of principle sociological theories beginning with system of August Comte and ending with World War II. P, 153, 393. Alternate years.

713 Contemporary Sociological Theory II 3(3,0) S (Offered in 1967)

Sociological theories from World War II to present. P, 153, 393. Alternate years.

780 Seminars in Rural Sociology 1-4 as arranged**790 Thesis in Rural Sociology** (as arranged)**DEPARTMENT OF TEXTILES AND CLOTHING**

Associate Professor Snellman, Head
Professors Lund, Rosenberger (Emeritus)

Graduate major offered: Master of Science degree with a major in Textiles and Clothing.

Graduate minor offered: Textiles and Clothing.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Home Economics with major work in textiles and clothing or related work.

For the graduate minor a Bachelor's degree with prerequisites to the graduate courses selected.

Textiles and Clothing Courses (TC)**610 Special Problems in Textiles and Clothing**

1-4 credits
Problems for advanced study selected from any field of textiles and clothing. Credit arranged by professor in charge of field of investigation chosen.

700 Seminar in Textiles and Clothing 1-2 credits

Reports and discussion of current literature in various areas of textiles and clothing.

703 New Developments in Textiles 3(3,0) Su

(Offered in 1967)
Recent developments in fibers and textile products. Chemical and physical properties of fibers, yarns, fabric structures and finishes. P, consent of instructor. Alternate years.

790 Thesis in Textiles and Clothing

(5-7 as arranged)

DEPARTMENT OF ENTOMOLOGY-ZOOLOGY

Professor Walstrom, Head
Professors Hartwig, Howe (USDA), Huggins; Associate Professors Greb, Stoner (USDA); Assistant Professor George (USDA)

Graduate majors offered: Master of Science degree with major in Entomology.

Master of Science degree with major in Zoology.

(See also Master of Education degree program with major in Biological Science, page 31.)

Prerequisites for graduate study:

For the graduate major in Entomology a Bachelor's degree with at least 14 credits in entomology. (General Zoology may be included in these credits.)

For the graduate major in Zoology a Bachelor's degree with at least 14 credits in zoology.

For the graduate minor in Entomology a Bachelor's degree with at least 6 credits in entomology and prerequisites to the graduate courses to be taken.

For the graduate minor in Zoology a Bachelor's degree with at least 6 credits of zoology and prerequisites to the graduate courses to be taken.

Note: Deficiencies in the prerequisites for graduate study may be made up during the first year of graduate study, without graduate credit.

Entomology Courses (Ent)

600 Entomology Research Problems

Qualified students may investigate special entomological problems under supervision of members of departmental staff. Arrangements must be made with supervising staff member prior to registration. Undergraduate students limited to total of 2 credits, and graduate students to a total of 5 credits toward graduation in any combination of Ent 600, Z 600, and Ent 700. P, cumulative grade point average of at least 2.75 plus permission of supervisor.

613 Insect Anatomy 3(2,2) F (Offered in 1965)

Detailed anatomy of insects; integument, appendages, sense organs, and organ systems of representative larval, nymphal and adult forms. Consideration given to structural variation, embryology, and evolutionary relationships. P, Ent 102 or its equivalent. Alternate years.

623 Insect Physiology 3(2,2) S (Offered in 1966)

Fundamental physiological processes in insects. Normal and abnormal functioning of adult and immature stages, developmental physiology, physiology of behavior. P, Ent 313, Ch 134. Alternate years.

642 Insect Ecology 2(1,2) F (Offered in 1966)

Comprehensive study of insects in relation to their environment. Effects of microclimate and macroclimate on predators, parasites, diseases, reproduction, development, and feeding habits of insects. Techniques for determining various factors important to survival and reproduction in the insect's

environment. P, Ent 103, 313, Z 302. Alternate years.

700 Taxonomy of Insect Groups 2-4 credits FS

Taxonomic study of group of insects. Student prepares report in which he gives technical description, and other information, of group under study. Total of not more than 5 credits in any combination of courses Ent 600, Z 600, WL 600 and Ent 700 may be counted toward requirement for the MS degree.

701 Graduate Seminar in Entomology 1(1,0) FS

Reports and discussions of topics of entomological interest. Maximum of 3 credits accepted. P, graduate status.

702 Insectary Methods 2(0,4) F (Offered in 1965)

Methods of rearing insects under laboratory, greenhouse, and screenhouse or caged conditions; includes techniques of mass production of insects for use in biological control of insect pests. Alternate years.

703 Insect Toxicology 3(2,2) S (Offered in 1967)

Comprehensive study of insecticides and chemosterilants, their effects, antidotes, detection, and uses. The techniques of determining insecticide resistance in an insect population, insecticide residues, and radioactive tracers in laboratory and field populations. P, 402, 623, Ch 134. Alternate years.

790 Thesis in Entomology (5-7 as arranged)

Zoology Courses (Z)

600 Zoological Research Problems

Qualified students may investigate special zoological problems under supervision of members of departmental staff. Arrangements must be made with supervising staff member prior to registration. Undergraduate students limited to total of 2 credits, and graduate students to total of 5 credits in any combination of Ent 600, Z 600, and Ent 700. P, cumulative grade point average of at least 2.75 plus permission of supervisor.

602 Human Genetics 2(2,0) SSu (Offered in 1965)

Subject matter of fundamental human heredity; to serve the specialist; such as physician, nurse, public health worker, social worker, etc., and general student. Basic principles used as they pertain to genetics of man. P, Z 303. Alternate years.

604 Comparative Vertebrate Embryology 4(2,4) F

Development of germ cells, and fertilization. Early cleavage, segmentation and organogenesis in *Ampiphoxus*, frog, chick and pig. P, Z 103, 113.

612 History and Philosophy of Zoology 2(2,0) F (Offered in 1965)

Early zoologists and their contributions to science. Controversial theories of past and their influence on growth of science of zoology; their relationship to modern zoological concepts. Biographies and works of great zoologists. P, Z 103, 113. Alternate years.

633 Zoological Education 3(5,4) Su

Offered only for selected Summer Science Institute students (high school teachers selected for NSF Summer Science Institute grants). Collegiate students cannot receive credit for this course toward B.S. or the M.S. degrees. On approval of Education Department credits for this course may be counted toward Master of Education degree with a major in Biological Science area. Material covered is in nature of an "advanced refresher" and serves to bring previously qualified individuals "up to date" in area of research advances and recent concepts in zoology. P, selection as student receiving grant in Summer Science Institute program.

654 Mammalian Anatomy 4(2,6) F

Detailed dissection of cat as representative mammal. Comparisons with human body (skeleton, models, charts) given special attention. All systems are dissected and studied. For those students who need more comprehensive and detailed course in anatomy than is available in Z 203. P, Z 103, 113.

664 Advanced Systemic Physiology 4(3,3) F

Various systems of the animal body; coordination and inter-relationships of systems; circulation, temperature regulation, muscle, and respiration. P, Z 414.

674 Advanced Systemic Physiology 4(3,3) S

Physiology of digestion, rumination, urine formation, reproduction, nervous system, endocrine glands, and special senses. P, Z 664.

701 Graduate Seminar in Zoology 1(1,0) FS

Reports and discussions of topics of zoological interest. Maximum of 3 credits accepted. P, graduate status.

703 Developmental Genetics 3(3,0) F

(Offered in 1965)

Chemical nature of gene and its chemical and physical action in development. P, Z 103, 113, 303 and Ch 134. Alternate years.

713 Helminthology 3(2,2) S (Offered in 1966)

Comprehensive study of worm parasites of vertebrate animals and of soil and plant nematodes. Morphology, taxonomy, life cycles, ecological relationships, and control methods are discussed. Techniques of collecting, preparation, and identification. P, Z 103, 113, 424. Alternate years.

790 Thesis in Zoology (5-7 as arranged)**DEPARTMENT OF WILDLIFE MANAGEMENT**

Associate Professor D. R. Progulské, Head
Associate Professor Springer

Graduate major offered: Master of Science degree with major in Wildlife Biology.

Graduate minor offered: Wildlife Biology.

Prerequisites for graduate study:

For the graduate major in Wildlife Biology a Bachelor's degree with at least 14 credits in the area of wildlife conservation and closely allied biological fields.

For the graduate minor in Wildlife Biology a Bachelor's degree with at least 6 credits in the wildlife area and prerequisites to the graduate courses to be taken.

Deficiencies in the prerequisites for graduate study may be made up during the first year of graduate study, but will not apply to the graduate program.

Wildlife Techniques and Conservation Courses (WL)**600 Wildlife Research Problems 1-2 credits, as arranged FS**

(Limit of 2 credits for B.S. degree; limit of 2 credits for M.S. degree)

Qualified students may investigate special wildlife problems under supervision of departmental staff. Arrangements must be made with supervising staff member prior to registration. Undergraduate students limited to total of 2 credits, and graduate students to total of 5 credits toward graduation in any combination of Ent 600, Z 600, WL 600 and Ent 700. P, cumulative grade point average of at least 2.75 plus permission of supervisor.

603 Fisheries Science 3(2,3) F

Specific taxonomy and life histories, distribution, environmental requirements, habits, species inter-relationships, population statistics, economic and recreational importance of species. P, WL 313, 404.

613 Advanced Wildlife Management 3(2,3) S

(Offered in 1966)

Taxonomy, life histories, distribution, environmental relationships, and management of big game and upland game species. Regional management practices of the major big game mammals of North America. P, WL 303, 324, 404. Alternate years.

623 Animal Ecology 3(1,6) S

Composition of environment and relationships of animals to their surroundings. Impact of ecological forces upon animals and responses elicited are examined in the field. P, Z 302.

624 Limnology 4(2,6) S

Analysis of physical, chemical, and biological characteristics of lakes, ponds, and streams and factors and processes that operate in fresh waters as dynamic systems. Methods of measuring and evaluating influences affecting aquatic life in fresh waters. P, Z 302.

701 Wildlife Seminar 1(1,0) FS

Reports and discussions of current topics in wildlife research and management. Not more than 3 credits may be applied toward the graduate degree.

703 Wetlands Management 3(2,3) F

Depletion and preservation of wetland areas during past and present years. Economic and recreational importance of wetlands. Need for coordinating land-use policies of various federal and state governmental agencies. Federal and state legislation as it relates to wetland management. Ecological analysis of wetland areas in eastern South Dakota. P, Z 302; WL 303, 324, 404.

790 Thesis in Wildlife (5-7 as arranged)

