South Dakota STATE

iversity

1986-1988 Graduate Catalog

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Graduate School edition

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SDSU CALENDAR 1986-87

1986 Fall Semester

(1 day Registration, 72 Class Days, 5 Exam Days)

September 2, Tuesday ..... Registration
September 3, Wednesday ..... Instruction Begins
September 17, Wednesday ..... Last day to add or drop and adjust final fees
September 29, Monday ..... Last day to submit a graduation card for Fall 1986
October 11, Saturday ..... Hobo Day
October 22, Wednesday ..... First half Fall semester ends
October 29, Wednesday ..... Deficiency reports due in Registrar's Office, 5:00 pm
November 11, Tuesday ..... Veterans' Day—Holiday
November 12, Wednesday ..... Last day to drop a course
November 12, Wednesday ..... Tuesday Classes
November 27-30, Thursday-Saturday ..... Thanksgiving Recess
December 13, Saturday ..... Graduation, 10:00 am
December 17, 18, 19, 22, 23, Wednesday-Friday, Monday-Tuesday ..... Final examination
December 30, Tuesday ..... Grades due in Registrar's Office not later than 5:00 pm

1987 Spring Semester

(1 day Registration, 72 Class Days, 5 Exam Days)

January 12, Monday ..... Registration
January 13, Tuesday ..... Instruction begins
January 27, Tuesday ..... Last day to add or drop a course and adjust final fees
February 23, Monday ..... Last day to submit a graduation card for Spring 1987
March 3, Tuesday ..... First half Spring Semester ends
March 9-13, Monday-Friday ..... Spring Break
March 10, Tuesday ..... Deficiency reports due in Registrar's Office, 5:00 pm
March 27, Friday ..... Last day to drop a course
April 17-20, Friday-Monday ..... Easter Recess
April 21, Tuesday ..... Monday Classes
May 2, Saturday ..... 101st Annual Commencement, 10:00 am
May 4-8, Monday-Friday ..... Final Examinations
May 13, Wednesday ..... Grades due in Registrar's Office not later than 5:00 pm

1987 Summer Session

June 9, Monday-August 1, Friday ..... Eight-Week Session
June 9, Monday ..... Registration
June 10, Tuesday ..... Instruction begins
July 3, Thursday ..... Close of 1st 4 week session
July 4, Friday ..... A Holiday
July 7, Monday ..... Registration for 2nd 4 weeks
August 7, Monday ..... Close of Instruction
August 6, Wednesday ..... Grades due 4:00 pm - Registrar's Office

The Graduate Bulletin South Dakota State University—Brookings, South Dakota

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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 of seven members elected from the Graduate Faculty assists the Graduate Dean. The council includes: The Graduate Dean (chairman); two members from biological science; two members from physical science; two members from social science; and one member from education. The Dean of the Library serves as an ex officio member.

The Graduate Faculty is composed of the University President, Vice President for Academic Affairs, college deans, heads of departments in which graduate courses are given, and other faculty, 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 are authorized to serve as adviser to graduate students or on their examining committee and to teach courses for graduate credit.

This bulletin deals only with the graduate programs of the institution. For material on undergraduate programs and for general information concerning South Dakota State, refer to the General Catalog. Information concerning summer school is published in the Summer Session Bulletin which may be obtained from the Director of Summer School.

PURPOSES

The Graduate School provides an atmosphere for qualified students to obtain rigorous advanced education in a variety of fields in preparation for service and leadership in their professions and society. It also promotes scholarly pursuits and scientific research for the advancement of knowledge within a climate of freedom of inquiry.

ACCREDITATION

South Dakota State University is a land-grant university and as such subscribes to the land-grant philosophy of education, research, and extension as its three-fold mission. The Graduate School is a separate administrative unit composed of selected scholars within the university.

The graduate program of South Dakota State is accredited through the Doctoral degree by the North Central Association of Colleges and Secondary Schools, the regional accrediting agency for 19 states including South Dakota. The Graduate School is a member of the Council of Graduate Schools in the United States and the Midwestern Association of Graduate Schools.

The departments of Agricultural, Civil, Electrical,and Mechanical Engineering are accredited by the Engineers Council for Professional Development.

The curriculum in Journalism is accredited by the American Council on Education for Journalism.

The College of Nursing is accredited by the National League for Nursing.

The Chemistry Department is accredited by the American Chemical Society.

Preparation of secondary teachers, administrators and guidance counselors at the graduate level is accredited by the National Council for Accreditation of Teacher Education.

The University also holds membership in the American Council on Education, the National Association of State Universities and Land-Grant Colleges, the American Society for Engineering Education, The Association of Accredited Schools and Departments of Journalism, the American Library Association, the National Commission on Accrediting Agencies and the American Chemical Society.

I. The Graduate School

A. Degrees and Fields of Study

1. Master's Degrees

Master of Science, Master of Arts, Master of Science Teaching and Master of Education degrees are offered. For a listing of majors within each degree, and for thesis and non-thesis options with requirements and procedures, see section on Master's degrees on p. 6.

2. Doctor of Philosophy Degree

The Doctor of Philosophy Degree is offered with majors in Agronomy, Animal Science, and Sociology.

B. Admission to the Graduate School

1. General Procedure

Students must be admitted to the Graduate School before enrolling in any graduate course, whether or not they are pursuing an advanced degree. A completed application must be filed with the Graduate School at least 15 days before the beginning of the first term of graduate work. Students taking Continuing Education classes or applying only for Special Student status are exempt from the prior admission requirement, but must complete an application and be admitted to Graduate School. The application procedure includes the following:

a. A completed form supplied by the Graduate School must be submitted and accompanied by a nonrefundable application fee of $15. Former SDSU students are exempt from the fee.

b. Official transcripts of all undergraduate and graduate course work must be sent to the Graduate School as a part of the application, except for South Dakota State University graduates who do not intend to pursue an advanced degree and non-degree students who are graduates of other institutions and intending to enroll for 10 credits or less (transient students). If application is made before the Bachelor's degree is completed, an incomplete transcript must be filed, followed by a completed transcript during the first term of graduate work. Foreign students who cannot provide original transcripts may submit notarized or certified copies at the time of application, followed by completed transcripts and certification of degree awarded, as soon as the bachelor's degree is completed.

c. Two letters of recommendation, written on forms supplied by the Graduate School, from persons acquainted with the academic ability and professional competency of the applicant should be sent directly to the Graduate School. This requirement may be waived by the Dean of the Graduate School on recommendation of the department.

d. Students from foreign countries should submit their applications at least four months before registration. The application must include:
1.) The results of the Test of English as a Foreign Language (TOEFL). A score of 500 or above is required.
2.) Evidence of available financial support for at least the first year of academic work.
3.) A statement concerning whether any financial assistance from this institution will be necessary to pursue the degree.
4.) Completed physical health evaluation form.

After an application for admission and supporting documents are received by the Graduate School, they are reviewed by the department concerned. Using the recommendations from the department, the Dean of the Graduate School acts on the application and notifies the applicant, the department and/or committee concerned. A physical evaluation report, filed with the Health Service, is required of all students, except those enrolled as undergraduates at South Dakota State University during the previous year.

2. Requirements for Admission

a. Baccalaureate Degree
Admission to the Graduate School requires that the applicant be a graduate of an institution of higher learning. The institution must be one of recognized standing (regional accreditation) 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.

b. Graduate Record Examination
Submission of the results of a Graduate Record Examination is not a requirement for admission to the Graduate School; the following programs require that scores be submitted: Health, Physical Education and Recreation, Microbiology, Nursing, and Sociology. Departments should be counsulted for specific requirements. The Graduate Record Examination is strongly recmmended for students applying for admission to Wildlife and Fisheries programs.

c. Departmental Requirements
Individual departments may have additional admission requirements. Applicants should inquire about such requirements from the department of interest.

3. Admission Status

a. Unconditional Admission
An applicant may be admitted without condition if a Bachelor's degree has been earned, all undergraduate prerequisites for major and minor fields of study satisfactorily completed, and the applicant had an average of "B" (3.0 or higher on a 4-point grading system; A = 4, B = 3, C = 2, D = 1) during the last two academic years of undergraduate work. Applicants with less than 3.0 but 2.75 or above grade point average may also be considered for unconditional admission if other aspects of their academic and/or professional record indicate superior performance and potential.

Admission to all degree programs is competitive and limited by the availability of personnel, facilities and funding necessary to provide quality graduate education within each program.

b. Conditional Admission
Conditional admission may be granted if:
1.) The applicant meets the requirements for unconditional admission for the last three semesters but has not completed the last semester of undergraduate study. Admission is conditional until the Bachelor's degree is granted, or
2.) The applicant lacks prerequisite undergraduate courses specified by the major department. Admission is conditional until these courses have been completed to the satisfaction of the department. These courses cannot be used on the graduate Plan of Study, or
3.) The applicant has a grade point average, between 2.5 and 3.0 for the junior and senior years.

A student admitted conditionally must satisfy any conditions within the first year after admission. Departments will assign advisors to such students. Failure of a student to fulfill the above conditions or to do satisfactory graduate work at any point in his/her program is sufficient grounds for dismissal or reclassification as a Special Student.

Students with a junior-senior grade point average above 2.75 and who have pass-fail (or equivalent) grades shall have instructors for such courses furnish letter grades or shall furnish satisfactory Graduate Record Examination scores.

c. Special Student
Students not meeting the above admission requirements, those initially enrolled only in evening, Continuing Education, or Adult Education classes, those not working toward a degree, or transient students may be granted admission and take courses as Special Students. Special Students may not receive Graduate Assistantships or enroll for thesis credits. The Graduate Dean will act as adviser for these students unless they are assigned to a department adviser. No more than ten credits under Special Student status may be applied toward a degree.

4. Change of Admission Status

Students with Special Student status may request and be granted a change in status to work toward a degree, provided ten credits of graduate work have been completed with grades of "B" or better. The request must include complete official transcripts and application fee if these have not been supplied previously. This request should be submitted to the Graduate School, after which it will be submitted to the appropriate department for a recommendation and processed as other applications.

5. Readmission

Students formerly enrolled as graduate students at South Dakota State University (who interrupt continuous registration for more than two semesters or one semester and one summer session) should apply for readmission at least one month prior to registration. Forms for this purpose can be obtained from the Graduate School. Official transcripts for graduate work taken at other institutions since enrollment at South Dakota State University must be furnished.

A personal interview with the head of the major department should be arranged prior to registration.

6. Postdoctoral Study

Postdoctoral students or eminent scholars who desire temporarily the privileges of the research facilities, staff counsel, library or seminars at the institution and who are not candidates for a degree, may pursue study upon approval of the Head of the Department, Dean and/or Director concerned.

C. Registration

Admitted graduate students should report at the place and time indicated in the semester schedule to receive registration materials and instructions.

1. Normal and Maximum Credit Loads

Minimum credit loads for the full-time student, including workshops, are 9 credits per semester during the academic year for master's students and 7 credits for doctoral students, 3 credits during the four-week and 6 credits during eight-week summer session. The maximum credit load for graduate assistants is as follows:

Maximum credits assistant 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 and undergraduate courses, are included at full value for Graduate School, but may not be allowable for loan deferral and other purposes.

2. Converted Credits

Courses numbered 300-499 are considered to be advanced undergraduate credits and may be used in graduate programs with the following provisions:

a. Total credit for courses in this series, when applied to a graduate program, will be valued at 80 percent discarding all fractions. After such conversion, these credits are defined as "converted credits," which may be used as graduate credit in meeting the requirements for the various degrees, provided a grade of at least "B" is obtained in each course in this series. For example, if eight credits are earned in this series, they would be equivalent to six graduate credits.

NOTE: When credits in the 300-499 series are applied to a graduate program, they are entered on the transcript without notation. It is doubtful, therefore, that they could be transferred as graduate credit to another institution. The converted credit rule also applies to 500-series courses.

b. For the Master of Arts, Master of Science or Master of Education degrees, no more than seven converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting course areas, converted credits are usually not permitted in The Master of Science Teaching degree.
c. For the Doctor of Philosophy degree, no more than ten converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting course areas.
d. Transfer credits may not be converted.
e. Converted credits may be applied to a graduate program only with the permission of the major adviser or Advisory Committee, and Dean of the Graduate School.

3. Thesis or Dissertation Sustaining

All graduate students who have completed the thesis or dissertation credits specified on their Plans of Study are required to register and pay for one credit of Thesis Sustaining 790 or Dissertation Sustaining 890 each semester during the academic year and Summer Session until the degree is awarded.

4. Summer Sessions

Many departments offer graduate courses during the summer. For information concerning the courses to be offered, write the Director of Lifelong Learning and request a Summer Session Bulletin.

D. Course Restrictions

1. Workshops

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

2. Problems Courses

No more than four credits in problems courses may be counted toward the Master of Arts, Master of Science or Master of Education degree. No more than six credits of problems courses (beyond the Bachelor's degree) may be counted toward the Doctor of Philosophy degree.

3. Correspondence Courses

Correspondence courses are not given at the graduate level at this institution and are not permitted on a student's Plan of Study.

4. Continuing Education and Evening Students

Graduate students enrolling in Extension or evening classes will ordinarily be admitted as Special Students.

5. Transfer of Credits

Graduate credits earned while in residence at other institutions may be applied toward an advanced degree if they were awarded a grade of at least "B", and if they are approved by the Advisor or Advisory Committee and the Dean. Transfer credits cannot substitute for credits required for minimum residence (See Residence and Credit Requirements). Requests for transfer of credits are usually made at the time a Plan of Study is approved and must be supported by an official transcript filed with the Graduate School. For the Master's degree transfer credits are limited to 7 credits in the major and 3 credits in the minor or supporting area.

Transfer credit is not permitted for courses taken by correspondence. Independent Study, Readings' courses, Continuing Education, or Extension courses may be approved for transfer if they are regularly listed in the graduate bulletin of an accredited institution and were taught by members of the Graduate Faculty of such institution. Subtitles or explanatory information will be required for approval of Independent Study and Readings' Courses. Transfer credit is generally not permitted for work from foreign institutions.

6. Graduate Credit for Seniors

Seniors within 15 credits of completing a Bachelor's degree at South Dakota State University may request permission from the Dean to take up to 6 credits of 600 or 700 level courses for graduate credit. Permission requires the student to have a grade point average of at least 2.5, or a junior-senior grade point average of at least 3.0 or better and to enroll for not more than 18 credits (9 credits during summer school). Forms for requesting permission to take courses for graduate credit may be obtained from the Graduate School.

7. Graduate Study by University Staff

Staff members with the rank of Assistant Professor or above may not work toward an advanced degree at this institution, but all staff members may take graduate courses for credit with permission from the Department Head, Dean and/or other required authorization. A transient Graduate application should be completed. A "Permission to Take Classes" form, which may be obtained from the Personnel Office, should be completed and returned to the Personnel Office before registration.

Staff members below the rank of Assistant Professor who intend to work toward a degree at this institution must follow the regular process for admission to the Graduate School (Section I B 1).

Full-time members of the research, instructional, or extension staffs may enroll for a maximum of 12 credits during the calendar year, with a maximum of seven in any one semester and two during the Summer Session. Staff must pay the application fee.

E. Grades

The student must maintain a "B" average (3.0) in all courses in the graduate program. No credit is given toward a graduate degree for any grade below "C" in 600 or 700 level courses, or below "B" in 300, 400, or 500 level courses. In addition, all work in the major must average "B" (3.0) and all work in the minor or in supporting courses must average "B" (3.0). Grades for transfer courses are not used in calculating these grade point averages.

Graduate students usually register for thesis or dissertation credit during several semesters. An incomplete grade (I) is given until satisfactory completion of the thesis and final oral examination. The advisor, upon satisfactory completion of the thesis or dissertation and final oral, will then assign a satisfactory grade (E) for all thesis or dissertation credit by notifying the Registrar. If not satisfactory, a grade of unsatisfactory (F) is given. This grading procedure also applies to Research and Design Papers.

For Seminars, a letter grade or a grade of Satisfactory (E) or Unsatisfactory (F) may be assigned at the discretion of the instructor.

When a graduate student is given an Incomplete grade (I) for any other course in the student's graduate program the instructor may indicate in writing to the student what additional work must be completed and may establish a date at which such work must be completed. A copy of this information must be filed with the Graduate School. If the work is not completed in either the manner or time prescribed, the instructor may change the Incomplete grade to whatever grade is justified as an evaluation of the student's work or may allow the grade to remain Incomplete. Incomplete grades given without this procedure will remain as Incomplete on the student's record unless changed because of completion of the remaining work in the course.

F. Tuition and Fees*

1. Academic Year

Application fee (new students only)	$15.00
+ Tuition per credit hour, undergraduate resident	32.25
+ Tuition per credit hour, undergraduate, non-resident	73.50
+ Tuition per credit hour, graduate resident	48.50
+ Tuition per credit hour, graduate, non-resident	94.00
General University fee (waived for faculty and staff, but not for Graduate Assistants), per credit	8.20
General Instruction Fee, per credit	7.50
General University Deposit fee (refundable)	35.00
Engineering Education Fee, per credit (Engineering students)	9.00
International Student fee (new international students only)	75.00

*Subject to change by action of The Board of Regents

+ Graduate Assistants, Fellows and Trainees on contract with the University pay one-third the resident tuition per credit. Students who are 65 or older pay one-fourth tuition.

2. Fees for Auditing Courses

Regular tuition per credit will be charged for auditing a course. Tuition is waived for faculty, staff and graduate assistants. Registration as an auditor requires the consent of the department concerned. Such registration carries permission to listen only; no credit is given. Registration for audit is by add slip after registration day.

3. General Deposit

All students enrolled in 9 or more credits or living in a residence hall must pay a $35.00 deposit to defray charges for damage of laboratory equipment or supplies, or housing facilities. Library and vehicle fines or special service fees may be assessed against this deposit. A minimum balance of $15.00 must be maintained at all times. The balance at the beginning of any semester must be $35.00 and appropriate charges will be assessed at final fee payment to reinstate the balance. Any remaining balance is refundable.

4. Thesis and Dissertation Fees

Master's students must pay a fee to the Library to cover the cost of binding four thesis copies. This must be done before the Graduate School will accept the manuscript in final form.

Doctor of Philosophy students must pay a fee for binding four copies of the dissertation, microfilming and publishing the abstract in "Dissertation Abstracts." This does not include Registration of Copyright, reprint costs or other incidental fees. The fee must be paid to the Graduate School when submitting the final copies of the dissertation.

5. Summer Sessions

See Summer Session catalog for tuition and fees.

G. Student Responsibility

Before a degree is granted, the student must meet all of the requirements of the Advisory Committee, the Major Department and the Graduate School. Students are responsible for conforming to all published academic policies and degree requirements. They are likewise responsible for the regulations concerning the degree they plan to obtain and any special requirements within the department or academic unit. In addition, it is the student's responsibility to conform to the University's policies regarding the standard of work necessary to maintain enrollment in the Graduate School.

H. Other Information

1. Fellowships and Assistantships

A number of fellowships and research and teaching assistantships are available to qualified graduate students. Recommendations for granting these are handled by the departments. Students interested in obtaining such financial assistance should write directly to the department in which they expect to do their major work.

2. Obligation Incurred in Accepting an Assistantship

The Graduate School of South Dakota State University as a member of the Council of Graduate Schools in the United States, subscribes and adheres to the following resolution regarding scholars, fellows, trainees, and graduate assistants. In every case in which a graduate scholarship, fellowship, traineeship or graduate assistantship for the next academic year is offered to an actual prospective graduate student, the student, having indicated acceptance before April 15, will have complete freedom through April 15 to submit in writing a resignation of the appointment in order to accept another scholarship, fellowship, traineeship or graduate assistantship. However, an acceptance given or left in force after April 15 commits the student not to accept another appointment without first obtaining formal release for the purpose. Students working on degree programs, including those on assistantships, are considered to have assumed an obligation to complete their graduate program before transferring to any other post baccalaureate or professional degree program.

3. Housing for Graduate Students

Prospective graduate students should inquire about rooms or apartments from the Director of Student Housing, well in advance of registration.

4. Living Costs

Living costs, including tuition and fees, for the single resident graduate student are estimated to be approximately $7,000 per academic year. Travel costs are not included.

5. Filing a Graduation Card

The student must file a graduation card with the Graduate School not later than four weeks after registration for the term in which completion of the advanced degree is expected. Failure to file this card will result in a delay in graduation.

6. Attendance at Commencement

All students are urged to participate in the Commencement exercises at which their degree is to be granted. However, attendance is optional. Students must notify Student Services of their intent to attend or not to attend on a card mailed to them shortly before Commencement. Diplomas will be mailed approximately three months after Commencement.

7. Cap, Gown and Hood Rental

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

II. Degrees and Fields of Study

A. Master's Degrees

1. Degrees and Options

The Master of Arts, Master of Science and Master of Education degrees are offered with the majors shown below. Some majors offer thesis option A only, others have non-thesis options B or C as well. Master of Education degrees are offered only with non-thesis options B or C. Requirements for each option are given in Section II A 5.

Major	Degree	Options
Agricultural Education	M.Ed.	B, C
Agricultural Engineering	M.S.	A, B
Agronomy	M.S.	A
Animal Science	M.S.	A
Biology	M.S.	A, B
Chemistry	M.S., MST***	A, MST: C
Counseling, Guidance and Personnel Services	M.Ed.	B, C
Dairy Science	M.S.	A
Economics	M.S.	A, B
Economics, J.D./M.S.**	M.S.	A, B
Educational Administration	M.Ed.	B, C
Engineering	M.S.	A, B
English	M.A.	A
Entomology	M.S.	A
Geography	M.S.	A
Health, Physical Education and Recreation	M.S.	A, B, C
Home Economics	M.S.	A,C
Industrial Management	M.S.	A
Journalism	M.S.	A
Mathematics	M.S., MST***	A, B, C
Microbiology	M.S.	A
Nursing	M.S.	A, B
Plant Pathology	M.S.	A
Physics	MST***	C
Rural Sociology	M.S.	A, B
Speech	M.A.	A
Teacher Education	M.Ed.	B, C
Wildlife and Fisheries Sciences		
Wildlife Option	M.S.	A
Fisheries Option	M.S.	A
Zoology	M.S.	A

*See department listing for description of multi-departmental program.

**(Agricultural emphasis) See page 16.

***MST degree has majors in chemistry, mathematics and physics.

NOTE: Previous editions of this bulletin include the M.Ed. degrees as a separate section. This edition integrates them with other master's degrees.

The major fields shown with the exception of Nursing, may be selected as minor fields. In addition, Botany, History, Political Science, Mechanized Agriculture (Agricultural Engineering Department) or Planning, page 30 may be chosen as a minor.

2. Admission

Applicants must meet the requirements for admission to the Graduate School as listed in section I B.

3. Advisory Committee

As a minimum, the Advisory Committee will be composed of the major advisor (Graduate Faculty member), the minor advisor (Graduate Faculty member), an additional member of the major department, and a Graduate Faculty representative (appointed by the Graduate Dean and representing the Graduate Faculty). The major advisor should be chosen or assigned by the head of the major department. Following selection by the student and recommendation of the major advisor, the Advisory Committee should be appointed by the Dean of the Graduate School as soon as practical after starting work on the graduate program.

The Advisory Committee is responsible for assisting the student in developing a suitable graduate program, providing continuing guidance and counsel and certifying the completion of the degree requirements to the Dean of the Graduate School. The Advisory Committee approves the Plan of Study and any revisions of it, approves the thesis proposal (in options requiring one of these), conducts the examinations appropriate to each option, supervises the validation of courses and ensures that professional standards have been met in completing the degree requirements.

4. Plan of Study

During the first semester of graduate work and no later than the end of the first year, the Plan of Study should be prepared on the appropriate form and approved by the Advisory Committee. After approval by the Advisory Committee, the Plan of Study will be submitted to the Dean of the Graduate School for approval. Courses for the major must be taken in the major department or in related fields. Failure to submit a Plan of Study may result in disapproval of courses taken prior to approval. After approval, changes in the Plan of Study must be requested on a form furnished by the Graduate School, approved by the Advisory Committee and the Dean of the Graduate School.

5. Requirements by Option, semester hours

	Option		
	A	B	C
Minimum total	30	32	35
Minimum major, including thesis or research problem*	19	19**	19**
Thesis	5-7	0	0
Research Problem	0	2	0
Minimum minor, or supporting courses from two or more disciplines***	8	8	8

*Consult major department for requirements.

**M.Ed. degree requires 21 credits for Option B, and 24 credits for Option C in the major.

***Courses in the major department may be used as supporting courses, providing they are considered sufficiently diverse by the major department.

NOTE: See separate listing for Master of Science Teaching requirements.

6. Minimum Residence Requirements

The minimum residence requirement is 22 semester hours, including at least one semester or two summer sessions of full time graduate work spent on campus. Residence credit is given only for graduate credit earned in courses offered by South Dakota State University. Appeal procedures are available from the Dean of the Graduate School for persons seeking exemption from this policy.

7. 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), provided:

a. The grade point average is "B" or better in the major and "B" or better in the minor or supporting courses, and
b. Reasonable progress has been made in the research for the thesis, research report or design paper as applicable, and
c. An approved program of study is on file at the Graduate School, and
d. The major adviser recommends it.

A student must be admitted to candidacy before taking his/her oral examination.

8. Thesis

A thesis meeting the requirements of the major department and the Graduate School must be submitted by each student completing a Master's degree in those options requiring a thesis. The thesis must represent a scholarly contribution to research knowledge in the major field.

A research area for the thesis topic should be chosen after consultation with the major advisor as early in the student's program as possible. A written research plan must be approved by the Advisory Committee not later than the end of the second semester of graduate work. The thesis accounts for 5 to 7 semester hours in the major. The thesis may be prepared with a view to publication and conform to the style of one of the journals in the major field as required by the major department and must be prepared in the format required by the Graduate School as shown in "Instructions for Thesis and Research Reports" available from the Graduate School.

Grades for thesis are submitted as Incomplete (I) until the oral examination. If the thesis is accepted by the examination committee, the major advisor and the Dean of the Graduate School, a grade of Satisfactory (E) is given for all thesis credits.

A copy of the thesis must be filed with the Graduate School for review at least ten working days (excluding Sundays and holidays) before the oral examination. The student should distribute one copy to each member of the advisory committee (including the Graduate Faculty Representative). Two copies (one on at least 50 percent rag content paper), corrected in accordance with suggestions by the advisory committee and the Graduate School, must be returned to the Graduate School with a receipt from the Library showing that the fee for binding for four copies of the thesis has been paid. This should be completed at least five days prior to commencement.

9. Research Problem (Research Report/Design Paper)

Students following Option B must complete at least two credits for a Research Problem (or Design Paper in Engineering) in the major field presented as a written report. The content, style and format of the report must meet the requirements of the major department. The Research Report (or Design Paper) must be approved by the Advisory Committee, and filed in the major department. A copy of the written report should be provided to each committee member and be available at the final oral examination.

10. Language Requirement

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

11. Examinations

a. Comprehensive
In those departments and options (academic programs) requiring a comprehensive written examination, the examination will be given by the Advisory Committee at least two weeks prior to the final oral examination, filed in the major department for review, and be present at the final oral examination. A comprehensive written examination is required of students on non-thesis Option C programs.

b. Final
An oral examination will be administered by the Advisory Committee covering the student's program. This examination should be comprehensive, testing the student's ability to analyze, integrate and apply knowledge from the discipline. This examination should occur at least ten working days (excluding Sundays and holidays) before commencement. An exemption from the oral examination may be given within the Division of Education on Option C programs by the student's advisory committee with the concurrence of the Graduate Faculty representative.

12. Time Limitation

a. Obsolete program
If the requirements for the Master's degree are not completed within six years from the time of admission to work toward the degree, a reconsideration of the student's program will be required and the rules of the Graduate School in effect at the beginning of the seventh year will apply.

b. Obsolete Coursework
Courses completed more than six years prior to completion of the requirements of the Master's degree and not part of a previous degree are regarded as obsolete coursework. Such courses may be used in the Master's degree program if validated. Validation is allowed at the discretion of the Advisory Committee and the department involved and can be accomplished by passing a written validation examination in the subject matter area.

Validation of obsolete coursework cannot exceed six graduate credits and must be certified by the Advisory Committee on a form prescribed by the Graduate School.

13. Checklist for Master's Degree

Requirements	When Due
1. Application for Admission to Graduate School	One month before initial registration
2. Designation of Major Advisor	Prior to registration for first semester or as soon as practical after starting program.
3. Designation of Advisory Committee	During first semester or as soon as practical after starting program.
4. Approval of Plan of Study by Advisory Committee	During first semester
5. Approval of Thesis Proposal (Option A) or Research Problem Plan (Option B)	During second semester
6. Admission to Candidacy	After 20 graduate credits have been earned
7. Comprehensive Written Examination	During last semester of course work, at least two weeks before final oral examination where required
8. Filing of Graduation Card	Within the first four weeks of the last semester
9. Thesis (Option A) or Research Problem (Option B) submitted to Advisory Committee	At least ten days before final oral examination
10. Thesis submitted to Graduate School (Option A)	At least ten days before final oral examination
11. Final Oral Examination	At least ten days before commencement
12. Corrected copies of Thesis submitted to Graduate School and Library (Option A) or Research Paper filed in major department (Option B)	At least five days before commencement

B. The Doctor of Philosophy Degree

1. Majors

The Doctor of Philosophy degree is offered with majors in Agronomy, Animal Science (offered in the Department of Animal and Range Sciences and in the Department of Dairy Science), and Sociology.

2. Admission Requirements

Applicants for the Doctor of Philosophy degree will usually have a Master's degree. In those cases where applicants do not have a Master's degree, departmental requirements will apply, either requiring completion of a Master's degree or permitting an individual to move directly into a doctoral program.

3. The Advisory Committee

After consultation with the student, the head of the major department will designate a major advisor prior to first registration where practical. During the student's first semester in residence (or before the completion of 12 credits part-time) the major advisor will recommend to the Dean of the Graduate School members of an Advisory Committee as follows:

a. The major advisor who acts as chairperson of the committee;
b. The head or representative of the major department or of a department in the area of the major;
c. An additional member of the major department or a related department, and
d. The minor advisor or a representative from an area where the supporting courses will be taken.
e. In addition, the Graduate School Dean will select a fifth member from a department representing an area not closely related to the major or minor department or supporting area. This member represents the Graduate Faculty, ensuring that its rules and regulations are followed by the Committee. The above five members shall be members of the Graduate Faculty. Additional members of the committee may be requested by the student or the major advisor and assigned to the committee by the Graduate School Dean.

The Advisory Committee is responsible for assisting the student in developing a suitable graduate program, providing continuing guidance and counsel, evaluating student progress and certifying the completion of the degree requirements to the Dean of the Graduate School. The Advisory Committee approves the Plan of Study and any revision(s) of it, approves the Dissertation Proposal, reviews the Dissertation, evaluates the student's progress, determines the student's proficiency with the research tools, conducts the comprehensive examinations and the final examination, supervises the validation of courses and ensures that professional standards have been met in completing the degree requirements.

4. Plan of Study

Within six weeks after appointment, the Advisory Committee will meet with the student to approve a Plan of Study and to consider a research area for the dissertation. The Plan of Study must be prepared on the appropriate form and approved by the Advisory Committee and the Dean of the Graduate School. Delay in submitting a Plan of Study may result in disapproval of courses taken prior to approval. The student cannot take the comprehensive written examination prior to approval of the Plan of Study.

Changes in the approved Plan of Study must be requested on a form furnished by the Graduate School, and must be approved by the Advisory Committee and the Dean of the Graduate School.

5. Residence and Credit Requirements

a. Total
A minimum of three academic years of full time work beyond the Bachelor's degree (minimum 90 semester credits) or a minimum of two academic years of full time work beyond the Master's degree (minimum of 60 semester credits) are required for the Doctor of Philosophy degree. Where consideration is given to a master's degree it must be in the area of the major, minor or a related area, be an academic program from a regionally accredited institution, and be declared at the time the Plan of Study is submitted. The Advisory Committee may require more credits than the minimum listed above if it believes the extra requirements are in the best interest of the student. The Research Tool requirements are in addition to this total.

b. The Major
At least 60 credits of the 90 or 40 of the 60 credits required for the degree must be earned in the major. Dissertation and transfer credits may apply. Not all courses need to be in a single department or area, but all courses applying to the major should be closely related to it.

c. The Minor or Supporting Courses
At least 15 credits of the 90 or 10 of the 60 credits required for the degree must be earned in a minor or in supporting courses (coursework chosen from two or more fields). Transfer credits may apply. All courses applying in the minor or supporting fields must be taken outside the major department or area, unless courses in the major department are considered sufficiently diverse by the Advisory Committee.

d. Residence Requirements
The minimum residence requirement is 50 credits, including two semesters spent on campus. Those on full time faculty appointment and graduate assistants may satisfy the residence requirements within one academic year.

e. Additional Requirements
The Advisory Committee may require more credits in residence than the minimum indicated above if they feel it is in the best interest of the student.

6. Research Tool Requirements

The Plan of Study must include development of proficiency with at least one research tool. Research tools are skills which are useful in advanced research in the major field, but which are not an integral part of the major or the minor fields (or supporting courses). Since relevant skills are involved, the number of credit hours cannot be specified, but generally will be equivalent to 8 to 10 credits of coursework. Each department, with the approval of the Graduate Council, shall specify the research tool requirements for students in its program. The Advisory Committee will determine that proficiency has been obtained and will certify completion of the Research Tool requirement on a form supplied by the Graduate School. Research tools that have been required frequently include foreign languages, statistics and computer programming. Credits earned in attaining proficiency with research tools may not be included in the degree program.

7. The Dissertation

a. Proposal
The student in consultation with the major advisor or dissertation adviser shall prepare a written dissertation proposal for approval by the Advisory Committee.

b. Requirements
The dissertation should represent at least one academic year of full time research (18-30 credits). Of no specific length, it should advance or modify knowledge in the major discipline and demonstrate the candidate's mastery of the subject. The dissertation should be prepared in the style of one of the journals in the major discipline as required by the Major Department and in the format required by the Graduate School as specified in "Instructions for Thesis and Research Reports". When submitted, it is accompanied by an abstract of no more than 350 words.

While the dissertation should be an integrated document providing opportunity for philosophic inquiry, the student is encouraged to develop one or more journal articles from it. Some departments may require that the journal articles be a part of the dissertation.

After the dissertation is approved by the major advisor or dissertation advisor, a copy is delivered to the Graduate School. After the dissertation is found acceptable in form by the Graduate School it is returned to the student who must distribute copies to the members of the Advisory Committee ten days (excluding Sundays and holidays) prior to the final oral examination.

After the final oral examination, all necessary corrections in the dissertation are made and four copies are delivered to the Graduate School (two copies for the Library, one for the department and one for the dissertation adviser). The cost for binding these copies is the responsibility of the student. The student must agree to the publication of the abstract and payment for publication of the abstract and microfilming of the dissertation.

8. Examinations

a. Interim Evaluation
Upon completion of approximately half of the coursework on the Plan of Study the Advisory Committee will meet to evaluate the progress of the student, provide advice and counsel, and recommend continuance or termination of the program. Since the Doctor of Philosophy is a terminal academic degree, evaluation of student performance includes an evaluation of progress in the program as well as academic performance. The Advisory Committee may recommend to the Dean of the Graduate School termination of the student in the program.

b. Comprehensive Written and Oral Examinations
When coursework has been substantially completed and the research tool requirement has been met, examinations covering the coursework are taken. These examinations are open for all members of the Graduate Faculty to listen, but not participate in the questioning. The first is a comprehensive written examination which is followed on satisfactory completion by an oral examination. These examinations are to test the student's knowledge and ability to integrate this knowledge in both the major and minor (or supporting courses) areas.

The Advisory Committee arranges for examinations and conducts them at times approved by the Dean. Review of the examination is accomplished by all members of the Advisory Committee, the results are reported to the Dean of the Graduate School on the appropriate form and copies of the written examination are filed in the major department. The comprehensive examinations must be completed at least two months before the final examination is taken. Upon satisfactory completion of the comprehensive examinations a student is formally admitted to candidacy for the Ph.D. degree.

c. The Final Examination
This examination is conducted by the Advisory Committee at a time and place announced by the Graduate School. While the Advisory Committee determines the character and length of the examination, sufficient time should be devoted to the dissertation, including journal articles to test the ability of the student to defend the research. In addition, questions to test the student's general knowledge, judgement and critical powers are usually asked. The final oral examination cannot be taken earlier than two months following successful completion of the comprehensive examinations and must be completed ten days prior to commencement.

9. Dissertation Sustaining

After satisfactory completion of the dissertation requirements in the Plan of Study, a student must register continuously each semester during the academic year for Dissertation 890, Section II, until the degree is awarded. Failure to do so will automatically terminate the degree program. Reinstatement requires retaking the Comprehensive Written Examination with performance approved by the Advisory Committee.

10. Time Limitation

a. Obsolete Program
If the Doctor of Philosophy degree is not completed within eight years from the time of admission to work toward the degree, a reconsideration of the student's program will be required. In such cases, the rules of the Graduate School in effect at the beginning of the ninth year will become effective for the student.

b. Obsolete Coursework
Courses completed more than eight years before completion of the doctorate and not part of a previous degree are regarded as obsolete coursework. Such courses, may be used in the doctoral degree program if validated. Validation is allowed at the discretion of the Advisory Committee and department involved and can be accomplished by passing a written validation examination in the subject matter area. Validation of obsolete coursework cannot exceed six graduate credits and must be certified by the Advisory Committee on a form prescribed by the Graduate School. However, credits earned as a part of a Master's degree which is applied toward the doctoral program remain valid and require no validation.

11. Checklist for Doctor of Philosophy Degree

Requirements	When Due
1. Application for Admission to Graduate School	One month before first registration
2. Designation of Major Adviser	Prior to registration for first semester where practical
3. Designation of Advisory Committee	Within first semester of graduate work or prior to 12 semester hours of graduate work
4. Approval of Plan of Study by Advisory Committee	Within first semester of graduate work
5. Approval of Dissertation Proposal by Advisory Committee	Before beginning research
6. Interim Evaluation by the Advisory Committee	Not later than halfway through the coursework in the Plan of Study
7. Language Examination/ Completion of Research Tools	Prior to comprehensive examination
8. Comprehensive Examinations, Candidacy for Ph.D. degree	Near completion of coursework and at least 2 months prior to final oral examinations
9. Filing of Graduation Card	Within the first four weeks of the last semester
10. Dissertation Due at Graduate School and to Advisory Committee	Not later than ten days prior to final oral examinations
11. Final Oral Examination	No later than ten days prior to commencement
12. Corrected Copes of Dissertation Due at Graduate School	Not later than five days prior to commencement
13. Arrangements for microfilming and binding of Dissertation	Not later than five days prior to commencement

Courses of Instruction

COURSE NUMBERING SYSTEM

300-499 series

Courses numbered 300-499 are advanced undergraduate courses. They are not listed in this bulletin, but are listed in the general catalog. They may be used in meeting part of the requirements for graduate degrees in accordance with the policy on converted credits (see C. 2, Page 4)

NOTE: When credits in the 300-499 series are applied to a graduate program, they are entered on the transcript without notation. It is doubtful, therefore, that they could be transferred as graduate credit to another institution.

500-599 series

Courses numbered 500-599 are advanced undergraduate courses open to selected undergraduate students (Juniors and Seniors, only) having the ncessary prerequisites. Such courses, except for fifth year pharmacy courses, may not be used as a requirement for the Bachelor's degree, but may serve as electives in an undergraduate program.

600-699 series

Courses numbered 600-699 are graduate level courses but are open to SDSU senior students for graduate credit if they meet the following requirements:

(1) Within 15 credits of completing Bachelor's degree;
(2) Have an overall grade point average of 2.5 or higher, or a Junior-Senior grade point average of 3.0 or higher;
(3) Enroll for no more than 18 credits (9 credits during Summer School).

700-799 series

Courses numbered 700-799 are graduate level and are open to graduate students only (except seniors by permission. See page 5).

800-899 series

Courses numbered 800-899 are doctoral and post doctoral level, open only to doctoral students or those holding an earned doctoral degree.

900-999 series

Coures numbered 900-999 are post-baccalaureate and not for degree credit.

ABBREVIATIONS USED

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

Other abbreviations explained in text.

DEPARTMENT OF AGRICULTURAL ENGINEERING

Professor Mylo A. Hellickson, Head
Professors Chu, DeBoer, DeLong (Emeritus), Moe (Emeritus), Wiersma (Emeritus);
Associate Professor Lytle

Graduate major offered:

Master of Science degree with major in Agricultural Engineering. Master of Science in Engineering. The Agricultural Engineering courses listed below are also offered in support of the Master of Science in Engineering program (See College of Engineering).

Graduate minors offered:

Agricultural Engineering, Mechanized Agriculture.

Prerequisites for graduate study:

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

For the graduate minor prerequisites to the graduate courses elected.

Two Options for Master of Science Degree:

Option A requires a minimum of 30 semester credits, including a thesis and a comprehensive oral examination.

Option B requires a minimum of 32 semester credits, including a two-credit design paper and a comprehensive oral examination.

Agricultural Engineering (AE)

603 Energy and Environment 3(3,0) S 1987, F 1988

Analysis of world energy resources and their relation to land and water environments. Energy technology in fossil fuels and investigations of research and technologies of non-fossil fuels. Analysis of energy requirements for selected tasks and energy conversion techniques.

612 Advanced Agricultural Tractors and Machines 2(2,0) S 1987, F 1988

Units of instruction will be selected from the following areas: Tractor chassis mechanics and dynamics, transmissions, hydraulics, human factors considerations for agricultural machine operators, soil dynamics in tillage and machine-plant concepts. P, Math 321, and AE 464 or equivalent.

622 Bio-environmental Engineering 2(2,0) F 1986, S 1988

Analysis of farm animals and their environment employing engineering principles combined with biological principles. Homeothermic mechanisms of animals and the influence of thermal environment upon growth and production. P, AE 324.

***633 Advanced Irrigation Engineering** 3(2,3) S 1986, F 1987

Basic soil-water-crop relationships. Theory and design of pumping plants, surface, sprinkle, and trickle irrigation systems. Design of pipe network distribution systems. P, AE 434 or consent.

642 Engineering Phases of Crop Processing 2(2,0) S 1986, F 1987

Study of physical properties of agricultural crops and engineering principles as they apply to cutting, shearing, collecting, packaging, transporting, drying, handling and storing of agricultural products. P, AE 444.

652 Theoretical Micro-Climatology 2(2,0) S 1987 F 1988

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 ground. P, Calculus, Physics, AE 353.

***663 Instrumentation** 3(2,3) S 1987, 1988

Principles of transducers, amplifiers and terminating devices in measurement systems with emphasis on transducers and systems performance. Techniques and methods for use in engineering and scientific measurement. P, Phy 213, Math 225.

673 Programming Agricultural Systems 3(2,2) S 1987, F 1988

The use of programs and computers in advanced engineering for the solution of problems occurring in Agricultural Engineering studies. Gathering, processing, evaluating mass engineering and scientific data. P, CSci 312, Engr. Stat.

695 Special Topics 1-3 Cr. On demand.

732 Advanced Hydrology in Agriculture 2(2,0) F 1987, S 1989

Study of small watershed hydrologic principles. The components of the land phase of the hydrologic or water cycle are studied and a study of the synthesis and interaction of these components is introduced. Mathematical relationships which describe the hydrologic components are reviewed and used to stimulate components of the hydrologic cycle on the digital computer. The principles of soil erosion from small watersheds are also studied and applied to field problems. P, AE 434, PS 352, FORTRAN or consent of instructor.

733 Ground Water Engineering in Agriculture 3(3,0) F 1986, S 1988

Study of saturated ground water movement. Presentation of theory and procedures for the design of subsurface drainage systems and water supply systems. Introduction of legal aspects of ground water use and pollution. P, EM 331.

770 Special Problems in Agricultural Engineering FSSu 1-2(on demand)

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

771 Graduate Seminar 1(1,0) F 1986, 1987
Discussion and reports of current topics and investigations in Agricultural Engineering. (Limit of 2 credits.)

***772 Similitude** 2(1,2) F 1986, S 1988
A systematic approach to the principles and theory of dimensional analysis, problems of model design and tests. The use of true, distorted and dissimilar models as they pertain to engineering design and research.

790 Thesis 5-7 FSSu

Mechanized Agriculture (MA)

500-600 Special Topics
(4-day workshops, 6 hrs. per day)
(On sufficient demand)
A. Agricultural Machinery, B. Soil and Water Mechanics, C. Small Power Units, D. Agricultural Power Units, E. Electric Motors and Electrical Controls, F. Agricultural Structures and Environment, G. Welding. Primarily designed for in-service teaching training activities for Vocational Agriculture teachers. Workshops held at several points in state.

***612 Advanced Farm Machinery** 2(1,3) Su 1986
Operation, care, adjustments, new developments in farm machinery, with emphasis on field and farmstead machinery as related to needs of agricultural production. Alternate years.

***622 Advanced Farm Structures** 2(1,3) Su 1986
Materials for farm construction; construction methods and techniques; new developments in farm building. Alternate years.

***642 Advanced Rural Electrification** 2(1,3) Su 1987
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.

***662 Advanced Irrigation, Mechanics and Practices** 2(1,3) Su 1987
Sprinkler, surface and trickle irrigation systems and equipment. Irrigation scheduling, management, and economics. Water laws and irrigation program financing. Water quality and environmental impact of irrigation. Alternate years.

***682 Advanced Farm Engines** 2(1,3) Su 1987
Operation, selection, care, adjustment, and new development of internal combustion engines as applied to farm power units. Alternate years.

*All courses would be subject to a laboratory fee.

DEPARTMENT OF ANIMAL AND RANGE SCIENCES

Professor John Romans, Head
Professors Briggs (Emeritus), Carlson (Emeritus), Dearborn, Dinkel (Emeritus), Embry (Emeritus), Emerick, Gartner, Granholm, Kamstra (Emeritus), Kohlmeyer (Emeritus), Kohler (Emeritus), Lewis (Emeritus), Libal, Luther, McCarty, Minyard, Morgan (Emeritus), Slyter, Wahlstrom
Associate Professors Bush (Emeritus), Costello, McCone (Emeritus)

Graduate majors offered:

Master of Science degree with a major in Animal Science. Doctor of Philosophy degree with a major in Animal Science.

Research toward the graduate degrees in this department may be pursued in the areas of animal breeding, animal production, ruminant nutrition, reproductive physiology, meat science, range management, swine nutrition.

Graduate minors offered:

Animal Science.

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 (AS)

623 Population Genetics 3(3,0) S Even years
Genetic structure of populations, and forces affecting this structure. Theories of biological variation, race and species formation. P, Bio 371 or equivalent. Stat 641 or equivalent highly recommended.

631 Ruminant Nutrition 3(3,0) S
Principles of nutrition for ruminants in relation to growth, reproduction, lactation and finishing. P. 223, 333, Chem 260, Vet 323 or Zoo 325.

636 Monogastric Nutrition 3(3,0) F
Nutrition principles for nonruminants related to reproduction, lactation and growth. P, 223, 333, Chem 260, Vet 323 or Zoo 325.

653 Meat Science 3(2,3) S Even years
Basic physical chemical, microbiological and histological characteristics of meat and effects of various processing methods on meat products and by-products. P, 241.

691 Research Problems 1-3 FSSu
Investigation of problems in the following areas with results submitted as a technical paper:
Animal Breeding; Nutrition; Meats; Livestock Production; Range Management; Reproductive Physiology; Wool Technology; Poultry

692 Special Topics 1-3 FS
Advanced study of one or more selected topics: breeding, management, product technology, physiology, nutrition, research methods or marketing.

711 Ruminology 3(3,0) F Odd years
See Dairy Science 711 for description.

731 Experimental Procedure 2(2,0) F Odd years
Research methods and planning of experimental work, necessary records, interpretation of results and presentation of material. Introduction to research application of linear programming. P, Stat 641 or equivalent.

732 Advanced Physiology of Reproduction 3(2,2) Even years
Anatomical and physiological process of reproduction in domestic animals with special emphasis on research techniques and the findings of recent research. P, 433.

733 Nutritional Interrelationships 3(3,0) S Odd years
Relationships between nutrients in metabolism. Substitution and sparing effects with emphasis on minerals and vitamins. Comparing metabolic significance of required nutrients for different animal species and as applied to human nutrition. P. 223, 333, Chem 260, Vet 323 or Zoo 325.

734 Protein and Energy Nutrition 3(3,0) F Even years
Principles of protein and energy metabolism and the partitioning of these nutrients for maintenance, growth and production in domestic farm animals. P, 223, 333, Chem 260, Vet 223 or Zoo 325.

781 Graduate Seminar 1(1,0) FS
Reports and discussion of current research in animal science. Maximum of two credits for M.S. and four credits for Ph.D.

790 Thesis, Master of Science 5-7

890 Dissertation, Ph.D.

Range Science (Rang)

681 Range Science Seminar 1(1,0) (On sufficient demand)
Review of current literature, research programs, and action programs in the management and the use of rangelands, Rang 300 or equivalent highly recommended. Limit 2 credits.

691 Research Problems in Range Science 1-3 FSSu
Investigation of problems in range science with results submitted as a technical paper.

692 Special Topics 1-3 FSSu
Advanced study of one or more selected topics in range science.

DEPARTMENT OF BIOLOGY

Professor C.R. McMullen, Acting Head
Professors Chen, Granholm, Hartwig (Emeritus), Holden, Hugghins (Emeritus), Morgan (Emeritus), Myers, Peterson, Taylor (Emeritus)
Associate Professors Haertel, Hutcheson, Larson, Whalen, Wilkin

Graduate majors offered:

Master of Science with Major in Biology:
Thesis Option:

This program requires a minimum of 30 semester credits including a thesis and comprehensive oral exams. The student may either select breadth in coursework or specialize in certain areas such as botany, ecology, genetics, physiology, etc. Supporting courses are available from other biological science departments on campus.

Non-Thesis Option:

This program requires a minimum of 32 semester credits including 2 credits of Biology 793 "Biological Research Problems." Again the student may select breadth in coursework from all levels of biological organization.

Master of Science with major in Zoology:

This program requires a minimum of 30 semester credits including a thesis and comprehensive oral exam. This program is designed for students wishing to specialize in animal-oriented coursework and research.

Graduate minors offered:

Biology, Botany or Zoology. These require a minimum of 8 semester credits.

Prerequisites for graduate study:

For the graduate major in Biology a Bachelor's degree, including 24 credits in biological sciences or consent.

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

For the graduate minor in Biology a Bachelor's degree, including 16 credits in biological sciences, or consent.

For the graduate minor in Botany a Bachelor's degree, including at least 6 credits in Botany or consent.

For the graduate minor in Zoology a Bachelor's degree with at least 6 credits of Zoology or consent.

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

Biology (Bio)

607 Principles and Techniques in Electron Microscopy 3(2,3) FS

Techniques and instruments basic to the preparation, examination and interpretation of specimens with the electron microscope.

651 Biology of Algae 4(2,6) F
Even years

Physiology, ecology, taxonomy and evolution of algea. Laboratory includes identification and field and laboratory techniques, P, two years of biological science and one year of chemistry or consent.

625 Biology of Aging 2(2,0) S

Primarily human aging studied at the molecular, cellular, tissue, organ, and whole animal levels. Physical, sensory and physiological changes with age. Diseases of aging including arteriosclerosis, cancer and Alzheimer's disease. Altered metabolism and dosage of drugs, aging as part of the entire life cycle. P, Zool 325 or Chem 260.

653 Advanced Genetics 3(3,0) F
Even years

Procedures in genetic studies as they relate to molecular and classical genetic applications.

673 Cytogenetics 3(2,3) F
Odd years

To study the nature and behavior of chromosomes in relation to heredity. P, 343 or 371.

695 Strategies in Science Teaching 3(3,0) FS

Training in identifying and teaching certain processes deemed fundamental to science and scientific behavior.

697 Special Topics FSSu*

Chromosome Analysis, Field Ecology, Human Ecology.

790 Thesis in Biology 5-7

792 Graduate Seminar 1(1,0) FS

793 Biological Research Problems 2-4

Botany (Bot)

605 Aquatic Plants 3(1,4) F
Even years

A systematic survey of vascular plants that grow in wetland habitats, and a study of their adaptations to life in the water. Field and laboratory practice in identification and recognition of common aquatic plants. P, Bot 301, or consent of instructor.

681 Plant Tissue Culture 3(2,3) F
Even years

Comparative studies of *in vivo and in vitro* cellular differentation, organ formation, and plant development. P, Bot 421 or Bio 371 or Bot 427.

615 Advanced Plant Ecology 4(2,3) S

Analysis of the energy relationships of communities with emphasis on productivity. Literature readings. Laboratory work in techniques of community analysis. P, Consent.

627 Advanced Plant Physiology 4(2,4) S
Even years

Role of organic and inorganic compounds in plant nutrition. Emphasis on photosynthesis, respiration, metabolism, and other cellular processes. P, 427, Ch 120.

685 Growth and Development 4(2,4) S
Odd years

Relations of light, temperature, water, wind, growth regulators, nutrients and other factors to various stages of plant growth and development. P, 427, Ch 120.

697 Special Topics FSSu*

Plant Anatomy, Plant Taxonomy, Morphology of Non-Vascular Plants, Morphology of Vascular Plants.

Zoology (Zool)

723 Systemic Physiology 4(3,3) F

Various systems of the animal body; coordination and interrelationships of systems; circulation, temperature regulation, muscle, and respiration. P, 325 or consent.

725 Systemic Physiology 4(3,3) S

Physiology of digestion, rumination, urine formation, reproduction, nervous system, endocrine glands, and special senses. P, 723 or consent.

727 Endocrinology 4(3,3) F

A study of the effects of the secretions of the various glands of the body on growth, development, metabolism, and reproduction of domestic animals. P, 325. Alternate years.

790 Thesis in Zoology 5-7

792 Graduate Seminar in Zoology 1(1,0) FS

Reports and discussions of topics of zoological interest. Maximum of 3 credits accepted. Major students are urged to attend all seminars.

797 Special Topics in Zoology FSSu*

Mammalian Developmental Genetics, and Zoological Research Problems.

*Special topics are taught as regular courses dependent upon student demand. Information about content, prerequisites and semester offered can be obtained from the Biology Department.

DEPARTMENT OF CHEMISTRY

Professor D.C. Hilderbrand, Head
Professors Brandwein, Emerick, Evenson, Gehrke, Grove, Greb (Emeritus), Halverson (Emeritus), Hecht, Jensen, Johnson (Emeritus), Kenefick, Klug, (Emeritus), Olson, O., (Emeritus), Palmer, Rue, Wadsworth, Webster (Emeritus), Whitehead (Emeritus), Spinar
Associate Professors Matthees, Paech, Seymour

Graduate majors offered:

Master of Science degree with a major in Chemistry and Master of Science Teaching (separate listing).

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 selected.

Chemistry (Ch)

622 Advanced Organic Chemistry 3(3,0) S
Review and discussion of nomenclature, stereochemistry, resonance theory, equilibria, elementary kinetics. Discussion of intermediates and mechanisms. Introduction to the chemistry of polymers, heterocyclics, and natural products. P, 328, 344 or concurrent.

624 Structural Determination of Organic Compounds 3(2,3) F 1987
Determination of the structure of organic compounds primarily by spectroscopic techniques. P, 328. Alternate years.

628 Physical Organic Chemistry 3(3,0) F 1986
Physical organic, reaction mechanisms, m.o. claculations, orbital symmetry, and e.s.r. spectroscopy. P, 328 and 344. Alternate years.

632 Advanced Analytical Chemistry 3(3,0) F
Theroretical treatment of principles involved in noninstrumental analytical chemistry including sampling and statistics. P, 344.

634 Analytical Spectroscopy 3(3,0) S 1986
In-depth treatment of the quantative applications and theory of modern spectroscopy techniques including atomic absorption, emission, and fluorescence; molecular absorption and fluorescence; and X-ray spectroscopy. P, 434. Alternate years.

636 Chromatography and Separations 3(3,0) S 1987
Theory and practice of solvent extraction and paper, thin layer, gas and liquid chromatographic techniques. P, 232. Alternate years.

642 Advanced Physical Chemistry 3(3,0) S
A review of the principles and applications of physical chemistry. Several topics such as thermochemistry, quantum mechanics, spectroscopy, kinetics, and electrochemistry will be considered. P, 344.

644 Chemical Thermodynamics 3(3,0) F 1986
Discussion of the laws and theories of classical and statistical thermodynamics as related to macroscopic chemical systems. P, 344. Alternate years.

646 Atomic and Molecular Structure 3(3,0) F 1987
Introduction to quantum mechanics and theoretical treatment of chemical structure and binding. P, 328, 344, or concurrent registration in 344. Alternate years.

652 Descriptive Inorganic Chemistry 3(2,3) F 1987
Discussion centered on periodic relationships of the elements. The laboratory work includes preparation and purification of typical inorganic compounds. P, 120 (4 credits), 232, 354. Alternate years.

654 Advanced Inorganic Chemistry 3(3,0) S
General discussion of inorganic systems including theoretical, representative group and transition metal topics. P, 344.

660 Radioisotope Techniques 4(3,3) S
Theory and measurement of radioactivity. Techniques for the application of radioactive isotopes in chemical and biological experimentation. P, consent.

662 Principles of Biochemistry 3-5(3,0 or 3,6) F
Chemistry of biological processes occurring in plants and animals. P, 260.

672 Seminar 1(1,0) FS
Required of all graduate majors in chemistry.

681 Bioinorganic Chemistry 3(3,0) F 1986
A study of biological systems stressing the role of metals ions, primarily the transition metals. Model systems included in the discussion. P, 120 (4 credits), 354 or consent. Alternate years.

691 Special Problems *(0,*) FS
P, consent. Limited to a total of 4 credits.

720 Special Topics in Organic Chemistry 1-6
One term advanced courses taught upon demand and covering such topics as stereochemistry, advanced synthetic organic chemistry, etc. P, consent.

730 Special Topics in Analytical Chemistry 1-6
Individualized studies in mass spectrometry, electroanalytical, trace analysis, or instrumentation and electronics, P, consent.

740 Special Topics in Physical Chemistry 1-6
One-term advanced courses taught upon demand covering such topics as electrochemistry, surface chemistry, kinetics, quantum chemistry, etc. P, consent.

750 Special Topics in Inorganic Chemistry 1-6
One-term advanced courses taught upon demand and covering such topics as coordination chemistry of transition elements, structural determinations, etc. P, consent.

760 Special Topics in Biochemistry 1-6
Selected concepts covering the more advanced concepts in the biochemistry field, new research techniques, etc. P, consent.

764 Biochemistry I 3(3,0) S 1987
Study of metabolism of carbohydrates and lipids. Includes aspects of enzyme kinetics and regulation as well as principles and characteristics of ATP-synthesizing complexes. P, 662. Alternate years.

766 Biochemistry II 3(3,0) S 1986
Study of the metabolism of amino acids, proteins, nucleotides and nucleic acids. Includes some aspects of enzymology and the mechanism of intra- and intercellular communication. P, 662. Alternate years.

773 Seminar 1(1,0) FS
Required of all graduate majors in chemistry.

790 M.S. Thesis in Chemistry 1-7

The following Physics courses may be used in either the graduate major or minor program.

Phys 635 Reactor Physics 3(3,0) S
Phys 637 Science of Solids 3(3,0)
Phys 743 Statistical Mechanics 2(2,0)
Phys 775 Advanced Quantum Mechanics 3(3,0)
Phys 779 Group Theory in Quantum Mechanics 3(3,0)

*To be arranged.

DEPARTMENT OF CHILD DEVELOPMENT AND FAMILY RELATIONS

Professor Jay Richardson, Head

The following Child Development and Family Relations course are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

Child Development and Family Relations (CDFR)

602 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 credits may be applied on advanced degree. P, consent.

643 Current Topics 1-3(1-3,0)
Study of current issues and concerns in the field of CDFR. Focus on topics not included in other graduate courses in the department. P, consent, can be repeated.

644 American Woman-Roles and Relationships 2(2,0) S
Recent literature regarding changing role of woman, her developmental tasks, and unique contribution she has to make in dynamic 20th century America. P, 342, or equivalent.

676 Early Childhood Education, Administration and Practicum 2-4 (On sufficient demand)
Practical experience in administration of preschool, kindergarten program. P, 211, 362, 364, 261, consent.

677 Child and Family Counseling 3(3,0) (On sufficient demand)
Theory and philosophy of counseling with children and their families. P, consent.

682 Special Problems in Human Development and Family Relations 2-4 credits as arranged
Individual study for qualified students. P, consent.

711 Child Development Theory and Application 3
In-depth study of human development. Emphasis upon current theories and their application to an understanding of the developmental growth processes; relationship between cognitive, social, physical and emotional development and behavior; range of normality in growth and behavior. Focus on normal development but with consideration of impact of deviance from normative development on child, family, neighborhood.

742 Family Relations 3
Current theoretical approaches to family interactions; impact of various forces (social, personal, intra-personal) upon dynamic aspects of family relationships; patterns and sequences of coalitions and alliances; factors which result in stress and breakdown or enhanced and rewarding relationships. Emphasis upon normal families but family problems are also studied.

DEPARTMENT OF CIVIL ENGINEERING

Professor Dwayne Rollag, Head
Professors Buckley, Dornbush, Johnson (Emeritus), Koepsell, Hassoun, Larson (Emeritus), Prasuhn, Selim, Sigl
Associate Professors Abdul-Shafi

The following Civil Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering), as well as other graduate programs in the University.

Civil Engineering (CE)

611 Bituminous Materials 2(2,2) F
Properties of bituminous materials including their compatibility with various types of aggregates. Asphalt cement surface courses are designed and tested for stability. Standard tests are performed on bituminous materials with emphasis on test results. P, CE 216.

623 Environmental Engineering 3(3,0) F
The relationship of man's environment to health and control of this environment from an engineering standpoint. P, consent.

624 Industrial Waste Treatment 2(2,0) S
Characteristics and composition of industrial wastes, sampling and methods of analysis of these wastes and remedial measures for treatment and disposal. P, 423 or equivalent.

625 Environmental Engineering Planning 3(3,0)
Analysis and review of basic concepts and procedures involved in environmental aspects of planning. Consideration given to local effects of projects as well as effects on the area and the state or region. Graduate standing or consent.

626 Water Quality Analysis 3(1,6) F
Chemistry and interpretation of process control tests for the use and treatment of water and waste water. Application of test results to the design of water and waste water treatment works.

627 Water Treatment Plant Design 3(1,6) S
Water supply sources, design of treatment plants, cost estimates of water supply systems.

628 Waste Water Treatment Plant Design 3(1,6) F
Design of waste collection and disposal facilities, waste treatment plants, cost estimates of waste disposal and treatment systems.

633 Open Channel Hydraulics 3(3,0) F
Energy and momentum principles in open channel flow, flow resistance, flow in uniform and non-uniform channels, flood routing, P, 433.

634 Fluvial Hydraulics 3(3,0) S
Erosion, transportation and deposition of sediments by flowing water, bed load and suspended load movement, river behavior control. P, 433.

635 Water Resources Engineering 3(3,0) S
Topics related to water resources engineering including: multiple purpose river development, economic analysis of flood control measures, aspects of water law and other topics related to surface and ground water hydrology and administrative aspects of water resources planning. P, 433.

636 Foundation Engineering 3(3,0)
Bearing capacity, load induced pressures and settlements, soil exploration and sampling, lateral earth pressure, retaining walls, sheet pile structures, pile formations and cassions. P, CE 446.

637 Hydraulic Design 3(3,0) F
Hydraulic design as applied to hydroelectric power development and turbine design, flood routing in reservoirs and natural channels, design of drainage structures, and energy dissipators. P, 433.

638 Advanced Hydraulics 3(2,3) S
Introduction to topics related to water resources engineering including: dimensional analysis, similitude, mechanics of sediment transport, river engineering, coastal hydraulics and stream channel mechanics. P, 433.

646 Advanced Soils Engineering 3(2,3) S
Application of basic soil mechanics to engineering problems. Stability, compaction, embankments, seepage, draining, and stabilization. P, 446.

651 Plastic Design 2(0,6)
Modes of failure, plastic hinges, design rules and applications.

652 Prestressed Concrete 3(3,0)
Theory and design of prestressed concrete including pre-tensioning, post-tensioning. P, 456.

654 Advanced Design of Steel Structures 3(3,0)
Design of slender compression elements, tapered members, hybrid plate girders, column base plates subjected to bending moments, bolted and welded connections. Cold form steel structures. P, 455. Alternate years.

656 Advanced Reinforced Concrete Design 3(3,0)
Design of rigid frames, effect of plastic behavior, details for complex structures, analysis of flat-plate floor systems. Design comparisons. P, 456. Alternate years.

657 Matrix Analysis of Structures 3(3,0)
Matrix analysis of structural members using the generalized stiffness and force methods. Applications to two- and three-dimensional framed structures. P, 353.

659 Advanced Structural Mechanics 3(2,3)
Matrix methods, arches and rings, buckling, structural dynamics, computer solutions. P, 353, 455.

663 Pavement Design 3(3,0) S
Stresses in and design of flexible and rigid pavements including subgrades, bases and sub-bases. P, 363.

669 Design of Steel and Concrete Bridges 3(3,0)
Determination of bridge loadings and bearings. Design of concrete and steel bridge systems. Specifications and detailing related to bridge. P, 455, 456. Alternate years.

690 Special Engineering Problems 1-3
Elective course for special or detailed study or investigation.

695 Special Topics 1-3
Special topics in the field of Civil Engineering. P, consent.

723 Advanced Sanitary Engineering 3(3,0) S
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.

733 Water Resources Engineering 3(3,0) S
Advanced topics related to water resources engineering including: Multiple purpose river development, economic analysis of flood control measures, aspects of water law, advanced topics related to surface and ground water hydrology and administrative aspects of water resources planning. P, 433.

763 Highway Administration and Economy 3(3,0) Su
Highway administration, highway and transportation costs, road user benefits, cost benefit ratio.

764 Advanced Transportation Engineering 3(2,3) F
Planning and designing of railroads, highways, water and air transportation facilities and coordination of transportation facilities.

790 Thesis FSSu
Independent investigation of special problem and written thesis.

DEPARTMENT OF COMPUTER SCIENCE

Professor G.E. Bergum, Acting Head

CSc 647 Advanced Microprocessor Design Applications 3(3,0)
(See EE 625)

DEPARTMENT OF DAIRY SCIENCE

Professor John G. Parsons, Head
Professors Baker (Emeritus), Schingoethe, Spurgeon (Emeritus), Voelker
Associate Professor Bartle (Emeritus)
Assistant Professors Baer, Torrey

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 (DS)

612 Physiology of Lactation 3(3,0) S 1987
Anatomy, physiology, and biochemistry of mammary glands. Factors affecting quality and quantity of milk. P, Vet 223 or equivalent. Alternate years.

622 Advanced Dairy Microbiology 3(2,3) S 1986
Role of microorganisms in manufacture and spoilage of dairy products. Emphasis on starter culture technology. P, 301 or Micro 311. Alternate years.

631 Laboratory Techniques in Dairy Science 2(0,6) F 1986
Current research techniques in Dairy Science including photometry, selective ion electrodes, and column, thin-layer, and gas chromatography of milk and plant or animal tissues. P, Ch 260 or consent. Alternate years.

690 Dairy Science Problems 1-3 FSSu
Investigation of problems in dairy production or dairy manufacturing. Results submitted as a technical paper. P, consent.

702 Seminar 1(1,0) S
Research report writing, oral reports and discussion of current research in dairy production, dairy manufacturing, and related sciences. Maximum of 2 credits will be allowed for Master of Science or 4 credits for Doctor of Philosophy degree.

711 Ruminology 3(3,0) F (Offered in 1987)
Biochemical, physiological, and microbiological activity occurring in the rumen and the relation of rumen function to animal response. P, Ch 260 and Vet 223 or consent. Alternate years.

782 Nutrition Seminar 1(1,0) F (Offered fall only)
Reports and discussions of current research in nutrition. Limited to 2 credits.

790 M.S. Thesis

890 Dissertation, Ph.D.

DEPARTMENT OF ECONOMICS

Professor Gene Murra, Acting Head
Professors Aanderud (Emeritus), Allen, Dobbs, Gilbert, Greenbaum, Helfinstine (Emeritus), Hsia, Kamps, Kim, Kohlmeyer (Emeritus), Lamberton, Lundeen, Myers (Emeritus), Smythe (Emeritus), Thompson (Emeritus), Taylor
Associate Professors Janssen, Shane, Sogn (Emeritus)

Graduate majors offered:

Master of Science degree with a major in Economics.

The graduate curriculum is designed to prepare students for professional placement or further graduate study. Emphasis is placed on theory and development of analytical skills. Students can take supporting courses in agri-business management, applied economics or other disciplines which suit their interests and career goals. A limited number of research assistantships are available for qualified students. Additional information is available from the Economics Department, Scobey Hall, SDSU.

Graduate minor offered:

Economics.

Prerequisites for graduate study:

Unconditional admission requires that applicants have a Bachelors Degree including successful completion of courses in Intermediate Microeconomic Theory, Intermediate Macroeconomic Theory, Statistics and Calculus. Applicants who otherwise qualify for admission can take these courses during their first year in the M.S. program. Additional background in mathematics, statistics and communications will benefit graduate students in economics.

Requirements for the Master of Science Degree:

Option A requires a minimum of 30 semester credits, including a thesis (5 credits) and comprehensive oral examination.

Option B requires a minimum of 32 semester credits, including a research paper (2 credits) and comprehensive oral examination.

All students must complete the core requirements plus sufficient additional graduate hours in this department and either a minor in another department or supporting courses.

No graduate credit on a converted basis for 300-499 advanced undergraduate courses will be granted for the following courses: Econ 301 Intermediate Microeconomics; Econ 302 Intermediate Macroeconomics; Econ 380 Personal Finance; Stat 341 Statistical Methods I.

Core Requirements

Econ 724 Advanced Quantitative Economics 3
Econ 701 Research Methods 2
Econ 703 Advanced Macroeconomics 3
Econ 704 Advanced Microeconomics 3
Econ 705 Applied Economic Theory 3

J.D./M.S. in Economics A cooperative program between the University of South Dakota School of Law and South Dakota State University Department of Economics is available. The two institutions mutually accept up to nine semester hours of transferred credit. Students design their academic program in Economics to best suit their career goals and interests. For details, students should consult with the USD Law School or SDSU Economics Department.

Agricultural Economics (AgEc)

630 Advanced Agricultural Marketing and Prices 3(3,0)
Economic theory and quantitative techniques used in analysis of agricultural market problems, construction of economic models, statistical estimates of supply and demand, and price forecasting. P, 301, 423, AgEc 354 or consent.

670 Advanced Farm and Ranch Management 3(3,0) S
Leasing arrangements, capital investment, computerized accounting and budgeting. Use of linear programming as a tool for planning and organizing the farm business. P, 202, AgEc 271, 2 credits of CSci or consent.

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. P, consent.

Economics (Econ)

604 History of Economic Thought 3(3,0)
The historical development of economic ideas. A study of the various schools of economic thought and the economic environment which produced them. P, 301, 302 or consent.

620 Economics of the Public Sector 3(3,0)
Governmental operations, policies and revenues as related to employment, productivity and economic welfare. Alternatives that would affect social services, education, commerce and trade, fiscal policies, and quality of life. P, 201 or consent.

640 Economics of the International Sector 3(3,0)
International flow of trade and balance of payments. Monetary and fiscal policies. Trade controls and their effect upon the agricultural and domestic economies. Significant current developments in trade and finance. P, 201, 202, 330 or consent.

650 Industrial Organization 3(3,0) S 1987
The elements involved in market power and how they function. A theoretical and empirical study of how the structure and conduct of sellers and buyers affects economic performance. P, 301 and 302 or consent.

660 Economic Development 3(3,0)
Economic development theory, methods of analyzing regional and national development in developing as well as developed economies. Role of public policy in development process. Agricultural and rural development issues emphasized. P, 201, 202 or consent.

672 Resource Economics 3(3,0) F 1986
Economic analysis applied to problems in allocation, conservation and development of natural resources. Environmental economics, water and land use, and methods of evaluating projects and programs. P, 202.

690 Special Problems 1-3(1-3,0) FS
Advanced work in special problems in agricultural cooperation, finance, management, land economics, marketing, public finance, statistics. Open to qualified seniors and graduate students by consent.

701 Research Methods 2(2,0) S
Planning and conducting emperical research in economics; the organization of research; the philosophy and aim of science. P, two statistics courses or consent.

703 Advanced Macroeconomics 3(3,0) S
Comparative statics analysis of aggregate income determination; comparison of alternative stabilization policies; modeling of investment and consumption behavior; dynamic analysis of optimal growth. P, 428 or consent.

704 Advanced Microeconomics 3(3,0) F
Rigorous analysis of topics in microeconomics including: methodology of economic science, economic choice, production, resource allocation, distribution, welfare economics, and general equilibrium. P, 428 or consent.

705 Applied Economic Theory 3(3,0) S
Practice in the application of micro- and macroeconomics theory to solutions of real and hypothetical problems. Selection and use of appropriate statistical and other analytical methods suitable for complex problems. P, 423, 428.

724 Advanced Quantitative Economics 3(3,0) F
Integral calculus, differential and difference equations, optimal control and other methods used to analyze economic dynamics, investment, growth and other advanced topics in economics. P, 428.

790 Thesis 5 FSSu
Independent investigation of a special problem and written thesis. To be taken under Option A.

791 Graduate Special Topics 1-4
Organized by an instructor in consultation with his or her department head and a group of students. The course will provide a medium through which a specific topic can be pursued. The course will normally be experimental and may be a "one time only" effort for a particular semester and the unique group of students. Maximum: 4 hours credit per semester, 7 hours credit per degree.

792 Research Paper 2 FSSU
Independent investigation of a special problem and written research paper. To be taken under Option B.

DIVISION OF EDUCATION

Darrell Jensen, Dean
Professors Edeburn, Everrett, Hanson, Larsen, Lingren, Scholten (Emeritus), Sundet (Emeritus), Widvey
Associate Professors Crosswait, Ristow, Smith, Steinley
Howard Smith, Supervisor, Counseling, Guidance & Personnel Services;
Clark Hanson, Supervisor, Agricultural Education;
Darrell Jensen, Supervisor, Educational Administration;
Robert Ristow, Supervisor, Teacher Education

Graduate majors offered:

Master of Education degree with a major in Agricultural Education; Educational Administration; Teacher Education; and Counseling, Guidance and Personnel Services.

Graduate minors offered:

Agricultural Education; Educational Administration; Teacher Education; and Counseling, Guidance and Personnel Services.

Program Options and Specific Prerequisites:

The Graduate Program in Education is designed to provide professional preparation above the Bachelor's degree. The program includes the following options:

(1) The Agricultural Education major is designed to provide the professional preparation and competencies for teachers in Agricultural Education/Agri-Business. Specific prerequisites include a course in General Psychology, nine credits in General Education and eight credits of science and mathematics.

(2) The Educational Administration major is designed to provide the basic professional preparation for those who expect to become qualified administrators in schools where certification is required and for other institutions, businesses, industries and service-oriented agencies that have educational programs. The South Dakota State Board of Education requires two years of teaching experience for administrator certification.

(3) The Counseling, Guidance and Personnel Services major is designed to assist the student to develop personally and professionally so that the person can function more effectively in a helping relationship with others. The program emphasizes the development of the professional competencies expected of qualified counselors and staff members in schools, higher education, agencies and other institutions.

(4) The Teacher Education major is designed to provide advanced work in the area(s) of instruction and in Education for those who are potential educators or who are employed in schools where certification is required and for those who teach in higher education or with business, industry or other service-oriented educational programs.

The courses in the Education Division are divided into the following areas: Agricultural Education (AgEd), Adult Higher Education (AHEd), Counseling, Guidance and Personnel Services (CGPS), Driver's Education (DrEd), Educational Administration (EdAd), Education, Evaluation and Research (EdER), Educational Foundations (EdFn), Elementary Education (ElEd), Educational Psychology (EPsy), Secondary Education (SeEd), and Vocational Teacher Training Education (VTTE).

Adult Higher Education Courses (AHEd)

600 Special Problems in Extension 2-6 cr. FSSu
Individually assigned investigative problems in Extension. Individual conference with Laboratory and/or field work. Arrangements with Extension staff must be made prior to registration.

610 Adult Teaching and Learning 3(3,0)Su
Emphasize teacher behavior in relation to adult learning. Social and cultural factors and their effects on learning process.

681 Workshop in Adult and Continuing Education 1-3 FSSu
Special areas in adult and continuing education are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

682 Seminar 1-3 FSSu
Selected area of education including special investigation, reports, and discussion.

689 Internship in Education 1-6 FSSu
On the job participation in teaching or related fields in schools or other agencies under the supervision of local personnel and a staff member from the Division of Education.

691 Problems 1-3 FSSu
Directed reading and research in selected individual adult and continuing education topics.

711 Organization and Administration of Adult Education 3(3,0) S
Organization, development of Adult Education programs. Particular emphasis on Adult Basic Education. Curriculum development, financing, staffing, evaluation of adult programs.

751 Principles of College Teaching 3(3,0) S
An analysis of teaching methodologies, planning procedures, evaluation techniques, and professional relationships. Emphasis will be on learning and using strategies suitable for teaching.

792 Research Problem in Adult Education 2
A problem is selected, analyzed, and reported in form approved by the research advisor. Required of all graduate students in education qualifying for Master's of Education degree under Option B. Can be elected under Option C if desired. P, consent.

Agricultural Education (AgEd)

605 Seminar 1-2(1,0) or (2,0) FSSu
Selected areas of Agricultural Education including special investigation, reports, and discussion.

606 Problems 1-3 FSSu

Directed reading and research in selected agricultural education topics.

706 Adult Education in Agriculture 2(2,0) Su

Policies, methods, materials and organization of adult education program in vocational agriculture/agri-business; course planning, procedures, media, followup and evaluation in adult program. P, graduate student in Agricultural Education.

707 Supervised Occupational Experience and Student Groups in Agricultural Education 2(2,0) Su

Emphasizes relationships of occupational experience and vocational student organization in agriculture to instructional programs; needs, scope, techniques and materials in developing and improving these programs. P, graduate student in Agricultural Education.

776 Curriculum in Agricultural Education 2(2,0) Su

For teachers, administrators and supervisers of vocational agriculture/agri-business programs at secondary, post secondary and adult levels; principles and procedures in course building, courses of study, and curriculum. P, graduate student in Agricultural Education.

792 Research Problem in Agricultural Education 2

A problem is selected, analyzed, and reported in form approved by the research adviser. Required of all graduate students in education qualifying for Master's of Education degree under Option B. Can be elected under Option C if desired. P, consent.

Counseling, Guidance and Personal Services (CGPS)

603 Elementary School Guidance 3(3,0) S

Examination of the counseling process with children. The implementation of developmental guidance programs to meet children's emotional and learning needs.

610 Foundations of Guidance 2-3 Cr. FSSu

Developing basic human relations and helping skills: self-awareness and self-examination process; emphasis on understanding self and understanding others.

651 Mental Health and Personality Development 3(3,0) FSu

The nature of personality and developmental theory, mental health issues of children, adolescence and adults with emphasis on programs/strategies for positive mental health. Various personality assessment methods are used.

661 Theories of Counseling 3(3,0) FSSu

An overview of major theories, the methods they employ and appropriate applications. Assist beginning counseling students in comprehending scope of various approaches in dealing with clients.

681 Workshop 1-3

Special topics are comprehensively explored in an intensive time framework. Designed to increase specific skills and understandings in a current topic area.

682 Seminar 1-3 FSSu

Selected area of education including special investigation, reports, and discussion.

690 Special Topics 1-3

Advanced courses taught upon demand covering such topics as crisis intervention, multi-cultural counseling, stress and depression, mid-life, chemical dependency, etc.

713 Adminstration and Operation of Guidance and Personnel Services 3(3,0) SSu

Developing and managing a comprehensive counseling program in schools and agencies. Emphasis on counselor role, function and management, needs assessment and program evaluation.

736 Appraisal of the Individual 2(2,0) F

Assessment methods used in studying individuals. Standardized instruments, self-report inventories, observation, case study techniques and other non-standardized assessment tools are used. Recording, analyzing, compiling and interpreting data for use in counseling setting.

742 Career Education and Occupational Information 3(3,0) FSu

Examination of the career development and counseling process through the life span. Assist those intending to counsel at elementary, secondary, higher education and the community/workplace. To explore strategies and resources for career/life planning, various interest inventories and personality assessment methods are used.

766 Group Counseling 3(3,0) FSSu

Processes and procedures used in small group counseling. Students participate in group counseling, facilitate in-class counseling sessions and develop structured units for specific populations. P, CGPS 610, CGPS 661.

787 Counseling Laboratory and Supervised Practicum 3-5 FSSu

Emphasis on developing/refining counseling skills and personal counseling theory. Minimum of 30 one-hour counseling sessions audio-taped. Limited to advanced graduate majors in CGPS and consent.

788 Group Counseling Practicum 3

Supervised practicum in conducting small group counseling sessions. P, CGPS 766.

789 Internship in Guidance and Counseling 1-6

Practical experience in a counseling and guidance setting.

791 Problems 1-3

Directed reading and research in selected individual guidance and counseling topics. Designed to meet needs of graduate students in guidance and counseling.

792 Research Problem in Counseling and Guidance 2

A problem is selected, anaylzed, and reported in form approved by the research adviser. Required of all graduate students in education qualifying for Master's of Education degree under Option B. Can be elected under Option C if desired P, consent.

Driver's Education (DrEd)

650 Safety Education 3(3,0) FSSu

Philosophy, content and methods requisite to teachers participation in accident prevention activities and school safety education program.

670 Advanced Driver Education 3(3,1) S 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 short course involving full two weeks (80 hours) of instruction. P, 370.

671 Driver Education Simulation 2(2,0) Su

Philosophy, organization and procedures in the use of simulators to teach Driver Education.

672 Alcohol and Drugs in Relation to the Driving Task 2(2,0) Su

The effects of alcohol and drugs in relation to the individual's ability to drive. Organization of course content and materials to be used in High School Driver Education.

Educational Administration (EdAd)

700 Public School Administration 3 FSu

A broad overview of administration. Will examine administration as an applied science and analyze the organizational, political, and human relations systems as forces affecting administration. Specific topics will include conflict resolution, crisis management, planning, staff development, evaluation, and communications theory.

710 Organization and Administration of Elementary Education 2(2,0) Su

Principles and modern practices of organizing and administering work of elementary schools.

711 Secondary School Administration 3 S Su

Problems and practices in organizing and administering the secondary school. Emphasis is on the principalship with topics focusing on staff recruitment, supervision and evaluation, student rights and responsibilities, parent-community relationships, curriculum, budget, plant management.

715 Elementary and Secondary School Supervision 3(3,0) SSu

A study of leadership styles and the effects different styles have on motivating people. Emphasis on utilizing and developing human potential.

730 School Finance 2(2,0) Su

Develop an understanding and a working knowledge of school finance theory and practice. Emphasis will be placed on the school finance reform movement in recent years.

732 School Building and Grounds 2(2,0) Su

Management, care and operation of school plant. Needs and evaluation of existing facilities, new buildings and remodeling. Emphasis on facility planning at school system and building levels. Not a technical course in design and materials. Alternates with EdAd 735.

735 School Law 3(3,0) SSu

Legal foundations of elementary and secondary education in our society; legal powers and relationships of school boards, administrators, teachers, parents (guardians) and students. Emphasis will be placed upon the values underlying these foundations, powers and relationships.

740 Administration of Reading Programs 3(3,0) Su

Provides a framework of knowledge to guide administrators in providing leadership in the development of the reading curriculum. Focuses on topics such as overviews of reading approaches, recent research, the role of the principal, evaluating programs, and choosing a basal. The course is also of value to classroom teachers who, though not directly involved in the teaching of reading, want background in the area.

781 Workshop 1-3

Special areas in education administration are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

782 Seminar 1-3 FSSu

Study in selected areas of education administration including special investigation, reports, and discussion.

789 Internship in Education 1-6 Cr. FSSu

On-job participation in administration or working with administrative tasks in public schools under supervision of local school administrator and a staff member from Division of Education.

791 Problems 1-3 FSSu

Directed reading and research in selected education administration topics.

792 Research Problem in Educational Administration 2 FSSu

A problem is selected, analyzed, and reported in form approved by the research adviser. Required of all graduate students in education qualifying for Master's of Education degree under Option B. Can be elected under Option C if desired. P, consent.

Education, Evaluation and Research (EdER)

690 Special Topics 1-3

Advanced courses will be taught upon demand covering such topics as Least Restrictive Environment, computers in education, observation techniques for classroom evaluation.

711 Group Testing 3(3,0) F Su

Theory and principles of standardized group tests. Aptitude, achievement, career, and personality assessment instruments are examined. Practice in administration, scoring, and interpretation of results.

761 Introduction to Graduate Studies 3(3,0) FSSu

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.

Educational Foundations (EdFn)

600 The Exceptional Child 3 F

An overview of the types of exceptionalities in children including the mentally retarded, gifted, emotionally disturbed, physically handicapped and speech impaired. Definitions, prevalence, indentification, characteristics, and educational and counseling procedures and resources are identified.

605 Computers in the Classroom 2 FSSu

Examines the relationship between teaching methods, learning theory, and the place of the computer in the classroom; covers such topics as the data processing cycle, an overview of computer hardware and software, computer vocabulary, career opportunities, and some programming. P, EPsy 302 or consent.

610 BASIC Programming Applications in Education 3 FSSu

Examines the utilization of microcomputers and microcomputer software in the classroom; covers BASIC programming language which allows educators to effectively evaluate and modify software programs to meet the needs of teachers and students in the classroom. P, EPsy 302 or consent.

620 Philosophy of Education 2(2,0) F

Comparison of historic and current philosophies of education, their major emphasis and effects upon educational goals and practices today.

625 Issues in Special/Multi-cultural Education 2

Deals with issues surrounding the diversity of populations, both within the schools and in our global society. Part of this diversity within the schools can be attributed to the multi-cultural nature of the American population, including the integration of handicapped and gifted children.

651 Programming for Gifted and Talented 3(3,0) SSu

Examines curriculum methods and materials for gifted and talented children and youth. Students will be exposed to various programming models, IEP development, differentiated curricular concepts, as well as strategies to facilitate higher level thinking skills and skills in self-directed learning.

690 Special Topics 1-3

Advanced study covering such topics as Introduction to Multi-Cultural Education, Introduction to Law Related Education, and Interpretation and Implementation of Public Law 94-142.

Elementary Education (ElEd)

681 Workshop 1-3 FSSu

Special areas in elementary education are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

773 Elementary School Curriculum 2(2,0) Su

A study of the nature and principles of curriculum and curriculum development in the elementary schools. Processes of curriculum change, development and evaluation will be examined. Roles of teachers, administrators, students and the public in curriculum change will be studied.

Educational Psychology (EPsy)

608 Humanistic Approaches to Teacher Effectiveness 2(2,0) Su

Skills in human relationships, developing potentials, resolving differences, active listening, avoiding roadblocks, developing congruency, using "no lose" method of resolving classroom conflicts. Developing learner responsibility, accepting others, communicating acceptance to others, "I Messages," changing the environment.

623 Adolescent Psychology 3(3,0) SSu

Physical, social, emotional, intellectual and vocational aspects of adolescent development. Emphasis is upon increasing understanding of adolescents and their problems.

630 Learning Disorders of Children 3(3,0) S

Examination of the nature, causation and assessment of learning difficulties in children. Designed to assist educators in mainstreaming students. Emphasis placed on diagnosing, remediating and designing Individual Education Plans in compliance with Public Law 94-142.

650 Gifted and Talented 3 SSu

Overview of the Gifted and Talented field; explores the development of gifted/talented children as well as identification and curriculum adaptations for meeting the needs of these children; also focuses on issues surrounding the parents and families of gifted and talented as well as program development and evaluation.

652 Enhancing Creativity 3

Explores the various dimensions of creativity, including what it is, how it develops, how to teach creative students, and how to evaluate creative works. Emphasis will be on how to work with students who already exhibit significant creative abilities as well as how to foster creativity with all students.

740 Advanced Educational Psychology 3(3,0) FSu

A study of theories of learning. The goal of the course is for each student to gain insight into their own beliefs about how learning occurs.

761 Practicum in Individual Testing 4(4,0) S

Intensive training in the administration and scoring of individual psychological tests; emphasis on the Stanford Binet and Wechsler scales. P, consent. Master's degree candidate in CGPS. Class limited.

Secondary Education (SeEd)

672 Motivation and Discipline 2 F Su

Deals with varying theories of motivation and discipline and their application in the classroom. Stresses techniques for preventing discipline problems, with emphasis upon ways to provide success experiences and positive reinforcement for students. Emphasizes effective procedures of group management as applied to the classroom situation. The course is appropriate for teachers, guidance, and administrative personnel.

681 Workshop 1-3(1-3,0) Su

Special areas in secondary education are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

682 Seminar 1-3(1-3,0) FSSu

Study in selected areas of education including special investigation, reports, and discussion.

690 Special Topics 1-3

Advanced courses taught upon demand covering such topics as questioning techniques, classroom management, systematic observations of teaching, school policy making, changing roles in education, computer applications, etc.

691 Problems 1-3(1-3,0) FSSu

Directed reading and research in selected education topics.

740 Secondary School Curriculum 2(2,0) FSu

A study of the nature and principles of curriculum and curriculum development in the secondary schools. Process of curriculum change, development and evaluation will be examined. Roles of teachers, administrators, students and the public in curriculum change will be studied.

745 Updating Teaching Strategies 2 Su

This course will provide opportunities for participants to learn additional techniques for use in classroom teaching. The theory underlying the techniques and their uses will also be explored. Emphasis will be on techniques which allow students to gain skills in processing and manipulating information and for participation in social model skills. Opportunities will be provided for participants to analyze, practice, and create the various techniques under study.

751 Reading for Content Teachers 3(3,0) Su
Examines the latest research on how readers comprehend and learn from written texts, and the classroom applications of this research. Intended for teachers of content subjects (Science, English, Math, History, etc.) in grades 4 through the early years of college.

752 Foundations of Reading 2(2,0) FSu
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.

753 Diagnosis and Remediation of Reading Problems 2(2,0) 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, EPsy 302.

754 Cinical 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, 753 or concurrent.

789 Internship in Education 1-6(0,1-6) FSSu
On-the-job participation in teaching in the public schools under the supervision of local school instructor and a staff member from the Division of Education.

792 Research Problem in Education 2
A problem is selected, analyzed, and reported in a form approved by the research adviser. Required of all graduate students in education qualifying for Master's of Education degree under Option B. Can be elected under Option C if desired. P, consent.

Vocational Teacher Training Education (VTTE)

625 Development of Vocational Education Thought and Practice 3(3,0) FSSu
For all teachers, administrators, supervisors, coordinators and guidance workers. Emphasis on philosophy, origins and development of vocational, technical and practical arts education programs at adult, postsecondary, secondary and prevocational levels. Delivery systems, principles, career education, vocational guidance, and current and emerging trends and issues are stressed. P, senior in Education

731 Administration and Supervision of Vocational Education 3 Su
Organization, administration of vocational-technical education and the practical arts at all levels. Local-state-federal relationships in administration and supervision. State plan development, reimbursement plans and procedures, projected activities and program standards. Principles of effective supervision and evaluation applicable to vocational-technical education. Consent.

COLLEGE OF ENGINEERING

Ernest L. Buckley, Dean

Three programs are offered in engineering:

Master of Science in Engineering

Option A requires a minimum of 30 semester credits including a thesis and a comprehensive oral examination.

Option B requires a minimum of 32 semester credits including a 2-credit design or research paper (of thesis quality and style) and a comprehensive oral examination.

Master of Science in Agricultural Engineering

Option A and B are available just as in the case of the M.S. degree program in Engineering. See departmental detailed description.

Master of Science in Industrial Management

This degree requires a minimum of 30 credits including a thesis and a comprehensive oral examination.

Master of Science in Engineering

The purpose of the Graduate Program in engineering is to provide an interdisciplinary education for engineers who will become leaders and experts in fields related to:

I. The development and control of land, water and energy resources.
II. The development and promotion of industrial development.
III. The application of engineering principles to biological and ecological problems.
IV. The control of pollution and preservation of the environment.

The degree granted is the Master of Science in Engineering. This degree gives the student an opportunity to acquire a broad interdisciplinary and technological education. Students will take course work not only from the engineering departments of Agricultural, Civil, Electrical, Mechanical Engineering, Mathematics and Engineering Physics, but from departments throughout the University which are related with the individual student's research area, such as Zoology, Microbiology, Plant Science, Rural Sociology, Horticulture, Economics, etc.

Research organizations which exist on campus for the purpose of assistance and direction in research include the following: Engineering Extension, Remote Sensing Institute, Water Resources Institute, Institute of Irrigation Technology, Agricultural Extension Service, and the Center for Power System Studies. These and other problem-oriented organizations as well as all departments on campus offer the graduate student a wealth of assistance and course offerings to help him in his graduate work.

The formal course offerings for Master of Science in Engineering are divided into four groups, a core, secondary core, supporting courses and the thesis, or design paper.

The core consists of the following courses:
Statistical 641—Statistical Methods II
Mechanical Eng. 661—Introduction to Operations Research
Agricultural Eng. 663—Instrumentation
General Eng. 600-601—Seminar

Seven to ten credits of these courses are required and will give the student a basic background in research methods.

The secondary core consists of the following courses:
AgE 772—Similitude
CE 623—Environmental Engineering
CE 624—Industrial Waste Treatment
CE 646—Advanced Soils Engineering
EE 610—Passive and Active Filter Design
EE 620—Integrated Circuit Engineering
EE 631—Computer Analysis of Power Systems
EE 647—Advanced Microprocessor System Design
EE 652—Biomedical Systems Analysis
EE 654—Biomedical Instrumentation and Safety for Health Facilities
EE 670—Communications Systems
Math 671—Numerical Analysis
Math 623, 624—Advanced Calculus
ME 612—Thermo-Fluid Energy Systems
ME 621—Modeling and Simulation of Dynamic Systems
ME 622—Applied Stress Analysis in Mechanical Design
ME 751—Computer-Aided Design
Phy 635—Reactor Physics
Phy 637—Science of Solids

The student is normally required to take at least three courses from this list or suitable and approved substitutions. The choices are expected to broaden the students interdisciplinary background and aid him in his particular research area.

The supporting courses taken can be chosen from a number of departments and colleges at South Dakota State University to allow the student further specialization within his primary professional area in engineering or further developments of interdisciplinary interests such as biology, plant science, etc.

A thesis will provide a research experience and a degree of specialization. This experience will help the student apply information learned in course work to the solution of practical problems which are of importance to South Dakota and the world.

The design or research paper will provide experience in searching the literature, applying theory to practice, considering economic factors, and considering the consequences of alternate solutions.

Course descriptions are listed under individual departments.

Master of Science in Industrial Management

The Master of Science in Industrial Management requires courses from the business and technical areas. The degree is administered and authorized through the College of Engineering at South Dakota State University. Coursework may be taken either at South Dakota State University or the School of Business at the University of South Dakota. A student may choose to take an equal number of courses from each school or concentrate in the offerings at one cam-

pus. The thesis will be written and defended at South Dakota State University.

This program is designed to allow the non-technical student the opportunity to expand in technical areas and to give the technical person exposure to the business adminstration, management, and economics areas of industry.

A BS degree in a field of technology or engineering or a BS or BA degree in a non-technical business oriented discipline, along with certain necessary background courses, will be required for entry into the program. Non-traditional students are encouraged to pursue this course of study.

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor V.G. Ellerbruch, Head
Professors Finch, Knabach, Manning (Emeritus), Sander, Storry (Emeritus)
Associate Professor Miron

The following Electrical Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the Univerity.

Electrical Engineering (EE)

610 Passive and Active Filter Design 3(3,0) or 3(2,3)

The analysis and design of passive and active filters for electrical signals. Topics include Butterworth, Chebyshev, Bessel-Thompson response characteristics biquad and Sallen-Key circuits, frequency and impedance transformations, sensitivity, gyrators, negative impedance elements, leapfrog filters and switched capacitor filters. P, EE 321 or consent.

615 Linear Network Theory 3(3,0)

State variables, Laplace transform theory, matrix analysis and complex variable theory as applied to problems in circuit analysis. Topology, network theorems and network functions. P, consent.

616 Nonlinear Analysis 2(2,0)

Numerical, graphical and analytical methods analysis. Singularities; systems and varying coefficients, stability of nonlinear systems, describing function methods. P, consent.

620 Integrated Circuit Engineering 3(3,0)

Analysis and design of modern integrated circuits. New devices and design concepts. P, EE 321 or equivalent.

630 Power System Stability 3(3,0)

Inertia constant, swing curves, equal area criterion, as applied to transient stability studies. P, EE 430 or consent.

631 Computer Analysis of Power Systems 3(3,0)

Concepts used in formulating load flow and fault study problems for computer solution. P, EE 430; EE 432 or consent.

632 Symmetrical Components 2(2,0)

Application of symmetrical components to simple three phase circuit, unloaded systems, loaded systems. Symmetrical component impedances. P, EE 430; EE 432 or consent.

633 Alternate Energy Conversion 2(2,0)

Basic principles and design equations of thermoelectric and thermoionic devices, magnetohydrodynamic converters, solar cells, and fuel cells. EE 430; ME 313, or consent.

647 Advanced Microprocessor System Design 3(3,0)

Details of microcomputer hardware design. DMA, multiprocessing, memory management and testing strategies. Advanced microprocessor architectures. P, EE 345; EE 447.

650 Biomedical Electronics 2(2,0)

Design and operation of basic biomedical electronic instrumentation. Measurement and continuous monitoring of physiological variables; ECG body temperature, blood pressure, etc. Data Acquisition, telemetry data and reduction techniques. P, EE 321 or consent.

652 Biomedical Systems Analysis 3(3,0)

Engineering concepts applied to the study of biological systems. Modeling of representative biological systems and analysis using techniques developed in the engineering disciplines. P, EE 316 or equivalent.

654 Biomedical Instrumentation & Safety for Health Facilities 3(3,0)

Methods for designing instrumentation for measurement and safety, analysis of instrument dynamics, interpretation of electrical codes and facility safety. Provides background material for engineers working with architects, consultants, and contractors. P, EE 430, EE 321.

670 Communication Systems 3(3,0)

Statistical methods, random signals and noise, physical sources of noise, statistical communication theory and digital communications. P, EE 470 or consent.

685 Microwave Theory 3(3,0)

Transmission lines, resonant cavities, waveguide junctions, and components. Active devices, lasers, masers. P, EE 485.

687 Electromagnetic Radiating Systems 3(3,0)

Electromagnetic waves; ground wave propagation; sky wave propagation. Advanced antenna theory. P, EE 485.

690 Special Electrical Problems 1-3

693 Special Topics in Electrical Engineering 1-3

P, consent.

720 Advanced Electronics 3(3,0)

790 Thesis in Electrical Engineering

ENGINEERING MECHANICS

Courses in Engineering mechanics are taught by staff from the Civil Engineering Department and Mechanical Engineering Department.

The following courses are provided in support of the Master of Science in Engineering program.

Engineering Mechanics (EM)

621 Introduction to Mechanics of a Continuous Medium 3(3,0) (On sufficient demand)

The general theory of a continuous medium. Kinematics of deformation and flow; stress tensors: conservation of mass, momentum, and energy; invariance requirements; constitutive equations for solids and fluids; applications for special problems. P, math 331; EM 331.

622 Theory of Elasticity 3(3,0)

Analysis of stress and strain; equilibrium and compatibility equations; Hooke's law; fundamental problems in the theory of elasticity; plane-stress and plane-strain problems of the narrow beam, rotating discs, and plate with a circular hole. P, EM 321, Math 331 or equivalent.

623 Theory of Plasticity 3(3,0)

Analysis of stress and strain; plastic behavior of materials; basic laws of plastic flow; applications to bending of beams, torsion of bars, and thick-walled cylinders; slipline theory and its applications to extrusion problems; limit-analysis theorems and their applications to structural problems. P, EM 622, consent.

624 Theory of Plates & Shells 3(3,0)

Small-deflection theory of plates. Laterally-loaded rectangular plates. Navier and Levy solutions. Plates of various shapes, boundary conditions, and loading systems. Basic equations of the theory of shells. Design problems in cylindrical shells. P, EM 321, Math 321, math 331, or consent.

631 Advanced Fluid Mechanics 3(3,0)

Fundamental notions of continuum, stress at a point, velocity field, and vorticity. General principles of kinematics and dynamics of a fluid. Potential flow and vortex motion. P, EM 331, Math 331 or equivalent.

641 Finite Element Analysis 3(3,0)

Theoretical basis of the method of finite element analysis—an approximate method which analyzes problems using small, but finite elements rather than the infinitesimal elements of the calculus. Two- and three-dimensional stress analysis, plate bending and shell problems, static, dynamic and stability problems. Geometric and material non-linearities. Introduction to both heat and fluid flow problems. P, Math 321 and consent. Alternate years.

DEPARTMENT OF ENGLISH

Professor Ruth Alexander, Head
Professors Evans, Foreman, Marken, Walz (Emeritus), West, Williams, Witherington, Woodard, Yarbrough
Associate Professors Brandt, Brown (Emeritus), Duggan, Kildahl, Nagle (Emeritus),

Graduate majors offered:

Master of Arts degree with a major in English.

Graduate minor offered:

English

Prerequisites for Graduate study:

For the graduate major a minimum of 24 semester hours of undergraduate credit in English or consent of Department Head. For the graduate minor a minimum of 16 semester hours of undergraduate credit in English or consent of the Department Head.

Degree requirement:

Much of the student's work is concentrated in the major area of study. In addition to this work in the major field, a minor concentration of 9 hours must be included in a field related to the major or in two fields supporting the major. The candidate must have a reading knowledge of at least one modern foreign language, or must have at least two years of undergraduate credit in a foreign language on the transcript. Unless English 706 or a similar course has been taken previously, it is required for the M.A. A full-time student may complete the degree requirements in one academic year. Graduate assistants should be able to complete the requirements in two academic years.

The candidate is required to present a minimum of 30 hours of graduate work including 6 hours of thesis (English 709), at least 20 hours must be taken in residence. The candidate will present a thesis which reports the results of research directed by a member of the Faculty in English. The candidate will be required in an oral examination to defend the thesis and to demonstrate knowledge of English and American literature, both generally and in particular in those areas in which graduate courses have been taken.

Qualifying Exam

Prior to being admitted to candidacy for the Master's degree, each graduate student will take a written qualifying examination based on a reading list of representative literary works.

Note:

Before registering for graduate work the graduate student should consult the adviser for graduate students in the English Department.

English (Engl)

606 Workshop in English and Speech Su
Workshop sessions in various areas of English: linguistics, composition or literature. This is a concentrated course; it may not be taken concurrently with any other course. P, teaching experience or consent.

619 Comparative Novel 3(3,0) F
Selected European and international novels.

624 Victorian Literature (3,0)
Intensive study of the chief writers of British poetry and prose from 1840 to 1900.

630 The English Romantic Movement 3(3,0)
The chief writers of English Romantic poetry and prose form 1789 to 1832, with emphasis on intellectual trends.

634 Advanced Shakespeare 3(3,0)
Intensive study of selected plays of Shakespeare and significant Shakespearean criticism.

635 Chaucer 3(3,0) F
A study of the works of Chaucer, with some attention to his sources and his language. Alternate years.

647 Pre-Civil War American Writers 3(3,0)
A selection of writers from American transcendentalism and Romanticism.

648 The American Realists and Naturalists 3(3,0)
An examination of Post Civil War realistic and naturalistic writers.

650 Modern American Novel 3(3,0) F
Intensive study of selected American novelists after 1920 and through the post World War II novel, particularly emphasizing twentieth century themes and forms in the novel.

665 Contemporary Drama 3(3,0) F
A study of representative British and American plays from the time of Shaw to the present; some attention may be given to significant Continental plays of this era.

697 Special Studies in Composition and Literature 1-3(1-3,0) FSSu
Special Studies in various areas of writing, grammar, and literature. May be repeated to total 6 credits. Given only with the permission of the Head of the Department of English.

705 Problems in Teaching Composition and Literature 3(3,0) SSu
Analysis of problems encountered in teaching composition and literature, and examination of teaching techniques.

706 Research Tools in the Humanities 3(3,0)
Survey of reference and research materials of special value and interest to students of the Humanities. REQUIRED OF ALL CANDIDATES FOR THE M.A. DEGREE IN ENGLISH.

720 Studies in Early English Literature 3(3,0)
Intensive study of a phase of English literature of the era before 1550.

723 Studies in Restoration Literature (3,0)
Intensive study of an important writer or group of writers or of a significant aspect of English neoclassical literature.

726 Studies in Seventeenth Century Literature (3,0)
Intensive study of the literature of an important writer or group of writers with consideration of the relationships between the literature and the historical and social events between 1600 and 1700.

727 Studies in Elizabethan Literature (3,0) F
Intensive study of an area of Elizabethan literature chosen to meet the needs and interests of the students. Alternate years.

758 Modern American Thought 3(3,0)
Analysis of selected economic, social and philosophical ideas of the late 19th and 20th centuries, their relationship to selected segments of American life, and their reflection in American literature.

784 Literary Criticism 3(3,0)
The tradition of literary criticism from Plato to the present.

790 Thesis 6
P, 690.

792 Seminar in American Indian Literature 2-3(2-3,0)
Intensive study of the American Indian literature of the past or present with concentration on the Plains Indians.

793 Seminar in English Literature 2-3(2-3,0)
Intensive study of a selected type, author, or period of American Literature.

Linguistics (Ling)

620 The New English 3(3,0) FSSu
Theory of transformational grammar and its approach to phonology, grammar, and semantics. Transformational grammar applied to language acquisition, English teaching, and second language teaching. Brief attention to stratification grammar.

643 Development of the English Language 3(3,0) S
Historical survey of the phonology, grammar, syntax, and lexicon of English leading to an understanding of the present state of the language and future developments.

DEPARTMENT OF FOREIGN LANGUAGE

Professors Barnes, Redhead, Richter

690 Special Topics in Language & Culture 1-3

692 Seminar in Literature (Topical) 1-3

DEPARTMENT OF GENERAL ENGINEERING (GE)

Professor D.E. Sander, Acting Head
Adminstrative Committee:
Dean of Engineering E.L. Buckley
Professors Ellerbruch, Rollag, Hellickson, Ghazi, Sander, Hein, Yocom

The following General Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University.

600 Seminar 0(1,0) FS
601 Seminar 1(1,0) FS
690 Special Topics in Engineering 1-3
Advanced and timely interdisciplinary topics relating to more than one field of physical science and engineering.
770 Engineering Design or Research Paper 1-2

DEPARTMENT OF GEOGRAPHY

Professor Edward P. Hogan, Head
Professors Gritzner (Graduate Coordinator), Opheim

Graduate major offered:

Master of Science degree with a major in Geography.

The Department of Geography offers graduate students the opportunity to earn the Master of Science degree. The degree program is designed to prepare students for employment in such areas as planning, geographic techniques, government service, business and teaching. Likewise the program is also designed to provide the students with the education background necessary for further graduate study.

The graduate curriculum is organized through formal courses, seminars, internship experiences and supervised research. The student seeking the Master of Science degree is expected to select courses that will provide a sound background in Geography supported by courses outside the department. Areas outside the department beneficial to the student include Civil Engineering, History, Economics, Education, Biology, Engineering, Plant Science, Planning, Political Science and Sociology. The minor or supporting areas from outside the department should be selected from these or other disciplines, to provide the student with a balanced, well-developed background.

The department offers several special programs for students interested in unique educational experiences. Among programs offered are: an interdisciplinary Planning minor; the Classroom on Wheels Field Experience; the Futurology Institute; the Industrial Development Workshop; and the Workshops on Teaching Geography. Other Special Programs can be taken through educational experiences provided for in the Alternatives and Options Programs of the College of Arts and Science, and cooperative education programs with the EROS Data Center and Remote Sensing Institute. Internships can be arranged with planning districts, governmental agencies and business and industry.

Graduate minor offered:

Geography, Planning

Prerequisites for graduate study:

A Bachelor's degree with at least 24 credits in geography or cognate social or physical sciences. If a student is deficient in geographic background, certain deficiencies may have to be removed by taking courses for which no degree credits will be earned.

Credit Requirements

Option A requires a minimum of thirty (30) semester credits for the Master's degree, of which at least 22 must be earned in the major. The thesis accounts for 6 of these credits.

A minimum of 8 credits must be selected from one department other than Geography as a minor field, or form at least 2 different departments for supporting course fields for the Master's degree. Courses in the Department of Geography may be used as supporting courses provided they are considered sufficiently diverse by the major department.

Option B requires a minimum of 32 semester credits including a research paper and a comprehensive oral examination.

Geography (Geo)

603 Evolution of Geographic Thought 2(2,0) FS
The history and development of geography and its theories, schools of thought and current ideas.
606 Seminar in Systematic Geography (Topical) 1-4 FS
Selected topics in systematic geography. The seminars will deal with one or more aspects of human geography, economic geography, physical geography, population geography, historical geography, and systematic techniques. This course may be repeated for credit. The specific topic to be studied will change each semester.
620 Advanced Regional Studies in Geography (Topical) 1-4 FS
Selected topics in the regional geography of continents, nations, or states. This course may be repeated for credit. The specific topic to be studied will change each semester.
700 Seminar in Geography 1-4
Studies in selected geography fields. This course may be repeated for credit. The specific topic to be studied will change each semester.
760 Advanced Demographic Theories and Techniques 3(3,0) S
(See Sociology 760). Alternate years.
765 Advanced Studies in Land Utilization (Topical) 1-4 FS
The physical and cultural factors affecting the nature and pattern of land utilization. Local and/or regional utilization, planning, and problems will be studied in detail in relation to the topic. This course may be repeated for credit. The specific topic to be studied will change each semester.
788 Advanced Geographic Technique (Topical) 1-4(1,4,0) FS
Selected geographic techniques such as cartography, aerial photograph interpretation, remote sensing, information systems and map interpretation. This course may be repeated for credit. The specific topic to be studied will change each semester.
790 Thesis in Geography 1-6
791 Seminars in Anthropology 1-4
(See Anthropology 791)
792 Special Problems in Geography (Topical) 1-4
Selected studies in geography to meet the needs of advanced students.

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

Professor Harry Forsyth, Head
Professors Blazey, Booher, Crabbs (Emeritus), Huether (Emeritus), Robinson (Emeritus), Williamson
Associate Professor Ewing, Coordinator of HPER Graduate Program

Graduate major offered:

Master of Science degree with a major in Health, Physical Education, and Recreation.

Graduate minor offered:

Health, Physical Education and Recreation.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Health, Physical Education, and Recreation or its equivalent, the General Exam of the Graduate Record Exam, and prerequisites to the courses to be pursued. For the graduate minor a Bachelor's degree with a major in Health, Physical Education, and Recreation or its equivalent, the General Exam of the Graduate Record Exam, and prerequisites to the courses to be pursued.

Thesis Option:

Option A requires a minimum of 30 semester credits, including a thesis and comprehensive oral examination.

The thesis is to be completed in an area of emphasis in Health, Physical Education, and Recreation. Areas of emphasis include: Athletic Administration, Behavioral Science, Exercise Science, Pedagogy, and Sports Medicine.

Non-thesis Options:

Option B requires a minimum of 32 semester credits, including HPER 792 (In-

dividual Research), and a comprehensive oral examination.

Option C requires a minimum of 35 semester credits and comprehensive written and oral examinations.

Obtain further details from the Health, Physical Education and Recreation Department.

Dance Education (Danc)

681 Workshops 1-3
See HPER 681

Health Education (Hlth)

650 Safety Education 2(2,0)
Curriculum planning and methods of presentation in the field of safety education.

681 Workshops in Health 1-3
See HPER 681

760 Advanced Administration of School Health Programs 2(2,0) F '87 Su '87
Methods of health instruction; problems of health service; problems in supervision of health environment; recent trends and problems in safety education. P, permission of staff.

Health, Physical Education and Recreation (HPER)

681 Workshop in Health, Physical Education, and Recreation 1-3
Lectures, conferences, committee work and outside assignments to increase understanding of a specific area. P, consent.

682 Seminar in Health, Physical Education, and Recreation 2(2,0) FSSu
Courses designed to offer current information on subjects of interest in field.

741 Philosophy of Physical Education, and Recreation 3(3,0) S
Discussion and analysis of major philosophic contributions to physical education. Formation and evauation of one's belief concerning physical education. P, consent.

742 Psycho-Social Aspects of Sport 2(2,0) S
Psychological principles, theories and laws applied to physical education and athletic situations. Interpretation of behavior in sports. P, consent.

743 Basic Issues in Health, Physical Education and Recreation 2(2,0) Su
Directed reading in recent literature in field; discussion of current problems; critical analysis of recent research. P, consent.

744 Supervision of Health, Physical Education and Recreation 2(2,0) Su
Techniques, principles, organization and philosophy of supervision in this field. P, consent.

751 Advanced Evaluation of Health, Physical Education, and Recreation 3(3,0) S
Advanced techniques for evaluating outcomes of physical education. Practice in test performance and administration. Some laboratory work may be required. P, consent.

760 Motor Learning and Development 3(2,2) S
Analysis of various teaching methods. Survey of research in motor learning. Demonstrations and study of methods applied to various activites. P, consent.

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, consent.

790 Thesis in Health, Physical Education and Recreation 1-7

792 Individual Research and Study in Health Physical Education and Recreation 1-4 FSSu
Special problems by individuals. Results of study presented in special reports and term papers. P, major in this field.

Physical Education (PE)

660 Methods and Materials for Elementary Physical Education 2(2,0) Su
Analysis of activities, materials, techniques, and methods used in physical education for elementary grades. Progression in curriculum planning in areas of dance, games, self-testing, and movement exploration. P, consent.

750 Applied Exercise Physiology 3(3,0) F
Physiological basis of factors which influence physical fitness and physical performance; application of physiological measures to fitness programs, critical analysis of current literature; emphasis on bioenergetics, neuromuscular and circulorespiratory function, body composition and physical training. P, undergraduate Exercise Physiology.

770 Advanced Administration of Interscholastic 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, consent.

771 Current Trends in Athletics 3(2,1) Su
For professionals who are experienced in coaching. Lectures, demonstrations, and visual aids are used to show the latest developments in athletics. P, one year coaching experience.

Physical Therapy (PT)

681 Workshops in HPER 1-3
See HPER 681

682 Seminars 2(2,0) FSSu
See HPER 682

790 Thesis 1-7
See HPER 790

792 Individual Research & Study 1-4 FSSu
See HPER 792

Recreation (Recr)

740 Recreation and Leisure in American Society 2(2,0) S Su
Problems related to equipment; establishing programs; budget and finance; selecting and supervising staff; public relations activities. P, consent.

DEPARTMENT OF HISTORY AND POLITICAL SCIENCE

Professor Rodney Bell, Head
History: Professors Funchion, Sweeney, Miller, Volstorff (Emeritus)
Political Science: Professors Cheever, Hendrickson, Tolle

Graduate major offered:
None

Graduate minor offered:
History, Political Science

Prerequisites for graduate study:
For the graduate minor a Bachelor's degree with major or minor in History or Political Science.

History (Hist)

638 European Intellectual History 3(3,0)
History of literature and the arts, leading cultural and ideological movements of Western man from the Renaissance to the present.

641 Europe in the 19th Century 3(3,0)
Europe, 1815-1914. The emerging power struggle in 19th Century Europe, the race for world empire, forces leading up to the outbreak of WW I and scientific, cultural and artistic achievements of the age.

660 Topics in History 2-4
An intensive examination of major historical themes, issues, and problems. Topics will include, but are not limited to, the following: War and Society; The Hero in History; Republics in Western Civilization; Christianity and the Roman Empire.

668 American Diplomacy Since 1945 3
Detailed and interpretive analysis of American Diplomatic history since 1945.

671-672 Cultural History of the United States 3(3,0)
Development of American society and culture; changes in values, ideas, beliefs, institutions, behavior, arts, leisure, and material culture.

691 Conflicting Interpretations of American History 3(3,0)
Analysis of questions of historical interpretations in the field of U.S. history which are currently being debated by scholars.

692 Special Problems in History 1-3
Selected studies for advanced students.

793 Seminar in History 1-3

Political Science (PolS)

660 Topics in Political Science 2-4
An intensive examination of significant political themes, issues, and problems. Topics will include, but are not limited to, the following: Republics and Self-Government; the Constitution and Civil Liberties; Parties, Elections and Campaigns; Presidential-Congressional Relationships.

692 Special Problems in Political Science 1-2-3(1-2-3,0) FSSu
Individual guided research culminating in formal research paper. May be repeated until 6 credits are earned.

COLLEGE OF HOME ECONOMICS

Edna Page Anderson
Acting Dean

The purpose of the Graduate Program in Home Economics is to provide an interdisciplinary education for home economists who will become leaders in fields related to the four home economics departments. These are:

Child Development and Family Relations
Home Economics Education
Nutrition and Food Science
Textiles, Clothing, and Interior Design.

The degree granted is the Master of Science in Home Economics. This degree gives the student an opportunity to acquire a broad education with a measure of specialization within the field of Home Economics.

Core Requirements

The formal course offerings for the Master of Science in Home Economics, as determined by the College of Home Economics, are divided into three groups: research requirements, subject-matter specialization, and supporting courses.

The following core credits are required:

Home Economics 701—Seminar in Home Economics 2 cr.

Home Economics 791—Research Methods in Home Economics 3 cr.

Home Economics 790—Thesis in Home Economics 5-7 cr.

or

Home Economics 793—Individual Research and Study: Area of Concentration

or

Home Economics 794—Internship: Area of Concentration

In addition to these research requirements, a statistics course must be taken if statistics was not taken as an undergraduate. Additional credits in statistics and research methods may be required for some areas of concentration.

A minimum of nine credits in the area of specialization are required not including Thesis, Individual Research and Study, or Internship.

Supporting courses may be selected from any of the other colleges and departments at South Dakota State University. Courses must contribute to an integrated plan of study.

Plan of Study

All plans of study must be signed by both the dean of the college of Home Economics and the major advisor. (Major advisor forwards to dean). They are then forwarded to the graduate school for action.

600 Practicum in Home Economics Related Occupations (2-6 cr.)

This course is for persons wishing to get experience in a job or career related to their subject specialization. A wide variety of experiences are possible. The supervising faculty member and student develop a learning plan prior to the practicum. P, consent.

601 Seminar 2

673 Special Problems 1-4

701 Seminar in Home Economics .5-1
(On sufficient demand)

Reports and discussion of research in various areas of home economics. Required of graduate majors. Must be repeated for total of 2 credits.

790 Thesis in Home Economics 5-7

791 Research Methods in Home Economics 3

Empirical methods of solving problems in Home Economics. Formulation of a research problem and plan. Evaluation of research reports. P, Stat 211 or equivalent and consent.

792 Problems in Home Economics 2
(On sufficient demand)

Investigation of problems selected from Home Economics fields. P, consent.

793 Individual Research and Study 5-7

794 Internship 5-7

DEPARTMENT OF HOME ECONOMICS EDUCATION

Professor Edna Page Anderson, Head
Professor Gilbert (Emeritus)

The following Home Economics Education courses are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

Home Economics Education (HEd)

673 Special Problems 1-4
(On sufficient demand)

Individual research and study in Home Economics Education. May be repeated to a total of four credits. P, consent.

701 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.

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

Review and discussion of current literature in home economics education.

711 History and Philosophy of Home Ecomonics Education 2(2,0)
(On sufficient demand)

Analysis of historical developments impacting on the profession and field of home economics; critical investigation of various concepts in home economics.

741 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.

743 Current Topics 1-3
(On sufficient demand)

Study of contemporary issues and concerns in the field of Home Economics Education. Focus on topics not included in other graduate courses in the department. Can be repeated. P, consent.

751 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, 412 or equivalent.

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

Methods and techniques used in evaluating programs in home economics. Evaluation instruments developed. P, 412 or equivalent.

DEPARTMENT OF JOURNALISM AND MASS COMMUNICATION

Professor Richard W. Lee, Head
Associate Professors Laird (Emeritus), Wentzy (Emeritus)

Graduate major offered:

Master of Science degree with a major in Journalism

The Graduate major in journalism is intended to meet the needs of (1) professional journalists who wish to broaden their education in communications and social sciences; (2) those who teach communications courses in high school, who have school public relations responsibilities, or who supervise school publications; and (3) individuals with undergraduate degrees in non-journalism specialities who wish to improve their mass communication skills.

Courses outside the department of journalism are accepted toward the degree with consent of the department head and adviser.

Because journalism is largely an interdisciplinary subject, most courses are open to students with non-journalism undergraduate specialities.

Graduate minor offered:

Journalism

Prerequisites for graduate study:

For the graduate major in Journalism, a Bachelor's degree; a minimum of 16 credits in undergraduate journalism courses or the equivalent (advanced English composition and advanced Speech courses in broadcasting are examples of equivalent); one year of practical experience in journalism or a related field (teaching of journalism or public information work will be accepted): plus demonstration of ability to write. Candidates not meeting the prerequisites may be accepted on condition, required to complete specified courses to meet deficiencies, and final exam may be postponed until all prerequisites are met to the satisfaction of the staff.

General Communication (GCom)

605 Theories of Communication 3(3,0) S
Examination of major theories of communication including the mass media and interpersonal communication.

606 Public Opinion and Propaganda 3(3,0) S
Formation and measurement of public opinion; the role of the mass media; propaganda techniques, agencies, theories.

Mass Communication (MCom)

610 Seminar in Mass Communication 2(2,0) F
Work selected areas of journalism and mass communication including special investigation, reports and discussions.

615 Editorial Writing and Policy 2(2,0) F
Opinions function of periodicals; great editorials and editorial writers; writing of editorials; shaping policy.

617 Media Administration and Management 3(3,0) FS
Business practices, newspaper, magazine and broadcast management.

624 Persuasion 2(2,0) S
See SpCm 624 under Department of Speech.

637 Educational Radio and Television 3(3,0) S
Educational broadcasting with practical work in preparation and presentation of educational and instructional materials for radio, television and film and their use in the classroom.

651 Special Problems in Communication 1-4 FSSu
Individual research and study in communication. May be repeated to a total of four credtis in problems courses. P, consent.

653 Workshop in Communication 1-4 Su
Understanding the mass media; using media in the classroom, supervising school publications. For high school or college instructors and publication advisers.

660 Special Problems in Radio, Television or Film 1-2 FSSu
Directed research. May be repeated to a total of 4 credits in problem courses. P, consent.

664 Film Studies 3(3,0) F
See MCom 664 under Department of Speech

672 Mass Media in Society 3(3,0) S
Rights and responsibilities of the press; relation of the media to individuals and society; role of media in a free society.

673 Public Relations 3(3,0) SSu
Interpreting institutional and industrial policies and programs to the public.

790 Thesis in Journalism 1-6 FSSu

791 Research Methods in Communication 3(3,0) F
Application of social science research methods and techniques to the study of interpersonal and mass communication. Elementary statistical procedures.

DEPARTMENT OF MATHEMATICS

Professor K. Yocom, Head
Professors Bennett, Bergum, Kranzler (Emeritus), Lacher, Richards, Wente (Emeritus)

Graduate majors offered:
Master of Science with a major in Mathematics and Master of Science Teaching (separate listing).

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:

Three options for Master of Science degree:
Option A requires a minimum of 30 semester credits, including a thesis and a comprehensive oral examination.

Option B requires a minimum of 32 semester credits including a research paper (expository) and a comprehensive oral examination.

Option C requires a minimum of 35 semester credits and comprehensive written and oral examinations.

Obtain further details from the Mathematics Department.

Mathematics (Math)

621 Complex Variable 4(4,0) On demand
Algebra of complex numbers, classifications of functions, differentiation, integration, mapping, transformations, infinite series. P, 225.

623-624 Advanced Calculus 3(3,0) FS
Set theory, real number systems, topology of Cartesian n-space, convergence, continuous functions; differentiation, integration, and infinite series. P, 225 or equivalent.

627 Vector Analysis 3(3,0) On demand
Vector algebra, vector functions, vector calculus with emphasis on various physical applications. P, 225.

631 Partial Differential Equations 3(3,0) On demand
Series, solutions, total differential equations, simultaneous equations, approximate solutions, partial differential equations of first and second orders, application. P, 321.

666 Projective Geometry 3(3,0) S
Synthetic and/or analytic approach to geometric properties invariant under projective transformations; theorems of Desargues, Pascal, Brianchon and applications. P, 224 or consent.

671-672 Numerical Analysis 3(3,0) FS
Survey of numerical methods including methods of interpolation, curve fitting, integration, solving equations (including differential equations with initial or boundary values). Errors of the methods analyzed and digital computer is used to apply methods. P, 321, and FORTRAN.

683 Applied Probability Theory 3(3,0) F
Topics in probability including an introduction to the axiomatic development of probability, random variables and distributions with emphasis on the exponential, binomial and Poisson distributions. Applications to discrete stochastic processes such as Markov chains and queueing theory are covered in some detail. P, 381 or consent.

790 Thesis in Mathematics 5-7

792 Special Problems 1-3

793/794 Advanced Topics in Mathematics 1-3(1-3,0) FS

DEPARTMENT OF MECHANICAL ENGINEERING

Professor H. S. Ghazi, Acting Head
Professor Christianson
Associate Professor Sayar

The following Mechanical Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University. Each course is taught on sufficient demand.

Mechanical Engineering (ME)

611 Statistical Thermodynamics 3(3,0)
Review of classical thermodynamics. Principles of kinetic theory and classical statistical mechanics. Principles of quantum mechanics, quantum statistics, partition functions, and thermodynamic properties. P, 312, Math 321, Phy 331 or consent.

612 Thermo-Fluid Energy Systems 3(3,0)
Review of viscous fluid, basic modes of heat transfer, and thermodynamic energy conversion. Discussion of energy sources, uses, conversion, transmission, and economics. Analysis of conventional energy generation, storage, and transmission systems, criteria for design and analysis of energy systems such as nuclear, wind, solar, geothermal, etc. P, 312, 415; Math 331 or equivalent.

621 Modeling and Simulation of Dynamic Systems 3(2,3)
A systems approach will be followed in the analysis of stationary and moving systems. Electrical, mechanical, structural, and hydraulic systems will be considered. Relevant differential equations will be derived for each physical system. These equations will be solved by numerical methods on digital computers. The students will be expected to write their own programs. P, Math 321 and consent.

622 Applied Stress Analysis in Mechanical Design 3(3,0)
Advanced solutions of practical stress-analysis problems related to mechanical structures and machine components. Elasticity equations and energy theorems. Stresses in thin-walled structures, and stability analysis. Discrete structures by

matrix-force and matrix-displacement methods. Continuous structures by finite-element methods. Applications to mechanical design problems. P, 421, Math 331 or consent.

631 Gas Dynamics I 3(3,0)

Objectives, applications, and scope of the subject. Methods of fluid dynamics and thermodynamics. Compressible flow in ducts, nozzels, and diffusers. Propagation of plane waves; shock dynamics, characteristics, interaction of waves. General theorems of gas dynamics. P, 312, EM 331, Math 331.

632 Viscous Flow Theory I 3(3,0)

Viscosity, types of fluid particle motion, shear stresses and stream function. Derivation of the Navier-Stokes equations. Viscous flow through different geometric channels. Lubrication theory. Turbulent viscous flow, Reynold's stresses and Reynold's equations. Prandtl's mixing length theory. Boundary layer theory. Exact and approximate solutions of the boundary layer equations. Hydrodynamic and thermal boundary layers. P, EM 331, MATH 331.

641 Advanced Metallurgy 3(3,0)

Crystal lattices and diffraction by crystals. Structure detemination, defects, registration by microscopic methods, single crystal orientation and analysis of stress caused by phase transformation. P, 341, Math 321.

651 Advanced Analytical Methods 3(3,0)

Practical engineering differential systems are examples for developing solution techniques. Functional approximations, coordinate changes, numerical methods, integral solutions, orthogonal functions, and Green's functions are discussed. Solutions are related to the original engineering systems. P, Math 331 or permission.

661 Introduction to Operations Research 3(3,0)

History and organization of operations research, mathematical and statistical models in industrial decisions. The evaluation of alternatives by means of linear programming, queuing theory, deterministic and stochastic inventory models, game theory and simulation. P, 362, Math 381 or consent.

662 Quality Control and Reliability 3(3,0)

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 procedure. P, 362, Math 381, or consent.

663 Topics in Reliability Engineering 3(3,0)

Probability concepts and typical models involved in the statistical prediction of reliability. Methods for estimating required parameters from experimental data. Reliability and maintainability techniques in practice, and a survey of recent developments in the field. P, 662 or consent.

690 Special Problems 1-5

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

695 Special Topics 1-3

711 Advanced Heat Transfer I 3(3,0)

Differential equation of heat conduction in rectangular, cylindrical and spherical coordinates. Isotropic, anisotropic, homogeneous and heterogeneous bodies. Analytical solutions of the boundary-value problems using Bessel Functions and Legendre Polynomials. Computational methods. Finite Differences using matrix inversion, Gauss-Siedel iteration and the Crank-Nicholson representation. Finite Elements using the Galerkin method. P, ME 415, MATH 331.

728 Topics in Advanced Machine Design 3(3,0)

Stress analysis, elastic energy theory, photoelasticity, curved beams, thin plates and shells, torsion, fatigue, and stress concentration. Criteria of fail-safe design based upon fracture-mechanics approach. P, 421, EM 622.

731 Gas Dynamics II 3(3,0)

Continuation of Gas Dynamics I. Treatment of two-dimensional and axially-symmetric bodies in subsonic, supersonic, and hypersonic flow. Consideration of both idealized isentropic flows and presence of oblique shocks. P, 631.

751 Computer-Aided Design 3(3,0)

The use of digital computer as a design tool. Techniques and algorithms which increase the rationality of the design process. Design principles and optimization theory. General approach to constrained optimization. Probabilistic approaches to design. Computer-aided design to reliability specification. Application of computer graphics to engineering design. The emphasis is on extending the designer's potential and not on automating his activities. P, competence in FORTRAN programming and consent.

761 Decision Theory 3(3,0)

Examination and evaluation of modern techniques of decision making. Mathematical models and measurement theory. Certainty, risk, and uncertainty. Prediction and optimal decisions. Game theory. Simulated decision making. P, consent.

762 Systems Analysis 3(3,0)

Analysis of industrial problems as systems of servicing stations with deterministic and stochastic inputs and service times using queuing theory as a principal approach. Development of theoretical models. Digital computer simulation of complex systems. P, 661 or consent.

790 Thesis 5-7

794 Special Problems 1-3

DEPARTMENT OF MICROBIOLOGY

Professor Robert Todd, Head
Professors Baker (Emeritus), Pengra, Semeniuk (Emeritus), Sword, Westby;
Associate Professors Hillam, Kirkbride
Assistant Professor Gauger

Graduate majors offered:

Master of Science degree with a major in Microbiology.

Graduate minor offered:

Microbiology

Prerequisites for graduate study:

For the graduate major, a Bachelor's degree with at least a minor in Microbiology with supportive courses including two semesters of Organic Chemistry.

All Microbiology applicants are required to take the Graduate Record Examination.

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

Microbiology (Micr)

DS 622 Advanced Dairy Microbiology 3(2,3) S

(See description in Dairy Science)

624 Virology 3(2,3) S

Viral characterization, structure and replication. Pathogenesis and pathology of viral diseases in man and animals. Laboratory exercises in viral structure, isolation and characterization. Pathology of animal viral infections. P, 422 or consent.

636 Molecular and Microbial Genetics 4(4,0) F

Basic course in molecular genetics and DNA recombinant techniques. Examples to illustrate genetic principles are drawn from all forms of life. P, 321, Bio 371. General microbiology recommended.

637 Systematic Bacteriology 4(2,4) F 1986

Techniques for isolation, identification, classification and preservation of bacterial cultures are presented. Current topic areas and theory in taxonomy and nomenclature are discussed in detail. P, 332 (or equivalent) or consent.

692 Advances in Microbiology 1-4 FS

In depth study of selected areas or specialities within Microbiology to strengthen and expand the current knowledge and technical skills of graduate students in Microbiology. Prerequisites will vary with area studied.

713 Industrial Microbiology 4(2,4) F 1987

A course detailing the use of microorganisms by people. Topics include the production of food and beverages, agricultural and industrial chemicals, pharmaceuticals, and alternate fuels. Legal and ethical ramifications are presented. P, 332 (or equivalent) and consent. 535-635 and Chem 260 (or equivalent) are recommended.

738 Microbial Metabolism 4(2,4) S 1986

A course dealing with microbial respiration of organic and inorganic compounds, anaerobic respiration, the various fermentations, photosynthesis, nitrogen fixation, and the biosynthesis of certain organic intermediates. The lab introduces the student to the usage of various research equipment. Elementary biochemistry recommended.

742 Graduate Seminar 1(1,0) S

P, Two credits maximum.

790 Thesis in Microbiology 5-7 FSSu

DEPARTMENT OF MUSIC

Professor Warren Hatfield, Head

Graduate major offered:
None

Graduate minor offered:
Music

Prerequisites for graduate study:
For the graduate minor, a Bachelor's degree with a major or minor in Music.

Music (Mus)

690 Independent Studies	1-3
691 Directed Studies	1-3
695 Course Specials	1-5

COLLEGE OF NURSING

Carol J. Peterson, Dean
Professors Blazey, Johnson (Emeritus), E. Peterson, Michalewicz, Hofland
Associate Professors Gilliland, Hardin-Palmer, Hegge
Assistant Professor Meyer

Program Focus
The general purpose of graduate education in nursing is to prepare professional leaders with special knowledge and skills to meet the nation's needs in nursing service and nursing education. The aim of the program at South Dakota State University is to prepare nurses to practice at an advanced level in adult nursing and in the functional roles of either nurse educator, clinician, or patient care manager. Achievement of this aim includes study in related fields and the use of research in the examination of nursing problems.

Objectives of Program
The graduate of the Master of Science in nursing program will:

1. Synthesize advanced knowledge from the sciences, humanities, other cognates, and nursing in the development of a conceptual framework.
2. Utilize a conceptual framework for advanced nursing practice and in performance of a functional role.
3. Contribute to the development of nursing as a scientific discipline through the generation of new knowledge and expansion of existing knowledge by application of the deliberative process at an advanced level.
4. Practice with expertise at an advanced level in the specialized nursing care of the adult client.
5. Synthesize and utilize knowledge and skills basic to the functional role of either clinician, nurse educator, or patient-care manager.
6. Evidence competence in research by evaluating research, conducting a research study and using research results in advanced nursing practice and in a functional role.
7. Plan and initiate leadership and change strategies to improve nursing practice, health care, and the health care system.
8. Collaborate with clients, community and other health professionals to enhance the delivery of health care to the adult client.

Prerequisites for graduate study:
In addition to meeting basic requirements for admission to the Graduate School, applicants for graduate study in nursing must have:

1. A bachelor's degree in nursing from an NLN accredited program with an upper division major in nursing.
2. Maintained a "B" average (3.0 or higher on a 4 point grading system).
3. Current licensure in South Dakota or be eligible to obtain licensure.
4. Professional nursing liability insurance.
5. One year of experience in nursing practice.
6. A course in physical assessment or documented skills in this area (evidenced by test or transcript).
7. A course in statistics, including descriptive and inferential statistics.
8. Submitted results of the Graduate Record Examination Aptitude Test to the College of Nursing.

Candidates not meeting basic prerequisites may be given special consideration if it appears that deficiencies can be corrected.

General Program Description
The degree granted is the Master of Science with a major in nursing. The program gives the student an opportunity to acquire a broad graduate education focusing on the health needs of adults in primary, secondary and tertiary care settings. The program requires a minimum of 38-41 semester hours which may be completed in three to four semesters of full-time study. Part time study is available.

Formal course offerings in the program are divided into the following groups: core courses which all students take; functional role courses specific to either teaching, patient care management or advanced clinical practice; courses which support the major and/or the functional role; and elective courses. The student may choose to do either a thesis or a research project. Plans of study vary slightly for these two options. A comprehensive written or oral examination is required of all students.

Students may choose to focus on the older client by emphasizing gerontological coursework in the supportive and elective areas.

Core Courses (All students)
Nurs 610 Theory and Conceptual Frameworks in Nursing
Nurs 620 Pathophysiologic Basis for Nursing Practice
Nurs 694 Research Methods in Nursing
Nurs 720 Leadership and Role Development
Nurs 760 Advanced Concepts in Nursing I
Nurs 765 Advanced Concepts in Nursing II
Nurs 782 Advanced Communication for Nursing Practice

Functional Role Courses (Vary depending on option)

1. Nurse Educator
   Nurs 710 Curriculum Development in Nursing
   Nurs 775 Nurse Role Practicum, Nursing Education Section
2. Patient-care Manager
   Nurs 725 Patient Care Management
   Nurs 775 Nurse Role Practicum, Patient Care Management Section
3. Advanced Clinician (Two suboptions)
   Clinical Specialist in Adult Care
   Nurs 770 Clinical Nursing Specialization (Secondary/Tertiary Care Section)
   Adult Nurse Practitioner
   Nurs 770 Clinical Nursing Specialization (Primary Care Section)
   Nurs 775 Nurse Role Practicum. (Advanced Clinical Practice Section)

Support Courses
Courses taken from other colleges and departments which support either the major and/or functional role.

Elective Courses
Courses taken either in nursing or other areas of study depending on student's interests.

Two Options for Master of Science Degree
Option A requires a thesis (Nurs 790 Thesis in Nursing 5 credits)

Option B requires a research project (Nurs 792 Problems in Nursing Research 2 credits) and five (5) elective credits.

Nursing (Nurs)

Required Courses: Core

610 Theory and Conceptual Framework in Nursing 2(2,0)
A systematic study and interpretation of nursing phenomena by critical examination of theoretical concepts and models.

620 Pathophysiologic Basis for Nursing Practice 2(2,0)
Manifestations of complex clinical problems analyzed through physiological and pathophysiological mechanisms with implications for nursing practice. Requires a basic knowledge of anatomy and physiology.

694 Research Methods in Nursing 3(3,0)
Components of the research process with emphasis on research in nursing and the health care system. (P, statistics course; P or concurrent, Nurs 610).

720 Leadership and Role Development 2(2,0)
Opportunity for analysis and critical review of current issues regarding the nurse's role in delivery of health care services. (P or concurrent, Nurs 610, Nurs 760, or consent of instructor).

760 Concepts in Advanced Nursing I 3(2,3)
The development of nursing practice by application of scientific principles, generalization and concepts to complex nursing problems. Particular attention directed

toward management of client relationship with the changed environment determined by his/her health status. (P, regular graduate student status; P or concurrent, Nurs 610, Nurs 620).

765 Concepts in Advanced Nursing II 4(2,6)
(Continuation of Nurs 760). See Nurs 760 for course description. (P, Nurs 694, Nurs 760; P or concurrent, Nurs 782).

782 Communication in Advanced Nursing Practice 3(2,3)
Seminar and supervised experiences with application of the therapeutic communication process to prevention, treatment, and rehabilitation of adults and/or families in health and illness. (P, regular status; P or concurrent Nurs 610, Nurs 760, or consent of instructor).

Required Courses: Within Role Options

710 Curriculum Development in Nursing 2(2,0)
Principles of curriculum development and their application to nursing curricula. Selection, organization and evaluation of learning experiences. (P or concurrent, Nurs 610), or consent of instructor.

725 Patient Care Management 3(3,0)
Identification and analysis of management theories influencing middle management nursing roles in a variety of patient care situations. (P or concurrent, Nurs 765, Nurs 782, or consent of instructor).

770 Clinical Nursing Specialization 6(3,9)
Extension and refinement of professional expertise in a clinical field of the student's choice. (P, Nurs 765).

775 Nurse Role Practicum 4-12(0,12-36)
Supervised experience in nursing role: Nursing Education Section.
Teaching in classroom and/or clinical services 4(0,12) (P or concurrent Nurs 710, P Nurs 765)
Patient Care Management Section.
Nursing middle management in selected patient care settings 4(0,12) (P or concurrent, Nurs 725, P Nurs 765).
Advanced Clinical Practice Section.
Application of clinical knowledge and skills in various health care settings by working interdependently with nurse and/or physician preceptors 12(0,36) (P, Nurs 770).

Required Courses: Two Research Options

790 Thesis 5
(P, Nurs 694; regular admission status; P or concurrent Nurs 760).
or
792 Problems in Nursing Research 1-3
Application of the nursing research process with particular emphasis on problems of inquiry in the health care system. (Project or non-thesis option) (P, Nurs 694; regular admission status; P or concurrent Nurs 760) May be repeated up to three times for a maximum of three (3) credits.

Elective Nursing Courses
(Available on sufficient demand)

625 Human Sexuality in Health Care 3(3,0)
Provides the opportunity to identify, study and discuss those areas in human sexuality which concern human interaction and in particular the work with clients and their families in health care. P, graduate student in nursing; graduate student in other disciplines with permission of instructor.

630 Nursing Science 2(0,6)
Experience in systematic assessment of client/patients in the identification of nursing diagnoses with emphasis on evaluation of nursing intervention. (P, consent).

635 Death and Dying; Principles and Practice of Care 3(3,0)
Provides an opportunity to identify and discuss issues surrounding death and ways in which health professionals may provide appropriate care for the dying person and family.

645 Management of Acute and Chronic Pain 2(2,0)
Provides opportunity to identify and discuss management principles of acute and chronic pain with noninvasive and invasive measures. P, graduate nursing student, other graduate students with instructor's permission.

655 Health and the Older Adult 2(2,0)
Issues and factors affecting the older adult will be analyzed for their implications in planning and implementing health care for this group. A guided study approach to a conventional course. P. senior or graduate nursing student, graduate or senior student of other health disciplines or by consent of the instructor.

665 Health Care for Victims of Abuse 3(3,0)
Opportunities to study the historical perspectives of health care for the victim; to assess the current physical, psychological and emotional health care needs of the victim; to plan and implement intervention procedures and to evaluate the treatment modes in appropriate health care facilities. P. Psychology 101, Sociology 100, senior or graduate nursing student, graduate or senior student of health disciplines or by consent of instructor.

690 Seminar: Guided Study in Nursing 1-4
May be either seminar or laboratory or combination of these.
Investigation of a selected problem in nursing theory or practice. May be repeated for two semesters for variable credit.

692 Special Problems 1-3
Directed study, analysis and/or research of selected problems related to clinical practice in nursing. may be a combination of discussion/conference and clinical experience. Open to qualified graduate students by consent. Limit of 4 credits can be applied to a degree.

695 Special Topics 1-3(1-3,0)
Review and discussion of special concerns, issues or trends in the nursing profession, such as, but not limited to, legislation, ethics, administration, education. Topics will be of a non-clinical nature. Open to qualified graduate students by consent.

780 Seminar in Advanced Nursing 1-3(1-3,0)
Discussion and reports of current literature, practices, or research in nursing. (P, consent) Limit of 3 credits applied to Master's degree.

785 Self Care and the Older Adult 3(3,0)
Analysis of various factors which alter the self care of the older adult. A guided study approach to a conventional course. P or C Bio 625 Biology of Aging, P Nurs 694 Research Methods in Nursing, Nurs 760 Advanced Concepts in Nursing I, Nurs 555/655 Health and the Older Adult.

DEPARTMENT OF NUTRITION AND FOOD SCIENCE

Associate Professor Roger A. Shewmake, Head
Associate Professor M. Crews

The following Nutrition and Food Science courses are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

Nutrition and Food Science (NFS)

603 Seminar in Food And Nutrition 1-2
(On sufficient demand)
Reports and discussion of current literature in various areas of food and nutrition. P, consent.

660 Maternal and Infant Nutrition 3
Fundamental principles of nutrition during pregnancy, lactation, infancy, and early childhood. Topics include stages of fetal development, maternal physiological and anatomical alterations, nutritional guidance in prenatal care, normal growth and development, food intake and its regulations. P 321 or consent.

661 Special Problems 1-3 as arranged
Special study in food and nutrition. P, consent.

662 Sociocultural Aspects of Nutrition 3
The study of diverse dietary patterns and their impact on nutritional health including food attitudes, socioeconomic structures, cultural patterns of food intake and their effect on nutrient composition of the diet. P. 221 or 321 or consent. Alternate years.

724 Recent Development and New Approaches in Human Nutrition 3(3,0)
(On sufficient demand)
Emphasis on new concepts in nutrition and resultant impact of changing dietary patterns on health and behavior. Insights essential for recognition of dietary needs and practical educational techniques to evoke favorable changes in food consumption patterns.

725 Nutrition and Human Performance 3
This course is designed to develop an understanding of nutrition, based upon knowledge of the biochemical and physiological process and functions of specific nutrients in meeting nutritional requirements. Emphasis will be placed upon the relationship of optimal nutrition and physical efficiency and performance.

734 Techniques in Nutrition Research 3(1,6)
(On sufficient demand)
Laboratory experience using methods, measurements and instruments for obtaining nutritional data. P, Chem 260 or consent.

743 Current Topics in Foods 3
(On sufficient demand)
Continuing changes in food processing and preparation techniques, modes of food distribution and food consumption patterns. Recent legislation regulating food labeling and food additives. Changes in food marketing practices resulting from increasing consumer demands for convenience packaging and prepared foods.

760 Child Nutrition 3
An intensive study of the nutrition of the human organism, beginning with prenatal nutrition and extending through adolescence. An evaluation of the factors affecting height and weight for age, muscular development, and the nutritional status. P. NFS 321 or consent.

761 Nutrition of the Aged 3
Physiological and behavioral changes associated with the aged and their impact on nutrition. Effect of nutrition on aging and lifespan. Common health problems of the aged and their implications. P. 321 or consent.

DEPARTMENT OF PHYSICS

Professor W. Hein, Acting Head
Professors Duffy, Graetzer, Miller;
Associate Professor Leisure;
Assistant Professor Sippel

Graduate majors offered. Master of Science Teaching (separate listing.

The following Physics courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University.

Physics (Phys)

621 Electrodynamics 3(3,0)
Complex quantities, circuits, Maxwell's equations, waves in general, planar, cylindrical, and spherical waves, approximation methods, plasmas. P, 421.

625 Plasma Physics 3(3,0)
Elementary processes in a plasma, trajectories of charged particles, collective effects, creation of plasma, plasma instabilities, applications. P, 421.

635 Reactor Physics 3(3,0)
Fission process: moderation and diffusion of neutrons; critical equation; reactor control; environmental effects; nuclear fusion. P, 331.

637 Science of Solids 3(3,0) S
Topics covered will be chosen to satisfy student interests and will be chosen from areas such as magnetism, semi-conductors, superconductors, ferroelectrics, and devices based on these aspects of solids. The role of defects in solids and strength of materials may also be included. P, Phys 439 or consent.

643 Statistical Mechanics 3(3,0)
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, 341.

671 Quantum Mechanics 3(3,0)
Hermitian operators, matrix methods, perturbation theory, Dirac wave equation, four-fermion interactions. P, 351, 371.

675 Tensors and General Relativity 3(3,0)
Covariance in physics, basic tensor algebra and calculus, affine connections, the Riemann tensor, field equations, linear approximations. The Schwarzchild solution. P, 351.

695 Special Topics 1-3
Special projects either from a theoretical or experimental approach. P, consent.

735 Theoretical Nuclear Physics 3(3,0)
Quantative treatment of the intrinsic properties of nucleons and the nucleon-nucleon interaction; consideration of current nuclear models and interpretation of scattering of nucleons in terms of these models. P, 433.

751 Theoretical Mechanics 3(3,0)
Further development of Lagrangian and Hamiltonian methods, canonical tranformations, rigid body motion, relativistic mechanics. P, 351.

779 Group Theory in Quantum Mechanics 3(3,0)
Symmetry transformations, continuous groups, finite groups, applications to valence theory, Lorentz group, fundamental particles. P, 371.

790 Thesis 5-7 as arranged. FS

PLANNING

Professor Edward P. Hogan
Chairman and Coordinator

Graduate Minor

Offered with Master's degree and major in: Economics, Education, Engineering, Geography and Sociology (other colleges or departments by special arrangement).

Planning is an essential part of most private and public activities. Planning is a process which can be learned and applied to increase effectiveness of decision making and operations.

The teaching of planning is governed by an administrative committee appointed by and responsible to the Vice President for Academic Affairs. The Planning faculty is appointed by the Vice President for Academic Affairs.

Planning (Plan)

691 Principles of State, Regional and Community Planning 3 F
Purpose, structure, and dynamics of the planning process. Identification of different types of planning. Interdependencies among persons who contribute to the planning process and are trained in separate academic disciplines. Introduction to basic techniques employed within different phases of the planning process. P, Enrollment within a minor in planning at the Master's level or consent.

692 Techniques of State, Regional and Community Planning 3 S
Brief review of basic approaches, procedures and methods employed within different phases of the planning process. Coordination required among persons trained in separate academic disciplines in order to carry out these basic techniques. Exercises in the practical application of selected techniques, and review of their application in ongoing or completed planning efforts. P, Plan 691.

(See also specialized courses in planning within departmental listings in Economics, Education, Engineering, Geography, Horticulture-Forestry, Political Science and Sociology).

DEPARTMENT OF PLANT SCIENCE
(Agronomy, Entomology, Plant Pathology)

Professor Maurice L. Horton, Head
Professors Arnold, Brage (Emeritus), Buchenau, P. Carson (Emeritus), Dybing (USDA) Fine (Emeritus), Gardner (Emeritus), Hoffman (USD), Kahler (USDA), Kantack, Kenefick, Kieckhefer (USDA), Kinch (Emeritus), Lay, McDaniel, Moore, Reeves, Semeniuk (Emeritus), Shank (Emeritus), Shubeck (Emeritus), Walgenbach, Walstrom, White;
Associate Professors Cholick, Easton, Kohl, Lemme, Lunden, Malo
Assistant Professors Boe, M. Carson, Ferguson, Fixen

Graduate majors offered:

Master of Science degree with a major in Agronomy, Entomology or Plant Pathology. Doctor of Philosophy degree with a major in Agronomy.

Prerequisites for graduate study:

A Bachelor's degree plus prerequisites for the courses elected. The Master of Science degree with a major in Entomology requires at least 14 prior credits in entomology.

Plant Science (PS)

604 Virus and Bacertial Disease of Plants 4(2,4) F 1986
Plant diseases caused by viroids, viruses, bacteria and mycoplasma-like organisms—including identification, development, symptoms, and control. Advanced laboratory research methods used in isolation, transmission, culture, purification, micro-

scopy, serology and investigation of the nature and properties of important plant pathogens. P, consent. Alternate years.

611 Insect Ecology and Biological Control 3(2,2) S 1987

Comprehensive study of insects in relation to their environment. Effects on microclimate and macroclimate on predators, parasites, disease, reproduction, development and feeding habits of insects. Techniques for determining various factors important to survival and reproduction in the insect's environment. P, Biol 211. Alternate years.

613 Host-Plant Pathogen Interactions 3(2,3) S 1987

Physiology and genetics and host-parasite interactions. Disease resistance. P, consent. Alternate years.

621 Integrated Crop Pest Management 3(3,0) S

The biological and ecological basis of integrated pest management for midwestern crop insects and the understanding of economic thresholds are emphasized. Pest scouting techniques for major crop pests and simulated management decisions are discussed.

623 Insect Physiology 3(2,2) S 1987

Fundamental physiological process insects. Normal an abnormal functioning of adult and immature stages, developmental physiology, physiology of behavior. P, Ch 120 and consent. Alternate years.

633 Advanced Soil Genesis 3(2,3) S 1986

Detailed study of the processes of soil genesis and an examination of soil and ecosystems with respect to the soil forming factors of time, parent material, topography, climate and organisms. P, consent. Alternate years.

634 Plant Nematology 3(2,4) F 1987

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

643 Physical Properties of Soils 3(3,0) F 1986

The exchange of energy and water at soil surfaces, infiltration and redistribution of water and soil physical properties related to plant growth. Emphasis on applications in development and utilization of soil and water resources in a manner consistent with preservation of environmental quality. P, consent. Alternate years.

644 Soils and Plant Nutrition 3(3,0) S 1987

Plant-soil nutrient relationships including nutrient sink development, uptake, transport to roots, labile soil sources, nutrient deficiencies, and their correction. Emphasis on nitrogen, phosphorus and potassium. P, consent. Alternate years.

653 Advanced Genetics 3(3,0) F 1986

Procedures in genetic studies as they relate to molecular and classical genetic applications. Alternate years.

654 Chemical Properties of Soils 4(4,0) F 1987

Chemical considerations of the dynamic interactions of soil-water-gas phases as affected by climate, soil age, kinds of minerals or organic matter, added fertilizer elements, and plants. P, consent of instructor. Alternate years.

661 Taxonomy of Insects 3(3,0) F 1986

Collection, identification and classification of insects. Techniques of identifying the groups of economic insect pests that affect the production of feed, food and fiber. Alternate years.

663 Environmental and Physiological Aspects of Crop Production 2 S 1987

Systems analysis of factors which limit or increase crop production and the potential for qualitative and quantitative adjustments. P, Bot 427 and consent of instructor. Alternate years.

671 Principles of Insecticide Use 3(2,2) F 1987

Insecticides and chemosterilants, their effects, antidotes, detection, and uses. Techniques of determining insecticide resistance in an insect population, insecticide residues, and radio-active tracers in laboratory and field populations. P, Ch 120. Alternate years.

673 Cytogenetics 3(2,3) F 1987

The nature and behavior of chromosomes in relation to heredity. P, Bio 371 or 343. Alternate years.

676 Livestock Insect Pest Management 3(3,0) AY F 1987

Encompasses the various methods used for suppression of insects and related arthropod pests of livestock and poultry. Information is included on the biology, indentification and ecology of the pests, economic injury levels and an understanding of present livestock and poultry management systems. A synopsis of the diseases of livestock that are transmitted by insects or other arthropod pests is included.

681 Crop Breeding Techniques 1 Su 1986

A techniques course where artificial hybridization of crop plants will be demonstrated and carried out. Background material will be offered with each crop. Both field and horticultural crops are included. Alternate years.

683 Crop-Water Relationships 2(2,0) F 1987

An examination of the role of water on crop productivity with an emphasis on environmental and physiological factors affecting the absorption, movement and use of water in crops. Water associated stresses will be analyzed in terms of agronomic and physiological mechanisms of adaptation. P, Bot. 427 and consent. Alternate years.

693 Genetics of Plant Disease Resistance 2(2,0) S 1986

Extensive study of genetics mechanisms in the host and pathogen that determine plant disease reactions and how these genetic systems interact; breeding plants for disease resistance; discussion of current topics in host-pathogen genetics. Alternate years.

700 Special Topics 1-6(1,3 per credits) FSSu

Advanced study of one or more selected topics 1. Biometrical Genetics, 2. Entomology, 3. Mycology, 4. Saline and Sodic Soils, 5. Phytobacteriology, 6. Plant Breeding, 7. Soil Chemistry, 8. Soil Genesis, 9. Soil Mineralogy, 10. Soil Physics, 11. Virology, 12. Weed Control, 13. Teaching Experience (2 Cr. maximum), P, consent for all Special Topics.

780 Advanced Special Problems 1 or 2 FSSu

Advanced study and research in crops, plant pathology, and soils. P, consent.

781 Plant Science Seminar 1(1,0) FS

Reports and discussions of current investigations in crops, entomology, plant pathology, and soils. (2 Cr. required for M.S.; 3 Cr. for Ph.D.).

790 Thesis—M.S. 5-7

890 Dissertation Ph.D. var.

DEPARTMENT OF RURAL SOCIOLOGY

Professor J. Satterlee, Head
Professors Dimit (Emeritus), Chittick (Emeritus), Hess, Kayongo-Male, Sauer (Emeritus), Wagner;
Associate Professor Mendelsohn
Assistant Professor Baer, Stover

Graduate majors offered:

1. Master of Science Degree With Major in Rural Sociology. Three Options:

   Option **A: Thesis Option:** requires a minimum of 30 semester credits including a thesis (5 credits) and comprehensive written and oral examination.

   Option B[1]: **Planning/Development Option:** designed for students seeking careers in domestic and international planning/development. (No thesis) Internship, written & oral comprehensive exam required.

   Option B[2]: **Non-Thesis Option:** requires 32 hours with no thesis. Does require comprehensive written and oral examination. Designed for those wishing to extend their education without the research emphasis.

   All students must complete the core requirements plus sufficient additional graduate hours in this department, a minor in another department and/or supporting courses.
2. Doctor of Philosophy Degree with Major in Sociology. Areas of concentration include Social Theory, Research Methodology, Social Organization, Demography, Social Deviance.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with 24 credits in social science or consent of the department.

For the graduate minor a Bachelor's degree, including prerequisites for the graduate courses elected, or consent of the department. (Send for Dept. Graduate Guide for more details).

Anthropology (Anth)

(See dept. for schedule of offerings)

690 Special Problems in Anthropology 1-3 FSSu

P, open to undergraduate and graduate students with sufficient background and consent.

791 Seminars in Anthropology 1-4 FSSu (On demand)

-Teaching of Anthropology
-Advanced General Anthropology
-Advanced Cultural Anthropology
-Archaeological Techniques
-Ethnology

-Ethnography
-Anthropological Theory & Social Thought

Rural Sociology (Soc)

(See dept. for schedule of offerings)

615 Social Thought 3(3,0)
Brief survey of history and development of world's most important social theories and schools of social thought, evaluated in light of present knowledge.

620 Social Organization 3(3,0)
Elements of social organization. Analysis of social groups and complex social organizations. Examination of conditions and factors related to the integration and disintegration of social organizations.

621 Social Stratification 3(3,0)
Theories of social stratification. Relationship between social class and education, occupational choice, political preference religious affiliation and social mobility.

630 Social Change 3(3,0)
Theories concerning factors and processes in social-cultural change. Consideration of various interpretations of social-cultural change in terms of stages, cycles, and trends.

633 Leadership and Group Organization 3(3,0)
Emergence of and types of leaders. Analysis of community power structure. Emphasis on group dynamics, small groups and effective meetings.

640 Rural Community Planning 3(3,0)
Structure, activities, problems, resources, and functions of the rural community; methods and techniques of community organization; institutional services and leadership with economic and social relationships of the small community to both open country and urban centers.

698 Social Deviance (3,0)
This course will examine the nature of negatively evaluated behaviors and the processes by which customs, rules and normative structures of society are constructed. A primary goal of the course is the development of a coherent interpretation of contemporary theories and emperical investigations of social deviance.

710 Research Methods in Sociology 3(3,0) S
Major emphasis will be given to research design, problems of measurement, methods of data collection, and analysis and interpretation of data. An integral part of the course will be the development of a research project dealing with some current sociological problem. P, consent.

712 Sociological Theory I 3(3,0) F
Critical examination of the main schools of sociological theory beginning with the system of Auguste Comte and ending with World War II. P, 301 or consent.

713 Sociological Theory II 3(3,0) S
Sociological theories and issues from World War II to present. P, 301 or consent.

760 Advanced Demographic Theories and Techniques 3(3,0)
An exploration of population theory and methods focusing upon contemporary literature and the basic population processes of fertility, mortality, and migration. P, 362 or consent.

780 Special Problems in Sociology 1-3(1-3,0) FSSu
Advanced work or special problems in such areas as population, marriage and family, rural sociology, criminology, social organization or urban sociology. P, open to graduate students with sufficient background and consent.

781 Internship in Planning 1-6 FSSu
P, Major and Planning option.

790 Thesis—M.S.

791 Seminars in Sociology 1-4 FSSu (On demand)
-Quantitative Research Methods
-Qualitative Research Methods
-Sociology of Region
-Advanced Social Psychology
-Demographic Resources & Materials
-Theory Constructions
-Advanced Criminology
-Teaching of Sociology

793 Research Paper in Sociology 1-3 FSSu

890 Dissertation—Ph.D.

MASTER OF SCIENCE TEACHING

The Master of Science Teaching Degree is offered with the following majors: chemistry, mathematics, and physics.

Residence and Degree Requirements

Minimum residence requirement for the Master of Science Teaching degree is 20 graduate credits. Transferred credits will be reviewed by the students advisor and approved by the MST Committee prior to inclusion in the student's Plan of Study. Completion of the degree requires a minimum of 35 credits of which 18 must come from the major department course list.

Requirements for the Minor or Supporting Courses

Each student must include a minimum of 6 credit hours from two of the following department course lists which are not the student's major department: chemistry, mathematics, and physics. An additional 5 credits must be taken from the fields of biology, chemistry, education, mathematics or physics.

Plan of Study

During the first term of work, the graduate student should plan with her/his advisor the Plan of Study for the Master of Science Teaching degree. The plan is processed the same as for other masters degrees.

Admission to Candidacy

Admission to candidacy is processed the same as for other masters degrees.

Examinations

The students in the program may take challenge exams in selected areas of each departments course offerings. Upon successful completion of those examinations, students will be allowed to proceed directly to more advanced courses.

Candidates must pass a comprehensive written examination over the course work in their own program. A comprehensive oral examination will be held prior to final approval for graduation. All other examination requirements are as described for other masters degrees using option C.

Chemistry Major:

Required Courses:
Chem 701 Concepts in Chemistry
Section 1 Atomic Structure and Bonding
2 Periodic Relationships
3 Formulas and Reactions
4 Stoichiometry and Chemical Math
5 Acids, Bases, and Salts
6 Solutions and Equilibria
7 Descriptive Chemistry

Elective Courses:
Chem 702 Environmental Chemistry
703 Computers in Chemistry
704 Industrial Processes
705 Instrumental Chemistry
706 Biological Chemistry
707 Inorganic Chemistry
708 Organic Chemistry
709 Alternative Energy
710 Lecture Demonstrations
711 Instructional Laboratories
712 Consumer Chemistry

Students may challenge and test out of sections of the 701 Concepts in Chemistry course. Students will be required to complete or test out of all sections of Chem 701. An additional 8 credits of chemistry courses will be required for a major in chemistry. Students will also be required to take 6 hours from physics, 6 hours from mathematics and 5 hours of electives from the fields of biology, physics, mathematics, chemistry or education.

Mathematics Major:

Sequence courses will be offered in five areas of mathematics with each course carrying 2 semester credits.

Area I — Algebra
Courses:
711 Functions and Permutations
712 Algebraic Structures
713 Properties of Algebraic Structures
714 Vector Spaces and Linear Transformations
715 Applications of Algebra

Area II — Analysis
Courses:
721 Analytic Geometry
722 Functions, Limits and Continuity
723 Analysis of Algebraic Functions
724 Analysis of Transcendental Functions
725 Convergence

Area III — Geometry
Courses:
761 Foundations of Geometry
762 Advanced Euclidean Geometry
763 Non Euclidean Geometry
764 Projective Geometry

Area IV — Computer Science
Courses:
711 Structured Programming I
772 Structured Programming II
773 Data Structures
774 Discrete Mathematics
775 Computer Applications

Area V - Probability and Statistics
Courses:
781 Intro to Probability
782 Statistics (one and two populations)
783 Statistics (three and four populations)

A degree candidate must take a minimum of 18 credits from the sequences above with at least 2 credits in each of three areas. Prior to the final oral examination, comprehensive examinations must be passed in the three areas selected by the candidate. Students may test out of required courses.

Physics Major:

Required Courses:
Physics 701 Mechanics I
702 Mechanics II
703 Acoustics I
704 Fluids
705 Thermodynamics I
706 Electricity
707 Magnetism
708 Optics I
709 Relativity
710 Introduction to Quantum Theory
711 Quantum Mechanics and the Atom
712 Physics of Molecules and Solids
713 Nuclear and Radiation Physics
714 Astronomy I

Elective Courses:
716 Electrical Circuits
717 Meteorology
718 Energy and the Environment
719 Solid State Physics
720 Solid State Electronics
721 Acoustics II
722 Thermodynamics II
723 Optics II
724 Computers in the Laboratory
725 Astronomy II
726 Careers in Science and Engineering
727 Recent Developments in Physics

The MST with a major in physics will require 18 hours of courses from the above list. Student may challenge and test out of the required courses. Requirements will also include a minimum of 6 hours of coursework from both chemistry and mathematics together with an additional 5 hours of elective from the fields of biology, chemistry, education or physics.

Chemistry (Chem)

The following courses are particularly designed for secondary school science teachers. Although the primary emphasis will be the course content, particular attention will be focused on laboratory experiments and demonstrations useful in teaching at the secondary level.

701 Concepts in Chemistry 1-10
A course designed for secondary school science teachers. The course will consist of seven concept areas which may be taken independently, such as atomic structure and bonding; acids, bases, and salts, etc. Each unit carries a 1 or 2 credit value.

702 Environmental Chemistry 2
Effect of chemicals on the environment will be discussed. Emphasis will be placed on problems related to the atmosphere and water. Other topics to be included are pesticides and heavy metals. (p. Chem 701 or permission)

703 Computers in Chemistry 2
Primarily intended to introduce students to ways in which microcomputers may be used to supplement other teaching methods. No previous programming experience necessary. (p. Chem 701 or permission)

704 Industrial Processes 2
This course will emphasize the economically important inorganic and organic reactions employed in industrial processes. Important factors such as raw materials costs, shipping costs and marketability will be discussed. (p. Chem 701 or permission)

705 Instrumentation in Chemistry 2
Discussion of the role of instrumentation in chemical work including experiments appropriate for use in the secondary school classroom. (p. Chem 701 or permission)

706 Biological Chemistry 2
Application of chemical principles to biological processes of current importance including nitrogen fixation, photosynthesis and genetic expression. A study of the fundamental reactions and review of current status. (p. Chem 701 or permission)

707 Inorganic Chemistry 2
Modern inorganic chemistry concepts will be developed including topics such as bonding in coordination compounds; organometallic compounds; metal atom clusters; bioinorganic systems; inorganic polymers, etc. (p. Chem 701 or permission)

708 Organic Chemistry 2
Principles of organic chemistry that may be presented in high school programs will be presented. (p Chem 701 or permission)

709 Alternative Energies 2
The chemistry of alternative energies will be discussed. The pros and cons of coal gasification, shale, tar sands, alcohol-based fuels, geothermal and solar energies will be emphasized. (p. Chem 701 or permission)

710 Lecture Demonstrations 2
The literature of reported lecture demonstrations will be reviewed. The class will practice selected demonstrations and work on their reliability and effectiveness. Each student will be asked to create a new demonstration. (p. Chem 701 or permission)

711 Instructional Laboratories 2
Design, development, testing and evaluation of laboratory experiments suitable for use by high school teachers. May include modification of current procedures and construction of new procedures compatible with time and facilities available. (p. Chem 701 or permission)

712 Consumer Chemistry 2
Topics of interest to the consumer will be discussed. Typical topics will include foods, food additives, polymers, soaps and detergents, cosmetics and drugs and chemistry on the farm. (p. Chem 701 or permission)

Mathematics (Math)

The following courses are particularly designed for secondary school science teachers. The primary emphasis will be the course content with emphasis on topics useful in teaching at the secondary level. All courses are two credits, each to be taken during ten days of concentrated study.

711 Functions and Permutations 2
This course deals with an in-depth study of functions defined on finite and infinite sets. The properties of addition, subtraction, multiplication, division and composition of functions will be examined as well as the necessary and sufficient conditions required for a function to be injective, subjective and bijective. Permutations and their properties as functions will also be discussed in detail. The relation of permutation to regular geometric figures will also be investigated.

712 Algebraic Structures 2
This course includes definitions and examples, both finite and infinite, of the following algebraic structures: group (Abelian and cyclic), ring (commutative and commutative with unity), integral domain, skew field, field and well-ordered domain. The concept of a subgroup, subring, subdomain and subfield will also be discussed as will the topics of quotient fields and quotient rings.

713 Properties and Algebraic Structures 2
This course covers such topics as the uniqueness of the identity, the inverse in an algebraic structure, which algebraic structures have cancellation and divisors of zero, what exponential rules hold in various structures, when are two structures basically the same (isomorphic) and how does one solve equations in different structures.

714 Vector Spaces and Linear Transformations 2
The topics covered in this course are: vector spaces, linearly independent and dependent sets of vectors, basis for a vector space, linear transformations and their relation to matrices, orthogonality, similiarity, diagonalization, eigenvectors, eigenvalues, Gram-Schmidt process and geometry of transformations.

715 Applications of Algebra 2
The purpose of this course is to show how the algebraic structures previously discussed are used to solve problems in graph theory, linear programming, probability and statistics, theory of games, differential equations and discrete mathematics.

721 Analytic Geometry 2
Analytic geometry of two and three dimensions including coordinate systems, lines, planes, conic sections, and rotation and translation of axes. Prerequisite: College Algebra.

722 Functions, Limits and Continuity 2
A careful study of the theory of limits for sequences and functions and the general properties of continuous functions. Prerequisite: Math 721 or a prior course in calculus.

723 Analysis of Algebraic Functions 2
Differentiation and integration of algebraic functions of one variable with emphasis on applications to graphing of functions and the solution of problems by the methods of calculus. Prerequisite: Math 722 or consent of the instructor.

724 Analysis of Transcendental Functions 2
A careful study of the trigonometric and exponential functions and their inverses with particular attention to the differentation and integration of these functions. Prerequisite: Math 723 or consent of the instructor.

725 Convergence 2
A careful study of sequences and series of real numbers and functions with emphasis on how they are related to the algebraic and transcendental functions. Prerequisite: Math 724 or consent of the instructor.

761 Foundations of Geometry 2
A study of the axioms necessary to prove theorems in geometry and a systematic development of Euclidean geometry using these axioms. Prerequisite: None.

762 Advanced Euclidean Geometry 2
Special properties of triangles and circles,

geometrical transformations, and inversive geometry. Prerequisite: Math 761 or consent of the instructor.

763 Non-Euclidean Geometry 2

An introductory study of hyperbolic geometry with an emphasis on models of hyperbolic geometry and its relationship to Euclidean geometry. Prerequisite: Math 761 or consent of the instructor.

764 Projective Geometry 2

A study of projective geometry as an extension of Euclidean geometry and an axiomatic development of projective geometry as a non-Euclidean geometry. Prerequisite: Math 761 or consent of the instructor.

771 Structured Programming I 2

An introduction to concepts of structured programming using the PASCAL language. Topics will include syntax, selection, looping and procedures. P, Math 113.

772 Structured Programming II 2

Structured programming using PASCAL. Topics will include data types, arrays, functions and packed arrays. P, Math 771 or consent.

773 Data Structures 2

The study of list, string and graph structures using the PASCAL language. P, Math 772 or consent.

774 Discrete Mathematics 2

The study of sets and functions, binary relations including trees, state graphs and automata, discrete probability, recursion and algebra. P, FORTRAN or PASCAL.

775 Computer Applications 2

Computer applications relevant to the high school curriculum will be studied. Problems will be solved using the PASCAL language. Topics from mathematics, sciences, business and the like will be used. P, Math 772 or consent.

781 Intro to Probability 2

Experiments, events, sample spaces. Random variables and density functions. Expected value. Common discrete and continuous random variables. Sampling distributions. Prerequisites: calculus or consent of instructor.

782 Statistics (one and two populations) 2

Sampling theory. Descriptive statistics. Confidence intervals and hypothesis testing for one- and two-sample experiments. Prerequisite: Probability (Math 781).

783 Statistics (three or more populations) 2

Elements of experimental design: Analysis of Variance and Regression Analysis. Selected non-parametric methods. Prerequisite: Math 782.

Physics (Phys)

The following courses are particularly designed for secondary school science teachers. Although the primary emphasis will be the course content, particular attention will be focused on laboratory experiments and demonstrations useful in teaching at the secondary level. All courses are one credit, each to be taken during five days of concentrated study.

701 Mechanics I 1

A study of Newton's laws and their application to the motion of bodies and the study of structures.

702 Mechanics II 1

A study of the concepts of work, energy and momentum. These concepts will be applied to collisions, rotational motion, oscillations, and bodies in gravitational fields.

703 Acoustics I 1

An introduction to waves in elastic media. Wave energy, the superposition principle and wave interference will be studied. Applications of these principles to audible, ultrasonic and infrasonic waves will be discussed.

704 Fluids 1

An introduction to the basic properties of static and dynamic fluids. Pascal's Principle, Archimedes Principle and Bernoulli's Equation will be applied to the study of gases and liquids.

705 Thermodynamics I 1

A study of temperature scales and their relationship to the laws of thermodynamics. Thermal expansion, specific heats, heat conduction, and the mechanical equivalent of heat will be studied. Applications to the first law of thermodynamics will be discussed.

706 Electricity 1

A study of electrostatics by use of Coulombs Law and Gauss's Law. The concept of electric field and electric potential will be introduced and applied to capacitors and resistances. Simple circuits will be analyzed.

707 Magnetism 1

A study of the basic properties of the magnetic field and its interaction with currents. Faraday's law will be discussed and applications made to generators, inductors and electric motors. Magnetic properties of matter will also be studied.

708 Optics 1

A study of geometric and physical optics. Applications of basic properties of light will be made to lenses, optical instruments and fiber optics. Diffraction and interference effects will be analyzed with both laser and incoherent light sources.

709 Relativity 1

An introduction will be made to both classical and Einstein relativity. The concepts of length contraction, time dilation simultaneity, relativistic mechanics and rest energy will be investigated. An introduction to general relativity and its relationship to the concept of the "Black hole" will be discussed.

710 Introduction to Quantum Theory 1

Basic experiments and theory leading to quantum theory and the present model of the atom will be studied. The concept of "matter waves" and their probability interpretation will be discussed.

711 Quantum Mechanics and the Atom 1

Quantum mechanics will be studied in relation to the hydrogen atom and the many electron atoms. Quantum numbers, the Pauli Exclusion principle, the Stern-Gerlach experiment and the Zeeman effect will be discussed.

712 Physics of Molecules and Solids 1

Quantum mechanics will be applied to molecular bonding and bonding in solids. Free electron theory and band theory will be applied to metals, insulators and semiconductors. An introduction to solid state electrical, optical and acoustical devices will be presented.

713 Nuclear and Radiation Physics 1

An introduction to nuclear structure and nuclear energy levels will be presented. Radioactivity, nuclear reactions, radiation detection and nuclear energy will then be studied. Applications to nuclear science will then be discussed.

714 Astronomy I 1

An introduction to astronomy and basic principles involved. The solar system will be discussed in relation to Kepler's laws and analysis performed. A general study of the universe as seen by an astronomer will be discussed. Observations of the sky by telescope will be carried out when possible.

716 Electric Circuits 1

A continuation of material from Phys 706 related to circuit analysis. More complex dc circuits will be studied together with ac circuits. An introduction to electronics will also be presented.

717 Meteorology 1

A study of the physical laws which determine the earth's weather patterns. Basic weather forecasting, weather map analysis and weather front analysis will be included.

718 Energy and the Environment 1

A study of the available energy resources and the long-term effects of their use on the environment of the earth and its inhabitants.

719 Solid State Physics 1

A continuation of topics from Phys 712 with emphasis on semiconductors and their applications.

720 Solid State Electronics 1

A study of the application of solid state semiconductor devices in electronics. Specific electronic circuits will be analyzed.

721 Acoustics II 1

A continuation of Acoustics I with emphasis on harmonic analysis of periodic waveforms, musical acoustics, room acoustics and applications to sound reproduction and recording.

722 Thermodynamics II 1

A continuation of topics from Thermodynamics I with emphasis to applications of the 1st and 2nd laws of thermodynamics. The concepts of entropy, enthalpy and free energy will also be studied.

723 Optics II 1

A continuation of topics from Optics I with emphasis of more complex analysis involved in physical optics.

724 Computers in the Laboratory 1

An introduction to the use of microcomputers in the laboratory for the aquisition of data, analysis of data and simulation of experiments.

725 Astronomy II 1

A continuation of topics from Astronomy I with emphasis on the "Cosmos Series". Sky observations by telescope will be carried out when possible.

726 Careers in Science and Engineering 1

Professional career opportunities in electrical, civil, mechanical and agricultural engineering, computer science, physics and mathematics will be explored, for advising high school students regarding career choices. Department visits and field trips to nearby industries will be arranged.

727 Recent Developments in Physics 1

Readings will be selected from **Scientific American, Physics Today, American Journal of Physics, Physics Teacher** and other professional journals, to develop awareness of current topics in physics and sources of information.

DEPARTMENT OF SPEECH

Professor Judith Zivanovic, Head
Professors Denton, Ferguson , Hoogestraat, Johnson, Meyer, Stine (Emeritus), Widvey;
Associate Professor Schliessmann

Graduate majors offered:

The Master of Arts degree with a major in Speech.

Graduate minor offered:

Speech

Prerequisites for graduate study:

For the Master of Arts with a major in Speech: a minimum of 20 semester hours of undergraduate credit in Speech, Theatre, Journalism, or Communication.

For the graduate minor in Speech; a minimum of 12 semester hours of undergraduate credit in Speech, Theatre, Journalism, or Communication; or the consent of the Department Head.

Those students who do not meet the above prerequisites may consult the Head of the Department of Speech concerning arrangements for removal of deficiencies. Before registering for graduate work leading toward a master's degree with a major in speech, the student must consult the Head of the Department of Speech who will assign an adviser.

Degree requirements:

The required curriculum for the Master of Arts degree with a major in Speech consists of: (1) A minimum of 22 semester hours in Speech including 5-7 hours in SpCm 790, and electives approved by the adviser to bring the combined total to not less than 30 semester hours; and (2) Completion and approval of a thesis based on appropriate research.

General Communication (GCom)

605 Theories of Communication 3(3,0)
See GCom 605, Theories of Communication under Department of Journalism and Mass Communication.

Mass Communication (MCom)

637 Educational Radio and Television 3(3,0)
Educational broadcasting with practical work in the preparation and presentation of educational and instructional materials for radio, television, and film and their use for instruction.

660 Special Problems in Radio, Television or Film 1-2
Directed research. May be repeated to a total of 4 credits in problem courses. P, consent.

664 Film Studies 3(3,0)
Film art forms, artists, and critics. Viewing and making films.

791 Research Methods in Communications 3(3,0)
See MCom 791, Research Methods in Communication under Department of Journalism and Mass Communication.

Speech Communication (SpCm)

616 History and Criticism of American Public Address 3(3,0)
Critical evaluation of American speakers from Colonial to contemporary period. P, consent.

624 Persuasion 2(2,0)
Audiences, motivation, principles of attention and suggestion, bases of belief and action applicable in persuasive speaking. Theory, practice. P, 315.

652 General Semantics 3(3,0)
Relations between symbols; human behavior in reaction to symbols including unconscious attitudes, linguistic assumptions; and the objective systematization of language.

666 Rhetorical Theory 3(3,0)
Historical development of rhetorical theory from classical to modern times.

676 Directing Speech Activites 3(3,0) SSu
Organizing and directing oral interpretation, dramatic, and forensic programs.

692 Special Problems in Oral Interpretation 1-2
Directed research. May be repeated to a total of 4 credits in problems courses. P, consent.

694 Special Problems in Public Address 1-2
Directed research. May be repeated to a total of 4 credits in problems courses. P, consent.

696 Special Problems in Speech Education 1-2
Directed research. May be repeated to a total of 4 credits in problems courses. P, consent.

790 Thesis 5-7 credits

Theatre (Thea)

610 Dramatic Literature 3(3,0)
Intensive reading and study of plays.

660 History of Theatre 3(3,0)
Periods, theatres, and representative dramatic literature from primitive to present day.

690 Special Problems in Theatre 1-2
Directed research. May be repeated to a total of 4 credits in problems courses. P, consent.

STATISTICS (Stat)

Professor W. Lee Tucker
Coordinator of Instruction
Administrative Committee: Professors Edeburn, Hsia, Kim, Lacher, Tucker;
Associate Professors Evenson, Ewing, Monahan, Nielson
Assistant Professor Vandever, Wicks

Statistics is concerned with the development and application of the most effective methods of collecting, tabulating, and interpreting quantitative data in such a manner that the validity of conclusions and estimates may be assessed by means of inductive reasoning based on the mathematics of probability.

The teaching of statistics is governed by an administrative committee appointed by and responsible to the Vice President for Academic Affairs. The statistics faculty is appointed by the Vice President for Academic Affairs from the departments involved in this area.

641 Statistical Methods II 3(3,0) S
Analysis of variance, various types of regression, and other statistical techniques and distributions. Sections will be offered in the areas of Biological Science, Physical Science, and Social Sciences. P, 341 or Math 381.

645 Nonparametric Statistics 2
Covers many standard nonparametric methods of analysis. Methods will be compared with one another and with parametric methods where applicable. Attention will be given to: (1) analogies with regression and ANOVA; (2) emphasis on construction of tests tailored to specific problems.

651 Interpretation of Statistical Software Output 1
Interpretation of statistical software package(s) include statistics such as correlation, means, standard deviation, standard error, t-test, chi-square, simple and multiple linear and curvelinear regression, and balanced and unbalanced analysis of variance.

661 Experimental Design 3
Experimental designs involving confounding will be explored as it relates to factorial experiments, incomplete block, lattice, and incomplete latin square designs. P, Stat 541/641.

791 Special Topics in Statistics 1-3
6 max/student
Advanced study of one or more selected topics as student need justifies; for example, sampling, statistical genetics, multivariate statistics, P, Stat 641.

DEPARTMENT OF TEXTILES, CLOTHING & INTERIOR DESIGN

Professor Sandra Evers, Head
Professors Lund (Emeritus), Lyle (Emeritus) Rosenberger (Emeritus), Semeniuk (Emeritus) Stoflet (Emeritus)

The following Textiles, Clothing and Interior Design courses are offered to support the Master of Science in Home Economics degree program.

Textiles, Clothing and Interior Design (TCID)

644 Textile Chemistry 3(2,2)
(On sufficient demand)
Chemistry of textiles including laboratory study of physical and chemical properties of textile fibers and fabrics.

673 Fashion, Art and Textiles Tour 3(3,0) Su
Understanding the interrelationship of fashion, art and textiles of a specific area of the world. Study of the arts from an historical and contemporary approach.

692 Special Problems in Textiles and Clothing 1-4
Problems for advanced study selected according to student's specific interests, needs, or current research with which student is familiar. Credit arranged by professor in charge.

743 Current Topics 1-3
Study of contemporary issues and concerns in the field of Textiles, Clothing and Interior Design. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.

744 New Development in Textiles 3(3,0) Su
(On sufficient demand)
Recent developments in fibers and textile products. Chemical and physical properties of fibers, yarns, fabric structure and finishes. P, consent. Alternate years.

770 Seminar in Textiles and Clothing 1-2
(On sufficient demand)
Reports and discussion of current literature in various areas of textiles and clothing.

773 Costumes and Textiles through the Ages 3(3,0)
(On sufficient demand)
A survey of the evolution of apparel arts from ancient to modern times emphasizing aesthetic, social, political, and economic factors affecting dress and mores expressed through dress in each culture. P, 372.

VETERINARY SCIENCE (Vet)

Professor Mahlon Vorhies, Head
Professors Kirkbride, Roller, Swanson; Associate Professor Francis

No major or minor is offered in this area. The following courses may be used in the major or minor as supporting courses in the graduate program.

690 Problems in Veterinary Science 1-3 FS
P, Vet 403, consent.

723 Systemic Physiology 4(3,3) F
(See Dept. of Biology)

725 Systemic Physiology 4(3,3) S
(See Dept. of Biology)

727 Endocrinology 4(3,3) F
(See Dept. of Biology)

DEPARTMENT OF WILDLIFE AND FISHERIES SCIENCES

Professor Charles Scalet, Head
Professors Flake, Linder (Emeritus)
Associate Professors Berry, Modde

Graduate minor offered:

Wildlife Biology

Prerequisites for graduate study:

For the graduate major in Wildlife and Fisheries Sciences 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 may not apply to the graduate program.

Wildlife and Fisheries Sciences (WL)

***611 Limnology** 4(2,6) S 1987
Physical, chemical, and biological characteristics of lakes, ponds, and streams. Analysis of factors and processes that operate in fresh-water systems. Methods of measuring and evaluating these factors and processes. P, Ch 114, Phys 113, Bio 211, or consent. Alternate years.

***613 Fisheries Science** 3(2,3) F 1986
Methods, facilities, and techniques of intensive and extensive fish culture, including parasites and diseases. This includes both sport and commercial culture. In addition, principles and techniques of selected management practices for reservoir, pond, and stream management. P, WL 367 and 412, or consent. Alternate years.

***615 Upland Game Management** 3(2,3) S 1987
Upland game birds and mammals as components of ecosystems. Effects of farming, industry, social change, technology, and federal, state and private programs on game and nongame species. Techniques for individual species management. P, WL 411 and consent. Alternate years.

***617 Big Game Management** 3(2,3) S 1988
Big game animals life histories and field techniques for research and management. Recreational, economic, and aesthetic importance of big game. Interaction between big game species and domestic livestock. P, WL 411 and consent. Alternate years.

***619 Waterfowl Management** 3(2,3) F 1987
Analysis of ecological and socio-economic factors affecting waterfowl habitat and waterfowl populations. State and Federal programs affecting wetland drainage and wetland preservation. Techniques of wetland management. Field inspection of waterfowl production habitat in the north-central states. P, WL 411 and consent. Alternate years.

***690 Special Topics in Wildlife and Fisheries** 1-3 as arranged FSSu
(Limit of 5 credits for M.S. degree)
Graduate students may secure small-group instruction in a variety of topics such as technical writing, advanced fisheries management, wildlife law enforcement, ecosystems analysis, wildlife habitat management, population regulation, and others. P, consent.

691 Wildlife Research Problems 1-2 as arranged FSSu
(Limit of 2 credits for M.S. degree)
Qualified students may investigate special wildlife problems under supervision of department staff. Arrangements must be made with supervising staff member prior to registration.

***711 Aquatic Ecology** 4(2,6) F 1987
Qualitative and quantitative measurements of aquatic populations including primary production of biomass. Interrelationship of biotic and abiotic components of aquatic ecosystems. Productivity and factors affecting rates of transfer of energy and matter within aquatic communities will be stressed. P, WL 611 and consent. Alternate years.

***713 Animal Population Dynamics** 3(2,3) F 1986
Methods of analysis and interpretation of vital statistics of animal populations. Current theories on natural regulation of animal populations. Particular emphasis on vertebrate species of economic and/or recreational importance. Comparison of environmental controls on population in various animal groups. P, consent. Alternate years.

790 Thesis in Wildife 5-7 as arranged FSSu

792 Graduate Seminar 1(1,0) FS
Reports and discussions of current topics in wildlife research and management. Not more than 2 credits may be applied toward the graduate degree.

*Field trips required in these courses may result in pro-rata charges to defray transportation costs.

GRADUATE FACULTY

ABDUL-SHAFI, ABDUL K., Associate Professor of Civil Engineering, 1958; B.S., Utah State State College, 1953; M.S., University of Missouri, 1955.

ALEXANDER, RUTH A., Professor and Head of English, Coordinator of General Studies in Humanities, 1952; B.A., Michigan State University, 1945; M.A., University of Missouri, 1947; Ph.D., Michigan State University, 1952.

ALLEN, HERBERT R., Professor of Economics, 1967; B.S., Iowa State University, 1950, M.S., 1952; Ph.D., SDSU, 1968.

ANDERSON, EDNA P., Professor and Head of Home Economics Education, 1978; B.S., Winthrop College, 1963; M.S., 1966; Ph.D., Pennsylvania State University, 1976.

ARNOLD, W. EUGENE Professor of Plant Science, 1970; B.S., Oklahoma State University, 1965; Ph.D., North Dakota State University, 1970.

BAER, LINDA, Assistant Professor Rural Sociology, 1983; B.S., Washington State University, 1971; M.S., Colorado State University, 1975; Ph.D., South Dakota State University, 1983.

BAER, ROBERT J., Assistant Professor of Dairy Science, 1982; B.S., University of Georgia, 1977; M.S., 1979; Ph.D., 1982.

BARNES, ALLEN R., Regental Professor Foreign Languages/Dean Emeritus, College of Arts and Sciences, 1961; A.B., Hastings College, 1948; M.A., University of Idaho, 1951; Ph.D., University of Madrid, 1953; Certificate University of Vera Cruz (Mexico), 1955.

BELL, RODNEY, Professor and Head of History and Political Science, 1970; B.S., Jamestown College, 1955; M.A., University of Michigan, 1956; Ph.D., 1975.

BENNETT, LARRY E., Professor of Mathematics, 1970; B.S., University of Oklahoma, 1965; M.A., 1967, Ph.D., 1970.

BERGUM, GERALD E., Professor of Mathematics, 1970; B.S., University of Minnesota, 1958; M.S., University of Notre Dame, 1962; Ph.D., Washington State University, 1969.

BERRY CHARLES, Associate Professor of Wildlife & Fisheries, (USFWS) 1985; B.A., Randolf Macon College M.S., Forham University; Ph.D., Virginia Polytech & State University.

BLAZEY, CHARLES H., Professor and Head of Health Science, Professor of Health, Physical Education and Recreation, 1965; B.S., University of State of New York (Brockport), 1959; M.S., 1960; D.Ed., University of Oregon, 1971.

BOE, ARVID A., Assistant Professor of Plant Science, 1976, 1979; B.A., Pacific Lutheran University, 1972; M.A., University of South Dakota, 1976; Ph.D., SDSU, 1979.

BOOHER, JAMES M., Professor of Health, Physical Education and Recreation, Athletic Trainer, 1967; B.A., Nebraska Wesleyan, 1965; R.P.T., School of Physical Therapy, Mayo Clinic, 1967; M.S., SDSU, 1969; Ph.D., University of Utah, 1976.

BRANDT, BRUCE, Associate Professor of English, 1979; B.A., University of Denver, 1969; M.A., 1971; Ph.D., Harvard University, 1977.

BRANDWEIN, BERNARD J., Professor Chemistry, 1955; B.S., Purdue University, 1948; M.S., 1951; Ph.D., 1955.

BUCHENAU, GEORGE W., Professor of Plant Science, 1959; B.S., New Mexico State University, 1954; M.S., 1955; Ph.D., Iowa State University, 1960.

BUCKLEY, ERNEST, Dean of Engineering, Professor of Civil Engineering, 1983; B.S., SDSU, 1948; M.S., Kansas State University, 1949; Ph.D., University of Texas, 1972.

CARSON, MARTIN, Assistant Professor of Plant Science, 1985; B.S., Eastern Illinois University, 1975; M.S., University of Illinois, 1978; Ph.D., University of Illinois, 1980.

CHEEVER, JR., HERBERT E., Professor of Political Science, 1968; B.S., SDSU, 1960; M.A., University of Iowa, 1962; Ph.D., 1967.

CHEN, CHEN-HO, Professor of Biology, 1960; B.S., National Taiwan University, 1954; M.S., Louisiana State University, 1960; Ph.D., SDSU, 1964.

CHOLICK, FRED, Associate Professor of Plant Science, 1981; B.S., Oregon State University, 1972; M.S., Colorado State University, 1975; Ph.D., 1977.

CHRISTIANSON, KENNETH D., Professor of Mechanical Engineering, 1955; B.S., SDSU, 1949; M.S., 1958.

CHU, SHU TUNG, Associate Professor of Agricultural Engineering, 1967; B.S., National Taiwan University, 1956; M.S., University of Minnesota, 1960; Ph.D., 1966.

COSTELLO, W. S., Extension Meat Specialist, Associate Professor of Animal & Range Science, 1965; B.S., North Dakota State University, 1954; M.S., Oklahoma State University, 1960; Ph.D., 1963.

CREWS, MICHAEL, Associate Professor of Nutrition Food Science, 1984; B.S., Virginia Polytechnic Institute and State University, 1972; Ph.D., 1978.

CROSSWAIT, BRUCE C., Coordinator of West River Graduate Programs in Education, 1978; B.S., Black Hills State College, 1950; M.Ed., University of Wyoming, 1956; Ed.D., University of Kansas, 1967.

DE BOER, DARRELL W., Professor of Agricultural Engineering, 1969; B.S., Iowa State University, 1963; M.S., 1964; Ph.D., 1969.

DENTON, CLARENCE E., Professor of Speech, 1956; B.S., University of Nebraska, 1950; M.A., Louisiana State University, 1954; M.F.A. University of Minnesota, 1965.

DOBBS, THOMAS L., Community Resource Development Specialist, Associate Professor of Economics, 1978; B.S., SDSU, 1965; Ph.D., University of Maryland, 1969.

DORNBUSH, JAMES N., Professor of Civil Engineering, 1949, Registered Professional Engineer (Minn.) 1949; B.S., SDSU, 1949; M.S., University of Minnesota, 1959; D.Sc., Washington University, 1962.

DUFFEY, GEORGE H., Professor of Physics, 1945; A.B., Cornell College, 1942; A.M., Princeton University, 1944; Ph.D., 1945.

DUGGAN, MARGARET, Associate Professor of English, 1978; B.A., St. John's University, 1958; M.A., Columbia University, 1965; Ph.D., 1972.

DYBING, C. DEAN, Professor of Plant Science, USDA, 1960; B.S., Colorado State University, 1953; M.S., 1955; Ph.D., University of California, 1959.

EASTON, EMMETT R., Associate Professor of Plant Science, 1977; B.S., Pennsylvania State University, 1965; M.S., Texas A&M University, 1967; Ph.D. Oregon State University, 1972.

EDEBURN, CARL E., Professor of Education, 1973; B.S., St. Cloud State University, 1963; M.A., University of Minnesota, 1969; Ph.D., University of North Dakota, 1973.

ELLERBRUCH, VIRGIL G., Professor and Head of Electrical Engineering, 1967; Registered, Professional Engineer (So. Dak.); B.S., University of Wyoming, 1960, M.S., 1961; Ph.D., 1969.

EMERICK, ROYCE J., Professor of Station Biochemistry, Professor of Animal Science, 1957; B.S., Oklahoma State University, 1952; M.S., University of Wisconsin, 1955; Ph.D., 1957.

EVANS, DAVID A., Professor of English, 1968; B.A., Morningside College, 1962; M.A., University of Iowa, 1964; M.F.A., University of Arkansas, 1976.

EVENSON, DONALD, Professor of Chemistry, 1983; B.S., Augustana College, 1964; Ph.D., University of Colorado, 1968.

EVERETT, V. DUANE, Professor of Education, 1966; B.S., University of Nebraska, 1953; M.S., 1962; Ed. D., 1966.

EVERS, SANDRA J., Professor and Head of Department of Textiles, Clothing and Interior Designs, 1982; B.S., Iowa State University, 1960; M.A., University of Minnesota, 1964; Ph.D., Michigan State University, 1970.

EWING, JOHN L., Associate Professor of Health, Physical Education and Recreation, 1983; B.S., Asbury College, 1974; M.S., University of Kentucky, 1975; Ph.D., University of Minnesota, 1982.

FERGUSON, JERRY, Professor of Speech, Supervisor of Fundamentals of Speech, 1970; B.S., SDSU, 1964; M.A., University of South Dakota, 1965; Ph.D., Southern Illinois University, 1973.

FERGUSON, MICHAEL W., Assistant Professor of Plant Science, 1981; B.A., California State University, 1974; M.S., California State Polytechnic University, 1976; Ph.D., Kansas State University, 1981.

FINCH, ROBERT G., Professor of Electrical Engineering, 1974; B.S., Michigan State University, 1958; M.S., 1960; Ph.D., Purdue University, 1974.

FIXEN, PAUL, Assistant Professor of Plant Science, 1981; B.S., SDSU, 1975; M.S., 1977; Ph.D., Colorado State University, 1979.

FLAKE, LESTER D., Professor of Wildlife and Fisheries, 1972; B.S., Brigham Young University, 1965; M.S., 1966; Ph.D., Washington State University, 1971.

FOREMAN, RUTH J., Professor of English, 1962; B.S., SDSU, 1961; M.S., 1964; D.A., Drake University, 1982.

FORSYTH, HARRY L., Professor and Head of Health, Physical Education and Recreation, Director of Athletics, 1955; B.S., SDSU, 1951, M.S., 1956; D.P.Ed., Springfield College, 1970.

FRANCIS, DAVID H., Associate Professor of Veterinary Science, 1978; B.S., University of Missouri, 1971; M.S., Brigham Young University, 1974; Ph.D., University of Missouri, 1978.

FUNCHION, MICHAEL F., Professor of History, 1973; B.A., Iona College, 1966; M.A. Loyola University, 1968; Ph.D., 1973.

GARTNER, F. ROBERT, Professor of Animal Science, 1956; B.S., University of Wyoming, 1950. M.S., University of California, 1956; Ph.D., University of Wyoming, 1967.

GAUGER, W. KENNEDY, Assistant Professor of Microbiology, 1981; B.A., Yankton College, 1974; M.S., University of Wyoming, 1977; Ph.D., 1981.

GEHRKE, JR., HENRY, Professor of Chemistry, 1964; B.S., Oklahoma State University, 1958; M.S., University of Iowa, 1962, Ph.D., 1964.

GILBERT, HOWARD A., Professor of Economics, 1966; B.A., Central Bible Institute, 1957; B.S., Washington State University, 1961; M.A., 1962; Ph.D., Oregon State University, 1967.

GILLILAND, MARLENE M., Adjunct Associate Professor of Nursing, 1978; B.S., Augustana College, 1950; M.S., George Washington University, 1958; M.S.N., Vanderbilt University, 1974.

GRAETZER, HANS G., Professor of Physics, 1956; B.A., Oberlin College, 1952; M.S. Yale University, 1953, Ph.D., 1956.

GRANHOLM, NELS, Professor of Biology & Animal Science, Electron Microscopist, 1968; B.A., University of Massachusetts, 1964; Ph.D., Iowa State University, 1968.

GREENBAUM, HARRY, Professor of Economics, 1961; B.S., Texas A&M University, 1955; M.S., Ohio State University, 1956, Ph.D., 1961.

GRITZNER, CHARLES F., Professor of Geography, 1980; B.A., Arizona State University, 1958; M.A., Louisiana State University, 1960; Ph.D., 1969.

GROVE, JOHN A., Professor of Chemistry, 1968; B.S., Ohio State University, 1961; M.S., 1964; Ph.D., 1966.

HAERTEL, LOIS, Associate Professor of Biology, 1969; B.S., University of Illinois, 1961; M.S., 1963; Ph.D., Oregon State University, 1969.

HANSON, CLARK W., Professor of Education, 1973; B.S., University of Minnesota, 1963; M.A., 1971; Ph.D., Iowa State University, 1972.

HARDIN-PALMER, SUSAN, Associate Professor and Head of Nursing, 1975; B.S., SDSU, 1958; M.S., University of Nebraska, 1976.

HASSOUN, M. NADIM, Professor of Civil Engineering, 1980; B.S., Cairo University, 1956; M.S., University of Michigan, 1966; Ph.D., 1968.

HATFIELD, WARREN G., Professor and Head of Music, 1961; B.A., University of Northern Iowa, 1952; M.A., University of Iowa, 1959; Ph.D., 1967.

HECHT, HARRY G., Professor of Chemistry, 1973; B.S., Brigham Young University, 1958; M.S., 1959; Ph.D., University of Utah, 1962.

HEGGE, MARGARET, Associate Professor and Coordinator of Continuing Education, 1977; B.A., Gustavus Adolphus College, 1969; M.S., University of Minnesota, 1984; Ed.D., University of South Dakota, 1983.

HEIN, WARREN W., Professor of Physics, 1979; B.S., University of Wisconsin, 1966; Ph.D., Iowa State University, 1970.

HELLICKSON, MYLO, Professor and Head of Agricultural Engineering, 1969; B.S., North Dakota State University, 1964; M.S., 1966; Ph.D., West Virginia University, 1969.

HENDRICKSON, JOHN P., Professor of Political Science, 1954; B.A., University of Iowa, 1947; M.A., University of Minnesota, 1949; Ph.D., University of Iowa, 1952.

HESS, DONNA J., Professor of Rural Sociology, 1974; A.B., Marquette University, 1965; M.A., State University of New York, 1971; Ph.D., Michigan State University, 1974.

HIETBRINK, BERNARD E., Professor and Head of Pharmacology, 1964; B.S., SDSU, 1958; Ph.D., University of Chicago, 1961.

HILDERBRAND, DAVID C., Associate Professor and Head of Chemistry, 1974; B.A., Southwest Baptist College, 1967; M.A., University of Missouri, 1969; Ph.D., 1971.

HILLAM, ROBYN, Associate Professor of Microbiology, 1976; B.S., Colorado State University, 1969; Ph.D., 1974.

HOFFMAN, GEORGE R., Adjunct Professor of Plant Science, 1980; B.A., Hastings College, 1957; Ph.D., Washington State University, 1962.

HOFLAND, SHARON, Professor of Nursing, 1972; B.S., SDSU, 1972; M.S., 1972; Ph.D., 1976; M.N., University of Washington, 1979.

HOGAN, EDWARD P., Professor and Head of Geography, 1967; B.S., St. Louis University, 1961; A.M., 1962; Ph.D., 1969.

HOLDEN, DAVID J., Professor of Biology, 1956; B.S., SDSU, 1950; M.S., 1952; Ph.D., University of Chicago, 1956.

HOOGESTRAAT, WAYNE E., Professor of Speech, 1960; B.A., Sioux Falls College, 1951; M.A., University of South Dakota, 1953; Ed.D., Pennsylvania State University, 1963.

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SHUBECK, FRED E., Professor Emeritus of Plant Science, 1951; B.A., SDSU 1940; Ph.D., University of Minnesota, 1951.

SKUBIC, LOUIS G., Professor Emeritus of General Engineering, 1954; B.S., University of Minnesota, 1947; M.A., 1953.

SMYTHE, LIMEN T., Professor Emeritus of Economics, 1941; B.A., University of Washington, 1934; M.A., 1937.

SOGN, ARTHUR, Associate Professor Emeritus of Economics, 1968; B.S., SDSU, 1948; M.S., 1959.

SPURGEON, KENNETH R., Professor Emeritus of Dairy Science, 1958; B.S., Purdue University, 1942; M.S., 1948; Ph.D., University of Wisconsin, 1951.

STINE, LAWRENCE C., Professor Emeritus of Speech, Director Emeritus of Theatre, Associate Dean Emeritus of Arts and Sciences, 1952; A.B., Butler University, 1947; M.A., University of Iowa, 1951; Ph.D., 1962.

STOFLET, DOROTHY, Professor Emeritus of Textiles, Clothing and Interior Design, 1963; B.A., Coe College, 1933; M.S., Iowa State University, 1948.

STORRY, JUNIS O., Amdahl Distinguished Professor of Engineering, Director, Engineering Experiment Station, Director, Engineering Extension, 1946; B.S., SDSU, 1942; Ph.D., Iowa State University, 1967.

SUNDET, STANLEY A., Director Emeritus of Placement, Professor Emeritus of Education, 1946; B.S., SDSU, 1935; M.S., Iowa State University, 1939; Ph.D., University of Minnesota, 1955.

TAYLOR, CHARLES A., Professor Emeritus of Botany, 1949; B.S., Cornell University 1935; M.S., 1939.

THOMPSON, JOHN E., Professor Emeritus of Economics, 1952; B.S., University of South Dakota, 1950; M.S., South Dakota State University, 1953; Ph.D., University of Wisconsin, 1960.

TRUMP, ALFRED G., Professor Emeritus of Library Science, A.B., University of Michigan, 1933; A.M., 1938.

WALZ, JEAN D., Professor Emeritus of English, 1960; B.S., Northern State College, 1933; M.A., University of South Dakota, 1939.

WEBSTER, VICTOR., Professor Emeritus of Chemistry, 1936; B.A., Iowa State University, 1930; M.S., 1931; Ph.D., 1933.

WELLS, DARRELL G., Professor Plant Science, 1962; B.S., SDSU, 1941; M.S., Washington State University, 1943; Ph.D., Iowa State University, 1949.

WENTZY, WOODROW P., Associate Professor Emeritus of Journalism, Supervisor Emeritus of Instructional TV, 1938; B.S., SDSU, 1938; M.A., University of Oklahoma, 1950.

WHITEHEAD, EUGENE I., Professor Emeritus of Station Biochemistry, 1941; B.S., SDSU, 1939; M.S., 1941.

WIERSMA, JOHN, Professor Emeritus of Agricultural Engineering, Director of Water Resources Institue, 1943; Registered Engineer (South Dakota); B.S., SDSU, 1943; M.S., 1950; Ph.D., University of California, 1970.

WILLIAMS, PERRY W., Professor Emeritus of Physics, 1936; B.A., Dakota Wesleyan University, 1936; M.S., SDSU, 1940.

WILLS, RENA, Professor Emeritus of Nutrition and Food Scienc, 1952; B.S., Iowa State University, 1940; M.S., 1946.

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APPLICATION FOR ADMISSION (see instructions before completing)

Graduate School, Box 2201, South Dakota State University, Brookings, South Dakota 57007

1. Name _____
(Last) (Other or Former Name, if any) (First) (Middle)

2. Current Mailing Address _____
Street, RFD, or Box

_____
City State or Country Zip Code Phone

3. Permanent Mailing Address (if different from 2) _____

_____

4. Date of Birth _____ 4a. Place of Birth _____
Month Day Year City State or Country

5. Social Security No. _____ 6. Citizen of what country _____ 7. ☐ U.S. Veteran

8. Name of person to be notified in case of emergency _____

_____
Relationship Address

9. Degree received (If none, state when bachelor's degree will be earned and remaining requirements. Baccalaureate degree or equivalent from an accredited institution is a prerequisite for pursuing graduate work.)

All institutions attended and addresses	Degrees earned (if any)	Dates attended

10. Standardized admissions tests taken (GRE, MAT, TOEFL). TOEFL required for international students, see instruction sheet.

Standardized admission test	Latest date taken	Score

11. Degree sought (check one) ☐ None ☐ Master of Arts ☐ Master of Science ☐ Master of Education (☐ Teaching ☐ Administration ☐ Guidance & Counseling) ☐ Doctor of Philosophy

12. Major department _____ Area of interest _____

13. Term graduate work will begin: ☐ Fall ☐ Spring ☐ Summer Year _____ 14. Indicate where you will enroll initially: ☐ On campus ☐ Continuing Education

Signature of Applicant _____ Date _____

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This section will be detached before your application is rated.

Name _____

SEX		ETHNIC GROUP/RACE*					CITIZENSHIP			
FEMALE	MALE	WHITE	BLACK	ASIAN	AM IND	HISPANIC	NATIVE	NAT'LED	ALIEN	RESIDENT ALIEN

* "Asian" includes "Pacific Islanders" and peoples of the Indian subcontinent and, "American Indian" includes "Alaskan native"

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